

Effect of Selected Auditory Interventions on Reducing Chemotherapy Induced Anxiety and Pain of Children with Cancer and their Parents' Satisfaction

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ABSTRACT

Background: Auditory interventions by listening to Holy Qur'an or music can be considered a support to the traditional medical practices in reducing anxiety and pain related to chemotherapy.

The study aim was to examine the effect of selected auditory interventions on reducing chemotherapy induced anxiety and pain of children with cancer and their parents' satisfaction.

Design: Pre/posttest quasi-experimental research design was used. **Sample:** A purposive sample of 100 children undergoing chemotherapy and one of their parents, children divided into two equal groups received selected auditory interventions: 50 children received Holy Qur'an and 50 children listened to music.

Setting: This study was conducted at the outpatient and inpatient pediatric chemotherapy units at University Hospital affiliated to Suez Canal and Ismailia Medical Complex. **Tools:** Tool (I) Interviewing questionnaire which included demographic data for the studied children and one of their parents, Tool (II) a numerical rating scale (NRS) to evaluate children's pain intensity, Tool (III) Hamilton Anxiety Rating Scale (HAM-A), is used to assess anxiety level, and Tool (IV) Parents' satisfaction questionnaire to evaluate the parents' level of satisfaction with the selected auditory intervention of pain relief in the children undergoing chemotherapy.

Results: Study results revealed that studied children age was between 8 to <10 years old were (40%) in the Qur'an group and (36%) in the music group. It also, showed that, 58% of children who listening to Holy Qur'an had severe pain pre-test and decreased to 5% post-test, while, in the music group 30% had severe pain in pre-test which improved to 12% post-test and 50% of children had not anxiety in Holy Qur'an group and 33% had moderate anxiety in music group post-test. Also parents' satisfaction to the use of selected auditory interventions are increased in post-test Holy Qur'an (50%) compared to music group (30%).

Conclusion: there were highly statistical significant differences in application of selected auditory interventions by listening to Holy Qur'an and music as children had lower pain intensity and anxiety level in post-test compared to pre-test.

Recommendation: Health education and training program should be conducted for pediatric nurses about different auditory interventions that can play a vital role in supporting clinical practices to reduce pain and anxiety level for children undergoing chemotherapy.

Keywords: Children undergoing Chemotherapy, Auditory Interventions, Anxiety, Pain, Parents' Satisfaction.

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Introduction

Cancer is still the chief health problem worldwide and one of the main leading causes of death around the world. ^(1&2) Over the precedent 10 years, the incidence of cancer has increased in the Middle East. ⁽³⁾ Each year, about 400,000 child and adolescent under 19 years of age developed cancer. The common types of cancer in children including leukemia, brain tumor, lymphomas, and solid tumors, such as neuroblastomas and Wilms' tumors. ^(4&5) Worldwide about 377 000–426 000 incident cases of childhood cancer in 2015, of which only 224 000 were diagnosed and In the world, 43% of cases of pediatric cancer were undiagnosed. ⁽⁶⁾ More than 80% of children with cancer are cured in high-income nations where full care is typically available while with low and moderate incomes nations less than 30% of children with cancer recover. Screening generally cannot detect or prevent childhood cancer. ⁽⁷⁾ Deaths from preventable childhood cancers in low and middle-income countries are attributable to under diagnosis, misdiagnosis or late diagnosis, barriers to accessing care, treatment abandonment, toxicity, and relapse. ⁽⁸⁾ In the United States of America, there were an expected, 1 685 210 new cancer cases diagnosed and 595 690 cancer deaths in 2016. ⁽⁹⁾ chemotherapy is the key therapy for cancer as it extends the life of children suffering from cancer and improves the quality of life by preventing or minimizing toxicity that harms and damages normal cells, in addition to exerting therapeutic benefits. ⁽¹⁰⁾ Along with healing, chemotherapy, which is administered to cancer children, can cause severe symptoms and a lot of side effects that lead to major discomforts such as pain, nausea, vomiting, fatigue and lack of appetite, anxiety, and depression which can increase anxiety level among affected children. ⁽¹¹⁾

Anxiety is defined as “an emotion characterized by feelings of tension, worried thoughts, and physical changes like increased blood pressure“. ⁽¹²⁾ Cancer itself and its treatment, both have negative effects on emotional and physical status and also make anxiety and pain. ⁽¹³⁾ Pain is defined as an unpleasant sensory and emotional experience associated with actual or potential tissue damage. ⁽¹⁴⁾ Depending on its pathophysiological mechanism; it may be classified into nociceptive, neuropathic, mixed and practical pain. ⁽¹⁵⁾ Practical pain is a type of pain due to a diagnostic or therapeutic intervention, physical illness, disability; or emotional as well as psychological problems associated with cancer and chemotherapy treatments. The occurrence of chemotherapy-induced anxiety is 15.38% in children who receive chemotherapy. ⁽¹⁴⁾

In addition, anxiety and pain are the main complications that children with cancer may face before and during chemotherapy also children reports fatigue, depressive symptoms, anxiety, and psychological stress from cancer treatment. ⁽¹⁶⁾ A high level of anxiety and severe pain can put children with cancer at risk of some immunological problems, impairment in quality of life, and functional loss. ⁽¹⁵⁾ On the other hand, immunity disturbance is one of the major side effects of chemotherapy. Anxiety and pain during chemotherapy increase children' heart rate, respiratory rate, and blood pressure as a result of releasing noradrenaline and adrenaline hormones ⁽¹⁶⁾.

Furthermore, chemotherapy-induced anxiety can increase the side effects of chemotherapy after administration. ⁽¹²⁾ Certainly, anxiety and pain not only affect the children's emotional status but also, the efficiency of chemotherapy and the duration of hospitalization. In addition, some studies declared that anxiety

increases children' nausea, pain, lack of appetite, and vomiting before and after chemotherapy. ⁽¹³⁾

There are numerous techniques of auditory interventions such as spiritual care by Holy Qur'an and music therapy, verbal relaxation, progressive muscle relaxation, or guided imagery that have been studied to reduce chemotherapy-induced anxiety and pain. ⁽¹⁴⁾ Music therapy is described as the clinical and evidence-based use of music interventions is an effective complementary health approach in integrative oncology treatment which provides support for cancer children. Evidence-based use of music therapy is directed to accomplish physical and social needs of children. ⁽⁴⁹⁾

Listening to music raise the children' relaxation by optimistic impacts on neurophysiologic and emotional responses. ⁽¹⁵⁾ On the other hand, spirituality is distinguished from all additional things such as humanism, values, morals, and mental health, by its connection to that which is blessed. Qur'an recitation, as religious confidence, can be used in a way of spiritual therapy. ⁽¹⁷⁾ So, reducing children' anxiety before and during chemotherapy administration minimizes the possible side effects of chemotherapy and increases the effectiveness of treatment.

Nursing and medical staff using spiritual care and music therapy techniques should be good experts to define if these techniques procedure actually used and is efficient at the treatment of the child's present perception of anxiety and pain and a regular evaluation must be done for any method will use. ⁽⁵⁰⁾ Regarding the coping of a child, mainly during the chemotherapy sessions, using simple language to decrease fear and anxiety of children is important. Pain and anxiety assessment must be continued until ending the procedure of chemotherapy. ⁽¹⁸⁾

To date, many pharmacological, physical, and psychological interventions have been appraised for pain management in children feeling needle-related procedures, such as spiritual care and music therapy. Most of these interventions wanted short training for the health care team and can be professed as being time-consuming and/or expensive causing barriers to application in clinical settings and daily practices. ^(19, 20)

Though, an easy-to-use, rapid, non-invasive, safe, inexpensive, and reusable intervention could be a motivating alternative, mainly in acute settings, which are often eventful and where time to achieve a procedure is a subject. So, nurses play a vital role in the assessment, reduction, and management of children's pain and anxiety and the use of pharmacological and non-pharmacological interventions must be an essential part of nursing practices such as applying new methods as auditory interventions by listening to Holly Qur'an and music that reduce and manage the intensity of pain and anxiety. ⁽⁵¹⁾ Nurses can support children, educate and instruct parents. They also, assess needs of children, perform measures to reduce and manage children's pain and anxiety.

Significance of the study

While many studies have been done regarding cancer, it is still a health problem that must be considered by the researchers. ⁽¹¹⁾ Forty percent of the population are children under 18 years old in Egypt. ⁽⁵²⁾ Age-standardized incidence rates of cancer in Egypt are 166.6 per 100 000 persons and 5-year survival of childhood cancer was estimated to be 40% based on baseline assessment of pediatric oncology care in Egypt. ⁽⁵³⁾

A study in Egypt by Madney, et al., (2019) ⁽⁵⁴⁾ showed that, among the pediatric cancer children that hospitalized with a median age of 8 years was 45 cases of proven mucormycosis and commonly occur in female

children. A multinational study, reported that procedural pain and anxiety cause a notable impact on general health and has an important issue for pediatric patients. In specific, chemotherapy pain and anxiety are the most stressful for children.⁽²¹⁾ Studies have shown that a large number of children do not obtain adequate pain and anxiety prevention during the chemotherapy procedures. Ignoring pain can cause several physiological, psychological and emotional consequences such as anxiety, phobias, and increase perceptions of pain in the future.⁽⁴⁸⁾ So, there is an extremely urgent requirement to focus on the importance of care and relief for pain and anxiety, on the other hand, the opportunity of care is missed.⁽²¹⁻²³⁾

In Egypt, the application of concerning care and relief of procedural pain and anxiety of children is very limited through the formal health care system. Both national and subnational surveys have stated that children and their parents require basic application and information on care and relief for practical pain and anxiety of chemotherapy. Using non-pharmacological approaches remains limited in clinical practices. In fact, these interventions do not require specific training, preparation time, or excessive cost, for healthcare teams, which represent barriers to their application in the fast-paced environment of the outpatient chemotherapy unit and pediatric department setting.⁽²⁴⁾

For children and adolescents, hospitalization can cause detachment and disturbance of family ties, friends, and school. In pediatric oncology patients, these issues may be aggravated due to the rate of side effects of drug therapy, mainly due to chemotherapy, the prolonged periods of hospitalization, expectations of alternative treatment and cure of the disease, and the physical and psychological changes caused by cancer itself and its treatment that greatly impacts habits

and life of children.⁽²⁵⁾ In the current study, the selected auditory interventions were used to investigate their efficacy in reducing children' anxiety level and pain intensity before and after chemotherapy sessions.

Aim of the Study

The aim of the current study was to examine the effect of selected auditory interventions on reducing chemotherapy induced anxiety and pain of children with cancer and their parents' satisfaction.

Research Hypotheses:

H1: Children with cancer who will receive selected auditory interventions by listening to Holy Qur'an or music will have a lower pain intensity and anxiety level during chemotherapy sessions in post-test compared to the pre-test.

H2: Parents' satisfaction during their children's chemotherapy sessions is expected to be improved post-test in Holy Qur'an group compared to music group.

Subject and Methods:

Study design:

A quasi-experimental research design (two groups' pre/post-test) was used to examine the effect of selected auditory interventions of Holy Qur'an and music on reducing chemotherapy induced anxiety and pain of children with cancer and their parents' satisfaction.

Setting:

The current study was conducted in two different settings, the outpatient and inpatient pediatric chemotherapy units at University Hospital affiliated to Suez Canal and Ismailia Medical Complex.

Subjects:

A purposive sample of 100 children having cancer who treated with chemotherapy and one of their parents (100 parents) are randomly assigned using simple random sampling technique. They are divided into two equal groups. Pretest and posttest was done

for each group. The first intervention group consisted of 50 children who are assigned for listening to Holy Qur'an and the second intervention group consisted of 50 children who are assigned to listening to music. The studied children were selected according to the following criteria:

Inclusion criteria for children:

- Children aged 8 to 17 years old.
- Children receiving intravenous chemotherapy for the first or second sessions.
- Able to communicate verbally and capable of self-reporting pain.

Exclusion criteria:

- Children with neurocognitive impairment or receiving psychiatric treatment, or analgesics within the last 6 hours.
- Children with hearing disorders and those who didn't want to listen to Holy Qur'an or music.

Data collection Tools: the tools used for data collection were four.

Tool (I): Interviewing questionnaire: it was developed by the researchers and included demographic data of children and one of their parents as follow:

Part A: Demographic characteristics of the studied children such as age, sex, order of children and type of cancer.

Part B: Demographic characteristics of the parent such as; age, educational level, caregiver attending the session and residence.

Tool (II): Numerical rating scale (NRS) was adopted from **Tsze, Baeyer, Pahalyants & Dayan (2018)**.⁽²⁵⁾ It is a valid and reliable self-report tool used to assess acute or chronic pain intensity of children in clinical settings as children undergoing chemotherapy sessions and it is a scale that is recommended to evaluate pain in children aged 8 to 17 years. Children are frequently asked to rate the severity of their pain using a simple 0–10 numerical rating scale (NRS), children are typically asked “How strong is the pain,

where 0 is no pain and 10 is the strongest or worst pain that child can imagine”. Numerical rating scale is used to Qur'an and music group pre/post-test.

Scoring system of numerical rating scale (NRS): Children's responses were sorted as follows: No pain (zero), mild pain (1-3), moderate pain (4-6) and severe or much worse pain (7-10).

Tool III: Hamilton Anxiety Rating Scale (HAM-A) was adopted from **Hamilton (1959)**.⁽²⁶⁾ It is a valid and reliable rating scale used to measure the severity of anxiety symptoms. The scale consists of 14 items, each item defined by a series of symptoms, and measures both psychic anxiety (mental agitation and psychological distress) and somatic anxiety (physical complaints related to anxiety). Administration time of the scale by the researchers' observation for children and asking the child, the tool takes 10–15 minutes, HAM-A scale contains 14 items including phrases that describe specific feelings that children have. 1) Anxious mood (Worries, anticipation of the worst, fearful anticipation, irritability), 2) Tension (Feelings of tension, fatigability, startle response, moved to tears easily, trembling, feelings of restlessness, inability to relax), 3) Fears of (Dark, strangers, being left alone), 4) Insomnia (Difficulty in falling asleep, dreams, nightmares, night terrors, disturbed sleep, insufficient sleep, and fatigue when you wake up), 5) Intellectual (difficulty in concentration), 6) Depressed mood (loss of feeling interest or well), 7) Somatic (muscular) (Pains and aches, twitching, stiffness, myoclonic jerks, grinding of teeth, unsteady voice, increased muscular tone), 8) Somatic (sensory) (Tinnitus, blurring of vision, hot and cold flushes, feelings of weakness, pricking sensation), 9) Cardiovascular symptoms (Tachycardia, palpitations, pain in chest), 10) Respiratory

symptoms (Pressure or constriction in chest, dyspnea), 11) gastrointestinal symptoms (abdominal pain, burning sensations, abdominal fullness, nausea, , lack of appetite, vomiting, constipation), 12) urinary system (Frequency, urgency of urination, enuresis), neurologic symptoms (Dry mouth, drowsiness, flushing), 13) pallor, tendency to sweat, tension headache), 14) behavior at interview (restlessness or pacing, verbal resistance, tremor of hands, furrowed brow, strained face, or rapid respiration, facial pallor, swallowing, refuse obeys, biting lips). The researchers told the children about the phrases and used pre/post-test for two interventions groups.

Scoring system of HAM-A scale: Each item is scored on a scale of 0 (not present) to 4 (severe), with a total score range of 0–56, where scores ≤ 17 indicates mild anxiety, 18–24 moderate and 25–30 severe anxiety level.

Tool IV: Parents' Satisfaction Questionnaire was adopted from **Friedel et al. (2014)**⁽²⁰⁾ in order to evaluate the parents' level of satisfaction with the selected auditory intervention methods of pain relief in the children undergoing chemotherapy and the parent desire to use it again in future, the researchers used a questionnaire. The questionnaire items were: 1. My child was comforted by the use of the selected auditory interventions Holy Qur'an or Music during the chemotherapy session; 2. It was a positive experience; 3. I think the selected auditory interventions Holy Qur'an or Music is easy to use; 4. I would like to use the selected auditory interventions Holy Qur'an or Music in the future for tests carried out on my son/daughter. Rating was based on a five points Likert-Scale: 1=No, 2= Probably not, 3=I don't know, 4=Yes, 5=Definitely.

Validity and Reliability of the tools:

Content validity was ascertained by a group of experts in (3) pediatric nursing, specialties.

Their opinions were elicited about the tool's format layout, sentences' clarity, content appropriateness, consistency, and scoring system.

Tool two numerical rating scale (NRS) validity (the scale demonstrated strong convergent validity, known-groups validity and the correlations was very strong in children aged 8–16 years old with responsiveness to tool 95% CI 3.1, 3.9) and tool two reliability (the correlation coefficients were greater than 0.82).

Reliability of all items of the tool parent satisfaction questionnaire was done. The reliability test was established by using Cronbach's alpha to assess internal consistency construct validity. Cronbach's alpha $r = 0.86$ for Hamilton Anxiety Rating Scale and 0.78 for Parents' satisfaction Scale.

Ethical Considerations:

Official steps were completed to get permission to carry out the current study; approval letter was taken from the responsible authorities (Faculty of Nursing Dean at Suez Canal University to the directors of Suez Canal University Hospital and Medical Complex Hospital at Ismailia City).

All studied children and one of their parents who attended as a relative with the child have explanation about aim, objectives and benefits of the study in order to gain their coordination and acceptance. The researchers informed the children and their parent that the participation in the intervention is voluntary; children and their parents have the right to withdraw from the study at any time, without giving any reason and their responses would be held confidentially. Confidentiality and privacy of all the data will be assured. Written consent will be gained from those who are agreeing to participate in the study.

Pilot Study:

A pilot study was approved on 10% of the total sample (10 children and their parent) to

test the clearness and applicability of the study tools as well approximation of the time needed to completion of each study tool. Those who contributed to the pilot study were included in the study because no modifications were done on the tools.

Procedure:

After obtaining official approval from the director of Suez Canal University Hospital and the agreement of the chairman of the inpatient and outpatient pediatric chemotherapy units, data were collected over a period of 6 months from the beginning of February 2021 to the end of July 2021.

The aim of the study at first was simply explained to the studied children undergoing chemotherapy and their parents who attended with the child in chemotherapy sessions. After that they started to collect data from the children and one of their parents by visiting the study settings 2 days/week (Mondays and Tuesdays) during the morning period in the previously mentioned settings from 9.00 a.m. to 2.00 p.m.

All engaged children and their parent were informed that participation is voluntary and they have the withdrawal right from the study at any time. Children were randomly selected. All surrounding conditions were similar to all children. The first group was assessed firstly (pre-test) then receive intervention of Holly Qur'an and reassessed again as post-test. The second intervention group were also assessed (pre-test) in the first chemotherapy session without intervention and then post-test in the second chemotherapy session was done after listening to music intervention. Children have the autonomy to select which auditory intervention they prefer to receive.

Children were allowed to select the preferred Surah of the Holy Qur'an to listen; they also allowed adjusting volume and voice as preferred. The music group was also allowed

to select the type of music they want to listen and adjust voice and volume as they preferred. Data was collected from children and their parents through interview questionnaire. The researchers introduced themselves to children and parents to obtain their approval to participate in the study. The researchers collected demographic data related to the parent's age, educational level and residence and data related to the studied children as age, sex, child's order in their families and type of cancer. The interview consumed about 20 -30 minutes each. Otherwise, time 10–15 minutes for the HAM-A scale, about 5 minutes for the NPS and 10-15 minutes for the parents' satisfaction questionnaire.

During the first interview session, the studied children and one of their parents were asked to fill out the demographic data; Numerical Rating Scale (NRS) of pain assessment, Hamilton Anxiety Scale and Parents' satisfaction questionnaire, and these tools are used before intervention for the studied subject as pre-test in the first session. Explanations for the children in the selected two auditory interventions groups were done. The parents were asked to help the children during the intervention (operate the phone with the intervention player, switching on and off, adjusting volume) to assist the researchers to complete the assessment. The first auditory intervention (Qur'an group) was asked to listen to the preferred Holy Qur'an for 20 to 30 minutes during their chemotherapy session by a hand free-earphone as the child like. The other group was asked to listen to preferred music as the children like to select for 20 to 30 minutes during their chemotherapy session. The studied children and one of their parents were instructed on how to operate the phone with the intervention player (e.g., switching on and off, adjusting volume) in an appropriate room in the chemotherapy unit before the intervention through the use of the

hand free-earphone. The children were asked to fill out NRS, and the researchers observed the children anxiety level using Hamilton Anxiety Scale and document it. The parents who attended the session with children were asked to fulfill the parents` satisfaction questionnaire in the two interventions groups.

Statistical Design

The researchers used Statistical Package for Social Sciences (SPSS, version 19), to organize, score, tabulate and analyze the data obtained. To express the numerical data the researchers used mean and standard deviation (SD). Also, frequency and percentage were used to express qualitative data. Paired T-test was used to compare quantitative variables. Chi-square (χ^2) test, to assess relationships between various qualitative variables, P-value less than 0.05 was significant, and P-value less than 0.001 were highly significant.

Results

Table (1) revealed that, more than one third of children aged 8 to <10 years old (40%) in the Qur'an group and (36%) in the music. This table also showed that, 60% and 50% of the Qur'an and music groups respectively were females. Regarding the type of cancer 44% and 40% of children in the Qur'an and music groups respectively had leukemia. Concerning Caregivers attending the procedure for both Qur'an group and music groups, it was found that, 70% and 80% respectively were mothers and the differences were not statistically significant between the two groups ($P>0.05$).

Table (2): Shows that, the mean age of parents was 32.22 ± 2.60 years in the Qur'an group compared to 31.12 ± 2.64 years in the music group. Slightly more than two fifth of children (44%) were second order in the Qur'an group and also, 44% were the third order in the music group. Regarding parents' educational level 50% & 36.7% of parents in Qur'an and music groups respectively had secondary education and three fifth of mothers

(60%) live in rural area in music group compared to 44% of parents in Qur'an group with no statistical significance differences between the two groups.

Figure (1): Illustrates that, more than half (58%) of the studied children`s in the Qur'an group had severe pain in pre-test compared to 5% of them who had severe pain posttest. Regarding pain intensity of the music group it was found that, 30% and 12% of the music group had severe pain pre-test and post-test respectively.

Figure (2): Portrays that, 40% of the studied children`s in the Qur'an group had severe anxiety level in pre-test while, 50% of them have not anxiety post-test. Forty percent of children in the music group had moderate anxiety pre-test compared to 33% of them who still have moderate anxiety post-test in the music group.

Table (3): Clarified that the differences were highly statistically significant for the studied children's selected psychological, somatic and neurological responses to anxiety during chemotherapy sessions in the pre and post-tests. Regarding crying and easy to bring tears, tension and headache, difficulty in falling asleep, refuse obeys and feelings of weakness, difficulty in concentration, dry mouth, pallor and biting on lips were less in the post test of Qur'an group compared to the music group with statistical differences that was highly significant between the two groups at p-value <0.001.

Table (4) reveals that there were highly statistically significant differences for studied children's in both groups regarding physiological responses during chemotherapy sessions in pre-test and post-test as regards tachycardia and palpitation, dyspnea, sweating, abdominal fullness, nausea, abdominal pain and lack of appetite, pressure or constriction in chest and frequent urination

were less in the post-test of Qur'an group than in Music group, (p-value ≤ 0.001).

Table (5), found that, the differences in the total mean scores of pain intensity between the two groups post-test were highly statistically significant at P-value ≤ 0.001 with the mean total pain score in Qur'an group was 2.12 ± 0.65 and in the music group was 4.32 ± 0.95 . Also, it was showed that the total mean scores of anxiety level were significantly improved between the two groups after intervention at P-value ≤ 0.001 with total mean score of anxiety level was 12.66 ± 1.3 in Qur'an group and 20.96 ± 1.32 in the music group.

As regard to the parent satisfaction questionnaire, **Table (6)** proves that, more than one third 30% and 36% of Qur'an group answered yes and certainly respectively regarding that Quran make their children feel comfortable compared to 28% and 10% respectively in the music group during the chemotherapy sessions. In addition, 32% and 20% of the Quran and music groups respectively were certain that it was a positive experience. Also, less than half (48%) of parents were certain to reuse the Qur'an intervention in future chemotherapy sessions compared to 30% of parents in the Music group who were certain to reuse music during chemotherapy in the future.

Results

Table (1): Frequency and Percentage Distributions of the Studied Children's Demographic Data (n=100).

Demographic characteristics	Qur'an group (n=50)		Music group (n=50)		X ²	P-value
	No	%	No	%		
Age/years					2.42	> 0.05
8 < 10	20	40.0	18	36.0		
10 < 12	15	30.0	12	24.0		
12 and more	15	30.0	20	40.0		
Mean \pm SD	11.6\pm1.02		12.2\pm0.86			
Sex					1.86	> 0.05
Male	20	40.0	25	50.0		
Female	30	60.0	25	50.0		
Type of cancer					2.31	> 0.05
Leukemia	22	44.0	20	40.0		
Brain tumors	5	10.0	8	16.0		
Lymphoma	15	30.0	19	38.0		
Others as (Wilms Tumor, Neuroblastoma and Lung Cancer)	8	16.0	3	6.0		
Caregivers attending the procedure					1.47	> 0.05
Mothers	35	70.0	40	80.0		
Fathers	15	30.0	10	20.0		

Table (2) Frequency and Percentage Distributions of the Studied Parents Demographic Data (n=100).

Demographic characteristics	Qur'an group (n=50)		Music group (n=50)		X ²	P-value
	No	%	No	%		
Age/years						
20-<30	6	12.0	8	16.0	2.18	>0.05
30-<40	34	68.0	27	54.0		
40-<50	10	20.0	15	30.0		
Mean ± SD	32.22 ± 2.60		31.12 ± 2.64			
Order of children						
First	10	20.0	12	24.0	1.96	>0.05
Second	22	44.0	11	22.0		
Third	12	24.0	22	44.0		
The last	6	12.0	5	10.0		
Parents' educational level						
Not read and write	8	13.3	14	23.3	2.07	>0.05
Primary	10	16.7	8	13.3		
Secondary	30	50.0	22	36.7		
High education	12	20.0	16	26.7		
Residence						
Urban	28	56.0	20	40.0	1.46	>0.05
Rural	22	44.0	30	60.0		

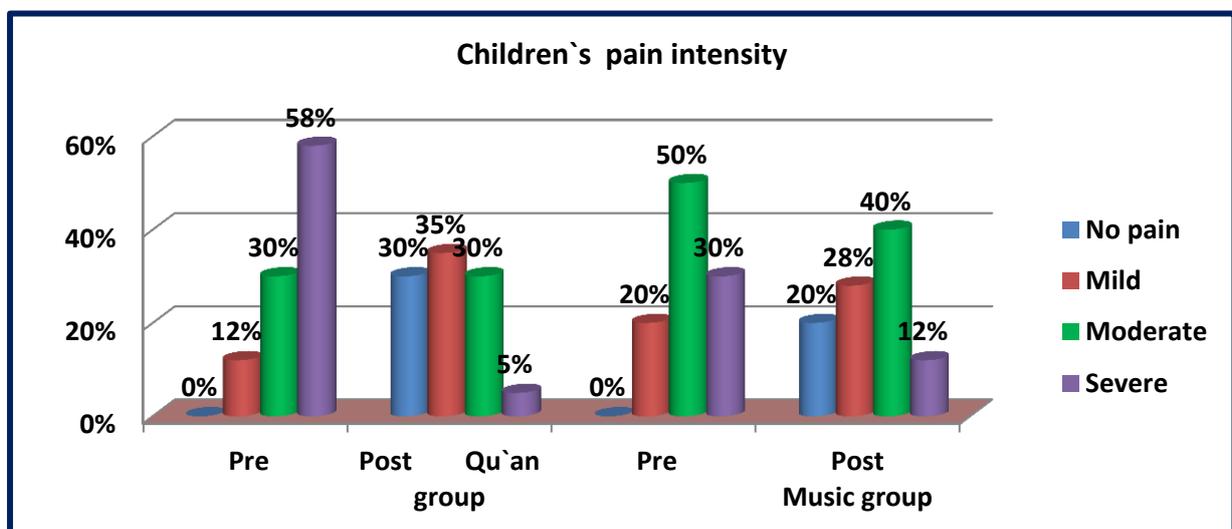


Figure (1): Percentage Distribution of Pain Intensity among the Studied Children during Chemotherapy Session Pre and Post-test in Qur'an Group and Music Group (n=100).

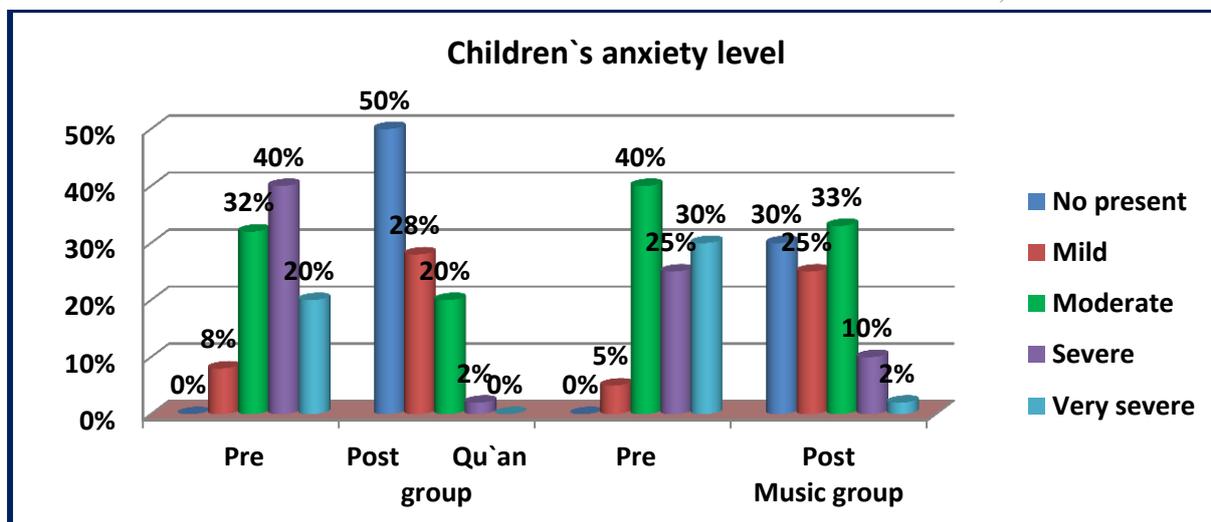


Figure (2): Percentage Distribution of Anxiety Levels Among the Studied Children during Chemotherapy Session Pre and Post-test in Qur'an Group and Music Group (n=100).

Table (3): Distribution of Children's Selected Psychological, Neurological and Somatic Complains Regarding Responses to Anxiety during Chemotherapy Session Pre and Post-test in Qur'an Group and Music Group (n=100).

Items	Qur'an group (n=50)		Music group (n=50)		P-value
	Pre	Post	Pre	Post	
	%	%	%	%	
- Crying and easy to bring tears	40.0	16.0	40.0	20.0	<0.001
- Tension and headache	45.0	20.0	43.0	25.0	<0.001
- Restlessness and loss of feeling interest	70.0	30.0	72.0	35.0	<0.05
- Difficulty in falling asleep	50.0	20.0	45.0	26.0	<0.001
- Refuse obeys and feelings of weakness	63.0	15.0	65.0	20.3	<0.001
- Difficulty in concentration	65.0	10.0	70.0	15.0	<0.001
- Aches	48.0	30.0	48.0	30.0	<0.05
- Fears of being left alone	53.0	25.0	50.0	30.0	<0.05
- Dry mouth and pallor	75.0	15.0	75.0	20.0	<0.001
- Biting on Lips	60.0	32.0	60.0	30.0	<0.001

-Statistical significant differences ≤ 0.05 -Highly statistical significant differences ≤ 0.001

Table (4): Distribution of Children's Selected Physiological Complains Regarding Responses of Anxiety during Chemotherapy Session Pre and Post-test in Qur'an group and Music group (n=100).

Items	Qur'an group (n=50)		Music group (n=50)		P- value
	Pre	Post	Pre	Post	
	%	%	%	%	
Tachycardia and palpitation	80.0	30.0	80.0	40.0	<0.001
Dyspnea	80.0	25.0	85.0	35.0	<0.001
Sweating	75.0	20.0	80.0	30.0	<0.001
Abdominal fullness	60.0	15.0	65.0	25.0	<0.001
Nausea, abdominal pain and lack of appetite	70.0	40.0	65.0	50.0	<0.001
Pressure or constriction in chest	75.0	30.0	70.0	35.0	<0.001
Frequent urination	30.0	10.0	35.0	20.0	<0.001

-Highly statistical significant differences ≤ 0.001

Table (5): Mean Differences in Studied Children' Total Mean Score of Pain Intensity and Anxiety Level Pre and Post-test in the Qur'an and Music Groups (n=100).

Items		Qur'an Group (n=50) Mean \pm SD	Music Group (n=50) Mean \pm SD	Paired T-test	P-Value
Pain Intensity	Pre-test	9.12 \pm 1.08	9.62 \pm 1.07	3.42	< 0.05
	Post-test	2.12 \pm 0.65	4.32 \pm 0.95	36.08	< 0.001
Anxiety Level	Pre-test	42.42 \pm 1.68	31.56 \pm 1.62	29.14	< 0.001
	Post-test	12.66 \pm 1.3	20.96 \pm 1.32	14.05	< 0.001

-Statistical significant differences ≤ 0.05 -Highly statistical significant differences ≤ 0.001

Table (6): Percentage Distribution of One the Parents' Satisfaction Questionnaire for the Qur'an and Music group (n=100).

Parents' satisfaction	Qur'an group (n=50)					Music group (n=50)				
	No (%)	Possibly not (%)	Don't know (%)	Yes (%)	Certainly (%)	No (%)	Possibly not (%)	Don't know (%)	Yes (%)	Certainly (%)
Comfortable child by the use during and after the procedure	(2)4.0	(5)10.0	(10)20.0	(15)30.0	(18)36.0	(7)14.0	(9)18.0	(10)20.0	(14)28.0	(5)10.0
It was a positive experience	(5)10.0	(2)4.0	(12)24.0	(15)30.0	(16)32.0	(8)16.0	(6)12.0	(14)28.0	(12)24.0	(10)20.0
I think the intervention is easy to use	(0)0.0	(2)4.0	(5)10.0	(25)50.0	(18)36.0	(0)0.0	(3)6.0	(12)24.0	(15)30.0	(17)34.0
I would like to use intervention in the future	(0)0.0	(3)6.0	(4)8.0	(19)38.0	(24)48.0	(0)0.0	(2)4.0	(15)30.0	(16)32.0	(15)30.0

Discussion

Cancer is the second cause of death in children under 15 years old and the leading cause of death in childhood. In spite of therapeutic advances, its incidence and prevalence have increased in recent years. ⁽³⁰⁾

The experts and researchers highlighted that being diagnosed with cancer is a very traumatic and highly stressful experience for children. In addition, all the diagnostic tests, the treatments, and the frequent hospital appointments have a great psychosocial impact. ⁽³¹⁾

The worst experiences related to cancer are the pain related to treatment and diagnostic tests, followed by depression, sleep disturbances, fatigue, and anxiety. ⁽³¹⁾ The importance of treatment by radiotherapy or chemotherapy is unquestionable. However, it has become evident that these treatments can cause stress in children as their life is altered and they are constantly made aware of the disease. ⁽³²⁾ This can lead to extreme negative consequences on

children' physiological, psychological and behavioral distress. ⁽³³⁾

The need for other complementary therapies to achieve a more effective and comprehensive treatment is being increasingly considered and studied. ⁽³³⁾ These therapies include a wide range of approaches from psychological intervention, to cognitive behavioral therapy, relaxation techniques, or breathing exercises ⁽³⁴⁾ to different auditory intervention that significantly used to reduce pain and anxiety level as Quran and music therapy, they have been used in different medical fields to meet the physiological, psychological and spiritual needs of children. ⁽³⁵⁾

Concerning the children characteristics in the current study, the majority of age was 8-<10 years in Qur'an group and music group, the majority of children were females and less than half of children had leukemia. The study was supported with the study by Robson, Dietrich & Akard (2021) ⁽⁵⁵⁾ who studied

"Associations of Age, Gender, and Family Income with Quality of Life in Children With Advanced Cancer" and found that children averaged 10 years and the majority were females and had a hematologic malignancy as leukemia. The study contradicted with Maele-Fabrya, Gamet-Payrastreb & Lison (2019) ⁽⁵⁶⁾ who studied "Household exposure to pesticides and risk of leukemia in children and adolescents" and found that more than one third of children cancers diagnosed under 15 years of age were in high income countries.

Concerning parents attending the chemotherapy sessions with their children, for the two groups, the majority were mothers. This may be due to that children are more connected to their mothers or may be related to that fathers are busy with their work than mothers. Regarding parents' educational level, half of the parents in the two groups had secondary education and the majority of them live in rural areas, the mean age of parents were 32.22 ± 2.60 years in the Qur'an group compared to 31.12 ± 2.64 years in the music group. More than two fifth of children were the second order in the Qur'an group and also, more than two fifth were the third order in the music group.

The result of the current study contradicted with Hasan, Mohamed, Ahmed, Riad & Ali (2020) ⁽⁵⁷⁾ who studied "Knowledge and Performance of Mothers Having Children with Cancer Undergoing Chemotherapy in EL mania" and found that the mean of age of mothers was 42.5 ± 5.4 years, more than half of them have basic education. And the study supported that all of mothers who participated in the study were mothers, and most of them lived in rural areas.

Concerning pain level, the pain intensity mentioned by children in studies groups, "Qur'an and Music group" was decreased post-test as compared to pre-test. These results were in accordance with a study conducted by

Majidi (2014) ⁽⁴¹⁾ who revealed that there was reducing in breathing and pulse rate and pain level post intervention in the holy Qur'an group in comparison to the control group. From the researchers' point of view, the relaxation effect of Holy Qur'an produced by activated endorphin leads to inhibition pain modulation process in acute pain produced by an invasive procedure.

The study supported with Saged, Yusoff & Abdul Latif (2020) ⁽⁵⁸⁾ who concluded that the Holy Quran sound is an effective treatment for spiritual and psychological issue that reduce anxiety and pain intensity. Also, Fooladi, et al., (2019) ⁽⁶¹⁾ concluded that distraction therapy can be effective in minimizing the severity of pain caused by intra-spinal injection of chemotherapy drugs in cancerous children and improving hemodynamic indices. Concerning anxiety level in the current study, there was lowering in the anxiety level post-test compared to pre-test in the Qur'an group compared to the Music group and there was a highly statistically significant difference between two groups post-test. This may be explained as that, the hearing to the sound of Qur'an, even for a short periods of time, can reduce the state of anxiety resulting from chemotherapy, cancer, hospitalization, medical staff and separation from parents, such an effect, whether due to the deviation of the child's mind from chemotherapy and its consequences or as a result of the spiritual effect of the Qur'an.

The study goes on line with Atikah, Ishak, Fitri & Ibrahim (2022) ⁽⁵⁹⁾ who discovered that listening to, recitation or memorization the Qur'an had a significant effect on decreasing depression, anxiety and improve physiologic parameters,.

The results of the current study are congruent with the study done by Al-Jubouri, et al., (2021) ⁽¹⁴⁾ who found that, listening to Holy Qur'an or music can reduce the level of

chemotherapy-induced anxiety in children with cancer. However, listening to Qur'an hasn't statistically significant differences compared to listening to music in reducing chemotherapy-induced anxiety in children with cancer. On the other hand, age, gender and educational level did not play significant roles at the level of chemotherapy-induced anxiety.

Concerning selected psychological, neurological and somatic complains of children to anxiety responses of Qur'an and Music groups pre and post-test, there were highly statistically significant differences between the studied groups for psychological responses during chemotherapy sessions, regarding crying, fatigue and decrease appetite, restlessness and feeling bad, refuse obeys and depression, verbal pain, fear, biting on lips. In the same line, Islamic studies emphasize the importance of religion in raising the psychological level of children, his stability and ensuring his peace. Also, this study supported with Pinheiro, et al., (2018)⁽⁶⁰⁾ who studied "Child and adolescent self-report symptom measurement in pediatric oncology " and found that most children reported that they had psychological symptoms of depression and anxiety in pediatric oncology units and they need for relaxation, auditory intervention as listening to Qur'an and music to relief pain and anxiety from chemotherapy sessions.

From researchers' opinion, religion in its various manifestations, the most important of which is the memorization of the Noble Qur'an, and its effects on the psychological health of individuals and their personalities, their enjoyment of a high level of mental health and their distance from manifestations of psychological imbalance compared to individuals who do not adhere to the teachings of a religion or do not memorize anything from the Noble Qur'an short Surah.

Concerning selected physiological complains of anxiety responses of children in the two groups, there were highly statistically significant differences for the studied sample among the Qur'an and Music groups' pre and post-test during chemotherapy sessions as tachycardia, palpitation and dyspnea, flushed face, sweating and frequency urination as they were less in Qur'an group than in music group.

This is consistent with Bragado (2009) and Ghiasi & Keramat (2018)^(42&43) who studied the effect of listening to Qur'an on physiological responses of mechanically ventilated Muslim patients and relieving pain, breastfeeding effect and music during heel lance for healthy-term neonates in China, respectively and found that playing the sound of the Holy Qur'an during painful procedures could positively influence the stabilization of the physiological responses in the hospitalized children, improving vital signs and decrease anxiety with the medical procedure. The researchers explain that, the relaxing effect of Qur'an initiates brainstem responses to cholinergic and dopaminergic neurotransmission to regulate heart rate, blood pleasure, body temperature, skin conductance and decrease muscle tension.

Regarding parents' satisfaction with Qur'an and music in both groups' pre and post-test. The majority of parents reported that, they would reuse the Qur'an and Music intervention in a future chemotherapy sessions, while most of the parents in the Qur'an group were certain in using Qur'an in the next sessions. No negative opinions were expressed for any of the questions regarding the Qur'an and Music intervention. This may be related to that parents' satisfaction may be due to decreased pain in their children, stable psychological and physiological responses also related to their children's satisfaction.

The study result supported with Nikfarid, Rassouli, Borimnejad & Alavimajd (2017) ⁽⁶²⁾ who found that parents' satisfaction and coping with religious, that are meaning, control, comfort, and intimacy with others and closeness to God are the most frequently used coping methods.

Conclusion:

Application of the selected auditory interventions by listening to Holy Qur'an efficiently reduced pain intensity from severe in pretest to mild in post-test in the Qur'an group compared to music group. Also, the anxiety level was decreased from severe in pre-test to no anxiety post-test in the Qur'an group compared to music group to nearly one third of children still have moderate anxiety post intervention in the music group. Also the study concluded that there were highly statistical significant differences in application of selected auditory interventions by listening to Holy Qur'an and music as children had lower pain intensity and anxiety level in post-test compared to pre-test. In addition to parent satisfaction, the majority of parents reported that, they would reuse the Qur'an and Music intervention in a future chemotherapy sessions, while most of the parents in the Qur'an group were certain in using Qur'an in the next sessions. No negative opinions were expressed for any of the questions regarding the Qur'an and Music intervention.

Recommendations:

1. Health education and training program should be conducted for pediatric nurses about different auditory interventions that can play a vital role in supporting clinical practices to reduce pain and anxiety level for children undergoing chemotherapy.
2. An educational training program should be conducted on pediatric nurses about different non-pharmacological approaches of pain management as auditory interventions for children undergoing chemotherapy.

3. Relaxation techniques should be used for children with cancer to make children's live as normal as possible.

4. Repetition of the study on a larger sample size and at different settings to prove the effectiveness of auditory methods for pain and anxiety management.

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