Effectiveness of Integrated Training Program on Knowledge, Parental Distress, and Coping Patterns among Mothers of Post-Operative Brain Tumor Children

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ABSTRACT

Background: Mothers of children with post-operative brain tumors may experience considerable suffering and challenges in coping, compounded by a lack of understanding regarding the disease, therapy, and their coping strategies, which adversely affect their well-being and caregiving abilities. **Aim:** examine the effectiveness of an integrated training program on knowledge, parental distress, and coping patterns among mothers of post-operative brain tumor children. **Design:** Quasi-experimental (non-equivalent control group design). **Subjects:** A purposive sample of 40 mothers of children with brain tumors postoperatively was recruited from a pediatric neurosurgical department at Cairo University Specialized Pediatric Hospital, equally divided into study and control groups. **Tools for data collection** were a structured interview questionnaire, a structured questionnaire for mothers' knowledge regarding brain tumor and postoperative care of children with brain tumor, a parental distress scale, and a coping strategies scale. **Result:** highly statistically significant differences of both groups concerning mothers’ knowledge, parental distress level, and coping strategies patterns mean scores before, after, and follow-up of the integrated educational program. **Conclusion:** Providing an integrated educational program for mothers of post-operative brain tumor children can effectively raise their knowledge, enhance their coping patterns, and reduce parental distress, which positively affects their children's physical and emotional well-being. **Recommendation:** the integration of the designed training program for mothers of brain tumor children in the pediatric neurosurgical unit to raise mothers' knowledge, enhance their coping patterns, and reduce parental stress.

Keywords: Coping patterns, Integrated Training Program, Mothers of Post-Operative Brain Tumor Children, Parental distress.

INTRODUCTION

Among pediatric patients, brain tumors (BT) are the most prevalent solid tumors and are one of the most common causes of tumor-related fatalities in this age group. BT is the second most common pediatric malignancy, with an occurrence rate of 1.15 to 5.14 cases per 100,000 children. A comprehensive approach that encompasses additional radiotherapy and chemotherapy is typically initiated by surgical removal, which is the primary method of treatment (Baalaaji, 2023). Astrocytoma is the most common brain tumor in infants, with embryonic tumors following in sequence. A variety of subtypes that are clinically, pathologically, and biologically distinct are associated with BT. International collaboration is imperative due to the complexity of conducting research and clinical trials (Thorbinson & Kilday, 2021).

According to Schupper, Yong, and Hadjipanayis (2021), therapeutic advances have resulted in a greater survival rate for children with BT. Recent advances in neurosurgery technology, including operating microscopes, neuro-endoscopy, intraoperative imaging, neurophysiological monitoring, and neuronavigation, have allowed surgeons to do less invasive resections with fewer neurological sequelae. However, some therapy options may have unintended consequences. Regardless of treatment alternatives, children may have severe medium- to long-term functional and psychological issues that impede their everyday activities and involvement. On the other hand, the socioeconomic and familial contexts of chronic disease. According to this viewpoint, the stress of pediatric sickness, along with high levels of carer load and inadequate levels of social support, may put carers at risk for psychiatric problems (Bates et al., 2022).

A child's diagnosis of a brain tumor often triggers negative emotions like fear, anxiety, uncertainty, stress, depression, and guilt. Furthermore, many families experience a drastic shift from feeling secure and in control of their lives to facing vulnerability and insecurity. The emotionally intense nature and challenges of treatment, which include invasive procedures, frequent hospital stays, side effects from medications, and disruptions to daily routines, lead to difficulties in coping and instability for many families. A significant reason that deters many parents from seeking knowledge and understanding about childhood tumors is the stigma associated with them. Parents feel that even speaking about tumors in relation to their child is associated with misfortune, and they form their own conclusions based on their family's experiences or the advice of others (Zhou, Bai, & Zhao, 2021).

The prevalence of clinically significant anxiety and depression among parents of children with tumors is reported to be as high as 74% and 46%, respectively. Parental fear and anxiety arise from a lack of understanding regarding the disease and its treatment, the perception that the tumor is incurable, painful, and fatal, and the difficulty in managing the associated uncertainty. The primary challenge faced by mothers of children with tumors is insufficient knowledge regarding the disease, treatment, and associated complications. This deficiency can impact various aspects, including psychological well-being and social interactions, potentially resulting in diminished trust in the healthcare team and reduced cooperation from the children during treatment. Parental stress has been identified as an independent predictor of children's emotional, behavioral, and social adjustment (Shaygani et al., 2024).

Pointon et al. (2023) showed that medical practitioners may anticipate, assess, and identify parents who may struggle with the emotional, physical, and logistical demands of a child's brain tumor diagnosis by studying parental coping methods. Parents frequently feel overwhelmed, but knowing their unique issues can help create therapies to help them cope with their child's brain tumor diagnosis. Mothers often lacked understanding about postoperative brain tumor diagnosis, complications, wound care, pain management, child placement, mobility, skin care, feeding, and infection control. Knowledge gaps can increase the risk of surgical complications, prolonging hospital stays and rehabilitation for children.

Otherwise , Educating families about brain surgery is a crucial initial step in promoting high-quality nursing care. The primary objective is to establish a framework for executing diverse nursing care responsibilities and identifying needs. Nursing care seeks to support the child and family in alleviating stress and addressing the emotional and physical challenges associated with illness (Azman, Jali, Singh, Abdullah, & Ibrahim, 2020). Integrated training programs incorporating psychoeducation, resilience-building, and peer support effectively enhance knowledge, decrease distress, and promote adaptive coping strategies among mothers of children post-brain tumor surgery. These treatments benefit caregivers and may also enhance child outcomes (LaRovere et al, 2022).

Significance of the Study

Brain tumors are the most common solid tumors in children and are associated with high mortality and significant long-term impacts on both patients and their families. The WHO reported a rise in annual death rates from malignant brain and CNS tumors in children between 2008 and

2017cited in (Lutz, Junger, & Messing-Junger, 2022). These tumors often lead to neurological, cognitive, and psychosocial issues in children, while families face emotional distress and struggle to balance caregiving with daily responsibilities. Studies highlight the need for comprehensive support systems, including individualized care plans and emotional support for children, as well as clear communication between healthcare providers, schools, and families (Young et al ,2022).

Children with brain tumors require age-specific nursing care during treatment, especially as they may struggle to express symptoms or discomfort. Parents' ability to cope is deeply influenced by the information and support they receive. Empowering mothers through integrated training programs can improve their knowledge, reduce distress, and enhance coping skills, ultimately benefiting the quality of life for both mother and child. However, in Egypt, few studies have explored such interventions. Therefore, the current study aims to examine and implement an integrated training program for mothers of post-operative brain tumor children, contributing evidence-based insights to pediatric and psychiatric nursing practices.

AIM OF THE STUDY

The aim of this study is to examine the effectiveness of an integrated training program on knowledge, parental distress, and coping patterns among mothers of post-operative brain tumor children.

Research hypothesis:

To fulfill the aim of the study, the following research hypotheses were formulated:

1. Mothers have children with post-operative brain tumors who will receive the integrated training program will have higher postoperative care knowledge scores than those who didn’t receive the program.
2. Mothers have children with post-operative brain tumors who are exposed to the integrated training program will exhibit lower scores of parental distress scores than the control mothers group.
3. Mothers have children with post-operative brain tumors who are exposed to the integrated training program will exhibit higher scores on coping patterns than the control group.

SUBJECTS AND METHOD

Research Design

Quasi-experimental design (A nonequivalent control group pretest, posttest &follow-up)

Research Subjects

A purposive sample of 40 mothers of children with brain tumors who are experiencing surgery participated in the study. The first 20 children with their mothers were considered as a control group who received the hospital routine care. The second 20 child and their mothers participated as a study group who exposed to the integrated program. The sample size was calculated based on the following formula

$$n= \frac{T^2 \times p\,(1-p)}{m^2}$$

n= required sample size.

t= confidence level at 95% (standard value of 1.96).

p = estimated prevalence of children with post-operative brain tumor in 2022 at CUSPH (0.38).

m = margin of error at 5% (standard value of 0.05).

$$n= \frac{(1.96)^2 \times 0.38(1-0.38)}{(0.05)^2} =40$$

Inclusion criteria

- Mothers have children aged from 3 to 12 years.
- Children diagnosed with brain tumor and undergoing removal of tumor surgery for the first time.

Exclusion Criteria

Children with any other congenital anomalies such as gastrointestinal, genitourinary, and orthopedic anomalies as well as congenital heart defects.

Research Setting

The study was conducted in the inpatient pediatric surgical department (neurosurgery unit) at Cairo University Specialized Pediatric Hospital (CUSPH). It receives children from all over Egypt. The neurosurgical unit receives children who have different neurosurgical problems either congenital or acquired. The number of brain tumors in post-operative children was 500 in the previous year. The hospital contains 185 beds, four operating theaters, radiology devices and specialized laboratories, and daily provides medical services for Egyptian and Arab children. It occupies an advanced rank in the field of pediatrics and child–related surgery.

Data Collection Tools

Four tools for data collection were used in this study: -

Tool (1) Structured Interview sheet was designed by researchers in Arabic language, it includes 15 questions and is composed of three parts:-

Part I: - It contains nine questions about the parents' personal data (age, level of education, father and mother occupation, family income, consanguinity with the husband, and residence).

Part II: - It contains five questions about personal data related to the child (age, gender, child rank, education, and the reason for not going to school or nursery if present).

Part III: - It contains four questions about the child’s current medical history (family history, duration of disease, type of brain tumor, signs and symptoms of brain tumor).

Tool (2): A questionnaire for mothers' knowledge regarding brain tumor & postoperative care of children with brain tumor (pre and post-test):

It was designed by researchers in the Arabic language and is composed of 13 questions and divided into two parts:

Part I: Mother's knowledge regarding brain tumor included seven questions about brain tumor definition, causes, signs & symptoms, diagnosis, management, postoperative medications & postoperative complications.

Part II: Mothers' knowledge about postoperative care of brain tumor consisted of six questions about pain management, positioning, skin care, and wound care, prevention of infection, and child's nutrition.

Scoring system:

Mothers' knowledge scored as follows: a complete and accurate answer scored (2) points, incomplete or inaccurate answers scored (1) point, and the wrong or unknown answers scored (zero). Based on mothers' answers, their total knowledge scored and categorized into: good knowledge level ≥ 75% (≥15), average knowledge level ≥50% to <75% (≥10 to <15) and poor knowledge level < 50% (<10).

Tool (3): Parental distress scale:

This tool was developed by Jebali (2012) in the Arabic language and published online, consisting of 34 items to assess the levels of distress among parents who are caregivers of children with chronic diseases. The scale and its versions' psychometric properties, as measured through their axes, are high in both validity and reliability. Each item is scored on a 3-point Likert-type scale as follows; (0= no;1 =sometimes; 2= yes). The minimum score is 0 and maximum score is 68, which is categorized as levels: low level= score from 0 to 23, a moderate level= score from 24 to 46, and high~~er~~ level= score from 47 to 68.

Tool (4): Coping strategies scale:

This standardized tool was designed originally by Paulhan, (1994), adopted and translated in Arabic version by Afifi et al (2019) consisting of 30 items from the domains of defensive coping (e.g., Wishful Thinking, Planning of Problem solving, Positive Reappraisal, Seeking Social Support, Accepting responsibility, Self-Control, Escape Avoidance and Self-blame.

Coping strategies	**Items Numbers**
Wishful Thinking	24 ,11 ,7 ,2
Planning of Problem solving	6 ,4
Positive Reappraisal	29, 28, 16 , 13, 12 ,9 ,5
Seeking Social Support	21, 10 , 3 , 1
Accepting responsibility	23 ,22
Self-Control	26, 25 ,18
Escape Avoidance	19, 17,15 , 8
Self-blame	30, 27, ,20,14

Translation and back translation techniques have been done for the measurement by Afifi et al (2019) through a panel of three bilingual experts; two professors in Psychiatry, and one Expert of Arabic language and published online. The tool is designed to measure coping strategies as measured on 4 points Likert scale as follows; 1 = I never did that ; 4 = I did that a lot. The minimum score is 30 and maximum score is 120. Accepted internal consistency and test–retest reliability was valued (α = .91).

Pilot Study

The purpose of the pilot study was to determine how long it would take to complete the tools and ensure they were clear and easy to understand. It was carried out on a sample of 4 studied mothers, indicating more than 10 % of the sample. Since no adjustments to the instruments were necessary, the studied mothers from the pilot research remained in the original sample size.

Procedure

Description of the integrated training program

Title of the Program: Integrated Training Program of knowledge, parental distress and coping patterns among mothers of post-operative brain tumor children.

Aim: This program aims to improve knowledge, and coping patterns among mothers of post-operative brain tumor children.

Overview: The program focus on a greater sense of empowerment to enable change by enabling one to acquire knowledge and skillful behaviors to enhance coping patterns among mothers of post-operative brain tumor children. The program was administered within the framework of knowledge and behavior training sessions. The studied mothers were divided into 4 groups, which each group consisted of each of 10 mothers. It was held on 13 sessions, each group twice times per week for one hour/session.

The following research was conducted according to the following:

Planning and assessment phase (the End of October 2023 – the end of January 2024): the study took three months to prepare the research plan and the content of developed Integrated Training Program for mothers of post-operative brain tumor children. The Program translation and back translation were done to prepare the Arabic version of the program. In addition, Content validity of the program was reviewed by a panel of 3 experts in psychiatric nursing, and psychiatric medicine. Data were collected from Studied mothers who met the inclusion and exclusion criteria. The researchers met each mother individually at special quiet room for waiting area in inpatient pediatric surgical department (neurosurgery unit) at Cairo University Specialized Pediatric Hospital (CUSPH) to keep privacy to fill the study's tools. A baseline assessment before the program implementation through Four tools (structured interview questionnaire, structured questionnaire for mothers' knowledge regarding brain tumor & postoperative care of children with brain tumor , The parental distress Scale, and coping strategies scale) as a pretest in both study and control groups. The time to fill in the tools took between thirty to forty-five minutes for each mother.

Implementation Phase (the first of February 2024 – end of June 2024): The researchers conducted the integrated program to the study group (20) of studied mothers. They were informed about the “Integrated Training Program for mothers of post-operative brain tumor children” which aimed to help them acquire mothers' knowledge of post-operative brain tumor, and enhance their coping patterns. Studied mothers were informed about the content of the program, activities for training, number of sessions, and methods of data collection. The program was implemented on 13 sessions, each group twice times per week for one hour / session. Each skill was performed by using learning techniques that included: data worksheets, exchanging personal experiences through the group discussion, videos, simulations, and program booklet for all participants as illustrations that would be given to them to ensure their compliance on attending the program to the end, guiding instructions from the researcher, and finally, homework assignments, all that were conjugated with positive reinforcement, and incentives such as self-care instruments, chocolate, tea break, biscuits, and book notes.

The developed training program sessions as following: Session (1): Introduction and Overview of program, Sessions (2&3): knowledge about brain tumor disease in children, Session (4): knowledge and application of child care steps after brain tumor surgery., Session (5): The difference between feelings, thoughts, and behavior, Session (6): Emotional release, Sessions (7&8): positive thinking & self-control, Session(9): Social support, Session (10): Acceptance and commitment, Session (11): Coping with stressors , Session (12) : Mindful Intervention Self-Compassion and Session (13): Conclusion and summary. The teaching methods were used through the program sessions role play, group discussion, rehearsal, cognitive exercises, debriefing, and. feedback. the evaluation methods were used through the program sessions questionnaires, feedback, re-demonstration and rehearsal.

Evaluation Phase (July 2024): After the application of the program on the study group who attended the program, once again completed an Immediate and one-month (follow-up) assessment postoperative the researchers filled Standardized education checklist for mothers of children newly diagnosed with cancer, The parental distress Scale & coping strategies scale as a posttest for study and control groups to evaluate the impact of the integrated training program on knowledge, Parental distress, and coping strategies among mothers of post-operative brain tumor children.

Ethical Considerations

The research ethics committee at the Faculty of Nursing, Cairo University, approved the study, ensuring an ethical code of IORG0006883. Mothers provided written informed consent after completion and were informed that participation was voluntary and they had the right to withdraw at any time without impacting their children's care. Data confidentiality was confirmed for scientific research purposes, and anonymity was guaranteed.

Statistical design

A Statistical Package for Social Science (SPSS) version 26 is used for statistical analysis of data, Parametric inferential statistics as descriptive (mean &SD), Chi-square test for categorical variables, to compare between different groups, Monte Carlo correction, Friedman test for abnormally distributed quantitative variables, to compare between more than two periods, ANOVA with repeated measures normally distributed quantitative variables, to compare between more than two periods or stages and Pearson coefficient to correlate between two normally distributed quantitative variables. Probability (p-value) less than 0.05 was considered significant and less than 0.001 was considered highly significant.

RESULTS

Personal data of the mothers/child of the study and control groups

Figure 1 shows that the age of the studied sample shows that 60%, and 35%of both the study and the control groups aged between 30 to less than 35 years respectively. Concerning mothers' educational levels of the study and the control groups had secondary education (60% and 45% respectively). As regards mothers' occupation 60% , and 50%-of both the study and the control groups were working as employee respectively.

Figure 2 reveals that 95% of the study group and 70% of the control group of the studied sample had no relation with their husband. In terms of the mother's income, about 85% of the study group had enough financial income in comparison to 55% of the control group. More than half (55%) of both the study and control groups levied in rural and urban areas respectively.

Figure 3 demonstrates that the child's gender was 65% of the study group and 60% of the control group were male. Regarding child's age 60% and 55% of both the control and study groups aged between 6-12 years respectively. In terms of child order among siblings, 45% of the study group and 25% of the control group were first members. Concerning children's education 70% and 65% of both the study and control groups did not go to KG/school respectively. As regards why he does not go to KG/school about 70% of the study group and 60% of the control group the reason was a health condition.

Figure 4 reveals that 95% of the study group and 85% of the control group did not have family members with a brain tumor. Concerning the types of tumor, nearly two-thirds and more than half of both the study and control group were benign (65% and 50% respectively). Additionally, almost all of both the study and control groups suffered from brain tumors in less than one year (100% and 95% respectively).

Table 1 and 2 illustrates the differences between mothers' knowledge of the study and control groups during three times of assessment (pre-program, post-program, and follow-up), it was found that there is a statistically significant difference between three times of assessment pre-program, post-program, and follow up among both the study and control groups where P< 0.001 regarding all items mothers' of knowledge assessment.

Table 3 shows that the total mothers' knowledge assessment scores for the study group it was found that there is a statistically significant difference between mean scores for the pre-program (**8.50±1.79**), post-program (**16.35±1.27**), and follow-up (**16.80±0.83**) the statistical analysis demonstrated highly significant at (**P=0.001**). This indicates a highly significant improvement. In a comparison of the control group was found no statistically significant difference between mean scores for the pre-program (**6.80±1.94**) and post-program (**6.80±1.94**), and follow-up (**6.55±1.85**) where (**p= 0.71). Moreover,** this table displays that before the program, more than two-thirds (70%) of the study groups had low levels of knowledge about brain tumors and the postoperative care of children with brain tumors, while almost all of the study groups increased their level of knowledge to high levels 90% after the program and 100% during the follow-up.

Table 4 represents the comparison between the study and the control groups regarding the parental stress scale in pre-, post, and follow-up programs. It is noted that in the study group, the percentage of the studied sample who had high parental stress pre-program (55.0%) was decreased in post-program and follow-up to (0 %), and the total mean score pre-program (**48.95±5.77**) was decreased post-program to (**30.45±4.73)** also decreased in follow up to **(32.80±1.58**) with a highly statistically significant difference P <0.001.

Table 5 compares the study and the control groups regarding coping strategies in pre-, post, and follow-up programs. It clarifies that the study group improved in all domains of coping strategy in three times of assessment pre-, post, and follow-up program with a highly statistically significant difference between pre-test, post-test, and follow-up at (p <0.001).

Table 6 displays that the study group increased most of the domains regarding coping strategies, including, wishful thinking, planning of problem-solving, seeking social support, accepting responsibility, and self-control, by 40.0%, 0.0%, 10.0%, 0.0%, and 0.0% respectively through pre-test to 75.0%, 65%, 80%, 65% and 75% respectively in post-test. In addition, improving it in follow-up to 100%, 70%, 90%, 75%, and 80% respectively. Moreover, this table illustrates that the study group had a moderate level of coping strategies pre-test was 35.0% and increased in post-test to 65% and follow-up to 100%.

Table 7 represents that there were statistically correlations between total mothers' knowledge scores about brain tumor post-operative care , mothers' coping strategies score in pre, post and follow program and parental distress score in post program (r = 0.61, p=0.004, r = 0.49, p=0.026, r = 0.64, p=0.002 & r = 0.56, p=0.010in order).

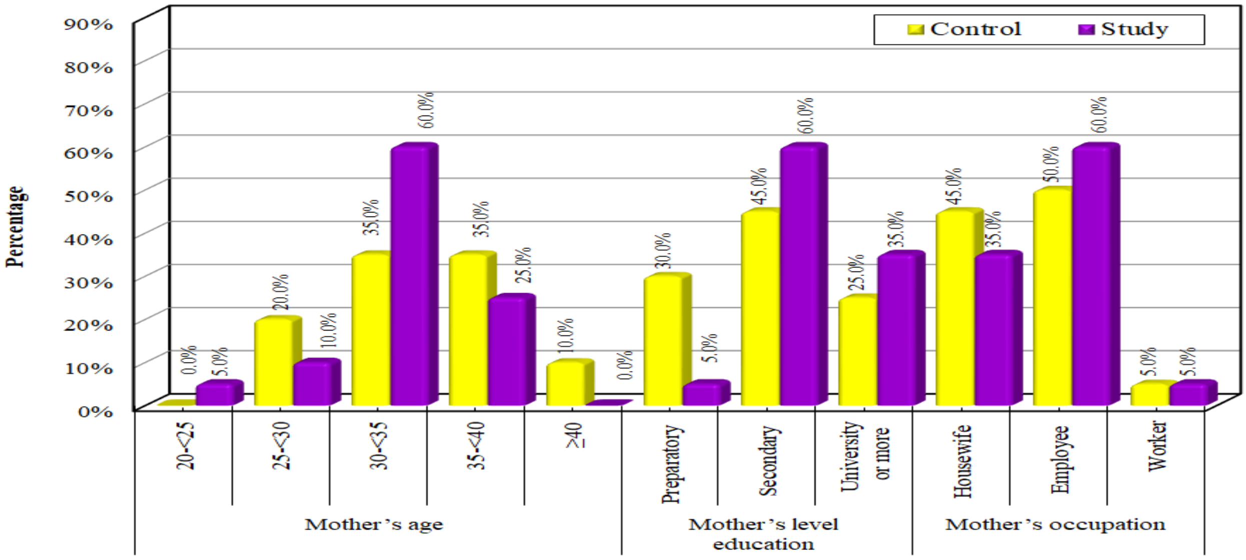

Figure (1): Distribution of the studied sample concerning their age, educational level, and occupation

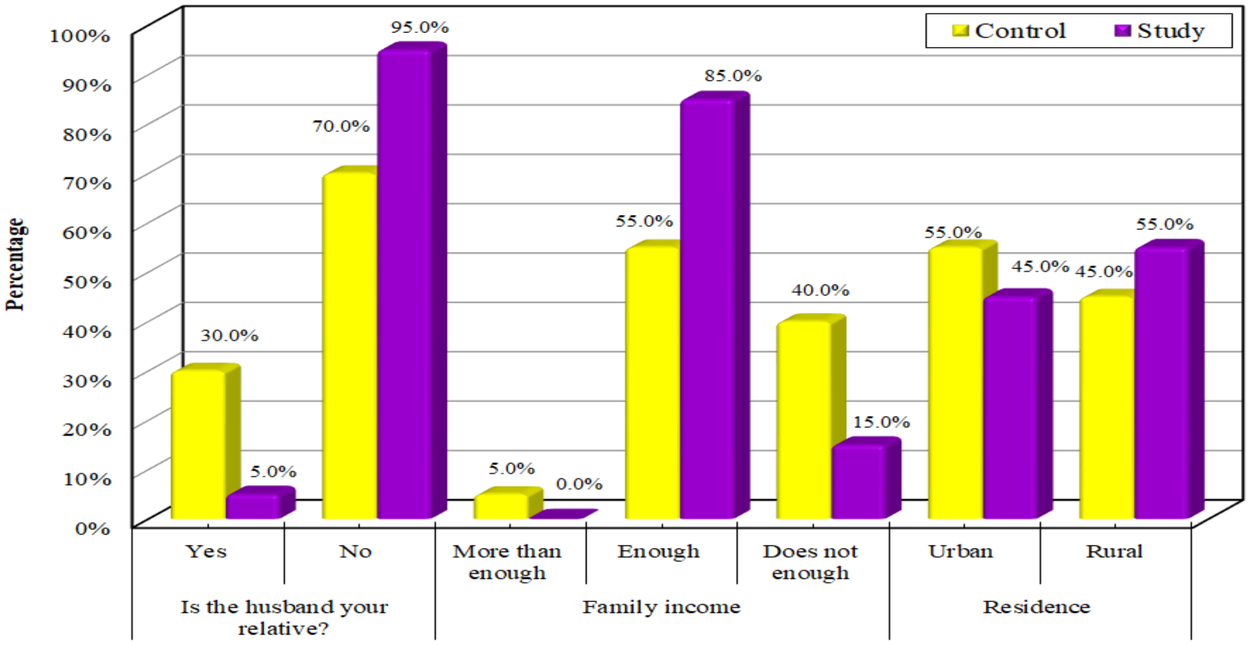

Figure (2): Distribution of the studied sample regarding their, relation with their husband, family income, and residence

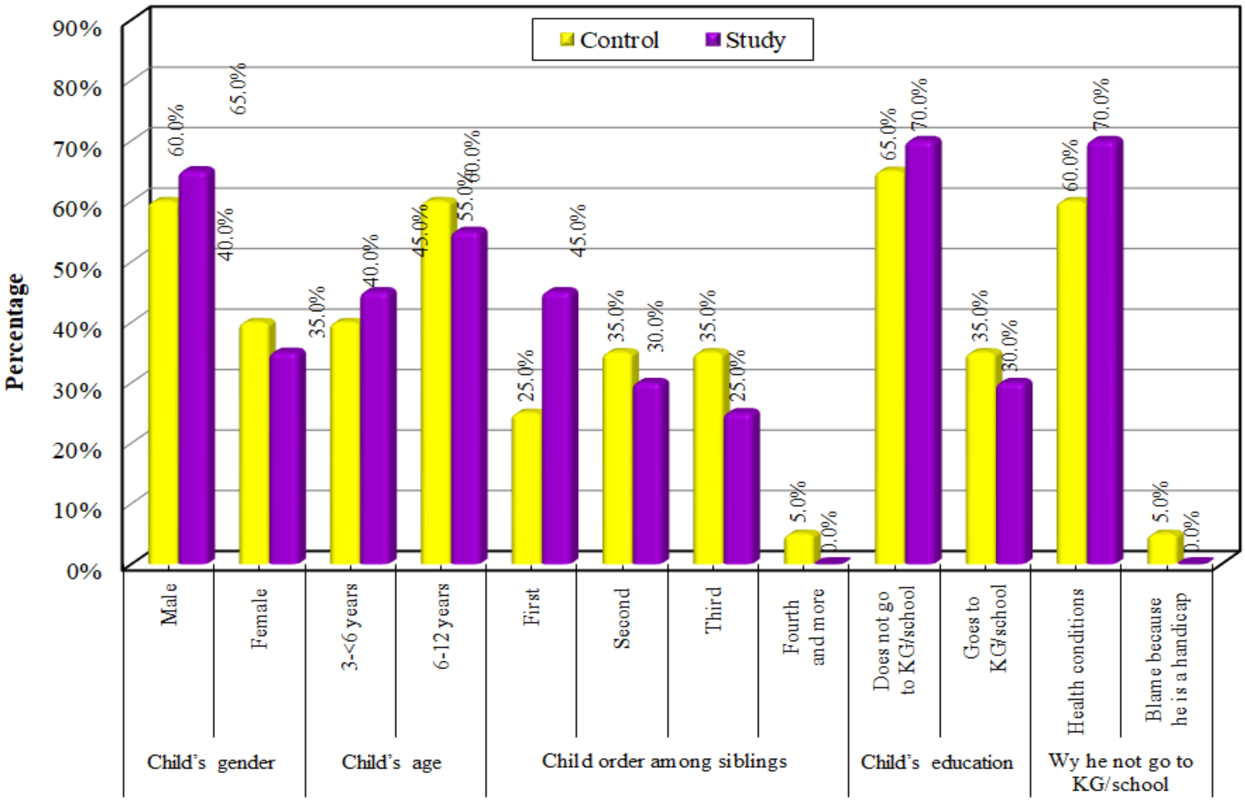

Figure (3): distribution of mother's child according to their age, order among siblings, education, and why he does not go to KG/school

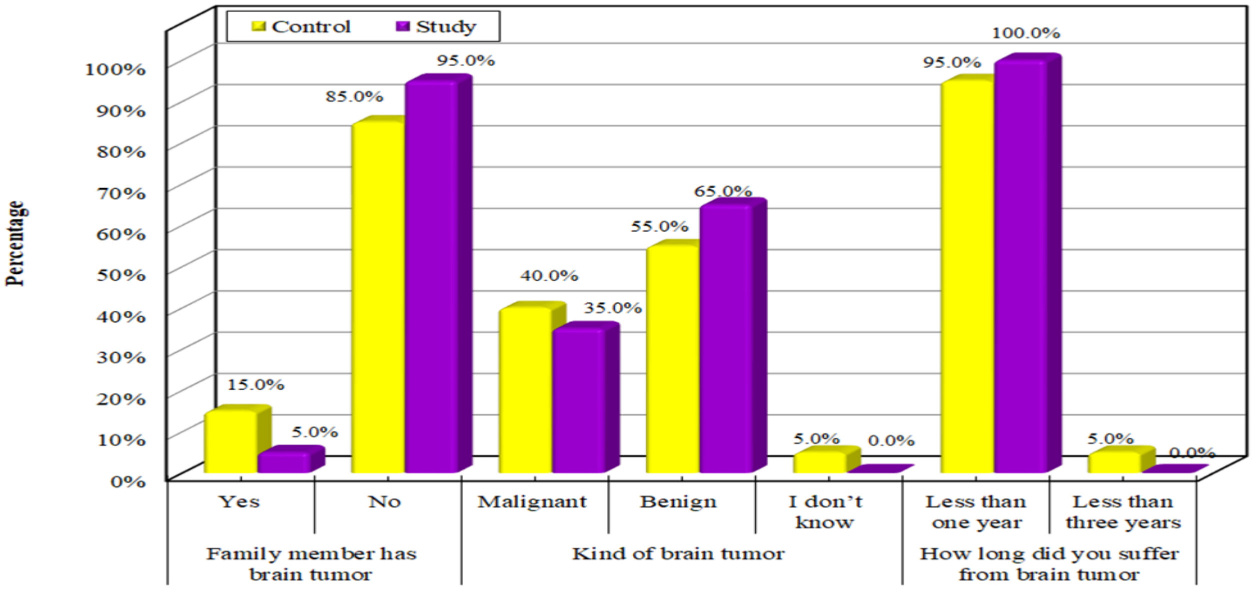

Figure (4): Distribution of the studied sample regarding their family member has a brain tumor, kind of brain tumor, and how long you suffer from brain tumor

Table (1): Comparison of mothers' knowledge regarding brain tumors & postoperative care of children with brain tumors in the study and control group

Part I: Mother's knowledge regarding brain tumor	**Control (n = 20)**						**Study (n = 20)**						**χ^2 (^{MC}p)**		
	Pre		**Post**		**Follow up**		**Pre**		**Post**		**Follow up**				
	No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**Pre**	**Post**	**Follow up**
Brain tumor definition													**1.026 (1.000)**	**1.026 (1.000)**	**1.026 (1.000)**
Wrong or unknown answers	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0			
Incomplete answers	1	5.0	1	5.0	1	5.0	0	0.0	0	0.0	0	0.0			
Complete answers	19	95.0	19	95.0	19	95.0	20	100.0	20	100	20	100.0			
Mean ± SD	**1.95±0.22**		**1.95±0.22**		**1.95±0.22**		**2.00±0.00**		**2.00±0.00**		**2.00±0.00**				
Fr(p)	-						-								
Causes													-	**3.243 (0.231)**	**5.714* (0.047)***
Wrong or unknown answers	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0			
Incomplete answers	20	100.0	20	100.0	20	100.0	20	100.0	17	85.0	15	75.0			
Complete answers	0	0.0	0	0.0	0	0.0	0	0.0	3	15.0	5	25.0			
Mean ± SD	**1.00±0.00**		**1.00±0.00**		**1.00±0.00**		**1.00±0.00**		**1.15±0.37**		**1.25±0.44**				
Fr(p)	-						**6.333* (0.042)***								
Diagnosis													**1.905 (0.301)**	**30.4* (<0.001)***	**30.571 * (<0.001)***
Wrong or unknown answers	8	40.0	8	40.0	9	45.0	4	20.0	0	0.0	0	0.0			
Incomplete answers	12	60.0	12	60.0	11	55.0	16	80.0	3	15.0	3	15.0			
Complete answers	0	0.0	0	0.0	0	0.0	0	0.0	17	85.0	17	85.0			
Mean ± SD	**0.60±0.50**		**0.60±0.50**		**0.55±0.51**		**0.80±0.41**		**1.85±0.37**		**1.85±0.37**				
Fr(p)	**0.222 (0.895)**						**30.131* (<0.001)***								
Management													**0.229 (1.000)**	**3.243 (0.231)**	**1.026 (1.000)**
Wrong or unknown answers	3	15.0	3	15.0	1	5.0	2	10.0	0	0.0	0	0.0			
Incomplete answers	17	85.0	17	85.0	19	95.0	18	90.0	20	100.0	20	100.0			
Complete answers	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0			
Mean ± SD	**0.85±0.37**		**0.85±0.37**		**0.95±0.22**		**0.90±0.31**		**1.00±0.00**		**1.00±0.00**				
Fr(p)	**2.000 (0.368)**						**4.000 (0.135)**								
Postoperative medications & postoperative complications													**0.000 (1.000)**	**2.105 (0.487)**	**4.444 (0.106)**
Wrong or unknown answers	2	10.0	2	10.0	4	20.0	2	10.0	0	0.0	0	0.0			
Incomplete answers	18	90.0	18	90.0	16	80.0	18	90.0	20	100.0	20	100.0			
Complete answers	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0			
Mean ± SD	**0.90±0.31**		**0.90±0.31**		**0.80±0.41**		**0.90±0.31**		**1.00±0.00**		**1.00±0.00**				
Fr(p)	**1.333 (0.513)**						**4.000 (0.135)**								

χ^2: Chi square test MC: Monte Carlo Fr: Friedman test between the three period in each group *: Statistically significant at $p \leq 0.05$

Table (2): Comparison for mothers' knowledge regarding brain tumor & postoperative care of children with brain tumor in the study and control group (cont.')

Part II: Mothers' knowledge about postoperative care of brain tumor	**Control (n = 20)**						**Study (n = 20)**						**χ^2 (^{MC}p)**		
	Pre		**Post**		**Follow up**		**Pre**		**Post**		**Follow up**				
	No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**Pre**	**Post**	**Follow up**
Pain management													**8.286* (0.004)***	**30.4* (<0.001)***	**34 * (<0.001)***
Wrong or unknown answers	16	80.0%	16	80.0%	17	85.0%	7	35.0%	0	0.0%	0	0.0%			
Incomplete answers	4	20.0%	4	20.0%	3	15.0%	13	65.0%	6	30.0%	3	15.0%			
Complete answers	0	0.0%	0	0.0%	0	0.0%	0	0.0%	14	70.0%	17	85.0%			
Mean ± SD	**0.20±0.41**		**0.20±0.41**		**0.15±0.37**		**0.65±0.49**		**1.70±0.47**		**1.85±0.37**				
Fr(p)	**0.400 (0.819)**						**31.559* (<0.001)***								
Positioning													**5.625* (0.044)***	**40* (<0.001)***	**40* (<0.001)***
Wrong or unknown answers	19	95.0%	19	95.0%	19	95.0%	13	65.0%	0	0.0%	0	0.0%			
Incomplete answers	1	5.0%	1	5.0%	1	5.0%	7	35.0%	0	0.0%	0	0.0%			
Complete answers	0	0.0%	0	0.0%	0	0.0%	0	0.0%	20	100.0%	20	100.0%			
Mean ± SD	**0.05±0.22**		**0.05±0.22**		**0.05±0.22**		**0.35±0.49**		**2.00±0.00**		**2.00±0.00**				
Fr(p)	**0.000 (1.000)**						**40.000* (<0.001)***								
Skin care, and wound care													**0.452 (0.862)**	**24.502* (<0.001)***	**30.571* (<0.001)***
Wrong or unknown answers	8	40.0%	8	40.0%	9	45.0%	6	30.0%	0	0.0%	0	0.0%			
Incomplete answers	11	55.0%	11	55.0%	11	55.0%	13	65.0%	4	20.0%	3	15.0%			
Complete answers	1	5.0%	1	5.0%	0	0.0%	1	5.0%	16	80.0%	17	85.0%			
Mean ± SD	**0.65±0.59**		**0.65±0.59**		**0.55±0.51**		**0.75±0.55**		**1.80±0.41**		**1.85±0.37**				
Fr(p)	**1.000 (0.607)**						**30.125* (<0.001)***								
Prevention of infection													**4.912* (0.027)***	**32* (<0.001)***	**40* (<0.001)***
Wrong or unknown answers	14	70.0%	14	70.0%	15	75.0%	7	35.0%	0	0.0%	0	0.0%			
Incomplete answers	6	30.0%	6	30.0%	5	25.0%	13	65.0%	3	15.0%	0	0.0%			
Complete answers	0	0.0%	0	0.0%	0	0.0%	0	0.0%	17	85.0%	20	100.0%			
Mean ± SD	**0.30±0.47**		**0.30±0.47**		**0.25±0.44**		**0.65±0.49**		**1.85±0.37**		**2.00±0.00**				
Fr(p)	**0.222 (0.895)**						**36.033* (<0.001)***								
Child's nutrition													**1.667 (0.197)**	**40* (<0.001)***	**40* (<0.001)***
Wrong or unknown answers	14	70.0%	14	70.0%	14	70.0%	10	50.0%	0	0.0%	0	0.0%			
Incomplete answers	6	30.0%	6	30.0%	6	30.0%	10	50.0%	0	0.0%	0	0.0%			
Complete answers	0	0.0%	0	0.0%	0	0.0%	0	0.0%	20	100.0%	20	100.0%			
Mean ± SD	**0.30±0.47**		**0.30±0.47**		**0.30±0.47**		**0.50±0.51**		**2.00±0.00**		**2.00±0.00**				
Fr(p)	**0.000 (1.000)**						**40.000* (<0.001)***								

χ^2: Chi square test MC: Monte Carlo Fr: Friedman test between the three period in each group

*: Statistically significant at $p \le 0.05$

Table (3): Distribution of studied sample according to their levels of knowledge regarding brain tumor & postoperative care of children with brain tumor

Overall, Mothers' knowledge about the postoperative care of brain tumors	Control (n = 20)						Study (n = 20)						χ^2 (^{MC}p)		
	Pre		Post		Follow up		Pre		Post		Follow up				
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	Pre	Post	Follow up
Poor knowledge	18	90.0	18	90.0	19	95.0	14	70.0	0	0.0	0	0.0	2.5 (0.235)	36* (<0.001)*	40* (<0.001)*
Average knowledge	2	10.0	2	10.0	1	5.0	6	30.0	2	10.0	0	0.0			
Good knowledge	0	0.0	0	0.0	0	0.0	0	0.0	18	90.0	20	100.0			
Total													t(p)		
Mean ± SD	6.80±1.94		6.80±1.94		6.55±1.85		8.50±1.79		16.35±1.27		16.80±0.83		2.882* (0.006)*	18.456* (<0.001)*	22.602* (<0.001)*
F(p)	0.667 (0.717)						37.607* (<0.001)*								

χ^2: Chi-square test MC: Monte F: F test (ANOVA) with repeated measures between the three periods in each group: Statistically significant at $p \leq 0.05$

Table (4): Comparison of the parental distress levels of the study and control groups

Parental distress levels	Control (n = 20)						Study (n = 20)						χ^2 (^{MC}p)		
	Pre		Post		Follow up		Pre		Post		Follow up				
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	Pre	Post	Follow up
Low	0	0.0	0	0.0	0	0.0	0	0.0	2	10.0	0	0.0	0.000 (1.000)	26.909* (<0.001*)	26.667* (<0.001*)
Moderate	9	45.0	4	20.0	4	20.0	9	45.0	18	90.0	20	100.0			
High	11	55.0	16	80.0	16	80.0	11	55.0	0	0.0	0	0.0			
Total													t(p)		
Mean ± SD	48.10±7.17		50.65±7.67		50.65±7.67		48.95±5.77		30.45±4.73		32.80±1.58		0.413 (0.682)	10.029* (<0.001*)	10.200* (<0.001*)
F(p)	1.326(0.277)						118.592*(<0.001)*								

χ^2: Chi square test MC: Monte F: F test (ANOVA) with repeated measures between the three periods in each group *: Statistically significant at $p \leq 0.05$

Table (5): Comparison between the control group and study group according to their overall coping strategies

Coping strategies	**Control (n = 20)**			**Study (n = 20)**			**t (p)**		
	Pre	**Post**	**Follow up**	**Pre**	**Post**	**Follow up**	**Pre**	**Post**	**Follow up**
Wishful thinking									
Mean ± SD	7.55±2.21	7.75±1.94	7.75±1.94	7.60±2.30	10.63±2.06	8.90±0.79	0.070 (0.945)	4.488* (<0.001*)	2.453* (0.021*)
F(p)	0.130 (0.879)			15.357* (<0.001*)					
Planning of problem-solving									
Mean ± SD	3.80±0.83	3.95±0.69	3.95±0.69	3.80±0.83	6.11±1.15	5.95±1.0	0.0 (1.000)	7.063* (<0.001*)	7.381* (<0.001*)
F(p)	0.461 (0.50)			30.370* (<0.001*)					
Positive reappraisal									
Mean ± SD	12.85±3.80	11.95±1.96	11.95±1.96	12.80±3.81	21.53±2.39	20.25±1.37	0.042 (0.967)	13.647* (<0.001*)	15.519* (<0.001*)
F(p)	1.176 (0.320)			54.340* (<0.001*)					
Seeking social support									
Mean ± SD	7.65±2.48	7.30±1.75	7.30±1.75	7.75±2.45	12.42±1.50	12.65±1.09	0.128 (0.989)	9.820* (<0.001*)	11.606* (<0.001*)
F(p)	0.406 (0.669)			45.167* (<0.001*)					
Accepting responsibility									
Mean ± SD	2.90±0.85	3.10±0.85	3.10±0.85	2.90±0.85	5.79±1.87	6.20±1.70	0.00 (1.000)	5.721* (<0.001*)	7.275* (<0.001*)
F(p)	0.388 (0.541)			25.773* (<0.001*)					
Self-control									
Mean ± SD	4.45±1.54	4.45±1.54	4.45±1.54	4.30±1.30	9.05±1.99	9.35±1.23	0.333 (0.741)	8.118* (<0.001*)	11.142* (<0.001*)
F(p)	0.0 (1.000)			65.498* (<0.001*)					
Scape avoidance									
Mean ± SD	9.35±2.68	8.90±2.20	8.90±2.20	9.25±2.49	10.68±2.47	8.85±1.18	0.122 (0.903)	2.384* (0.022*)	0.090 (0.929)
F(p)	0.395 (0.677)			6.045* (0.006*)					
Self-blame									
Mean ± SD	7.25±1.65	7.15±1.50	7.15±1.50	7.60±1.67	12.11±1.66	10.25±1.02	0.667 (0.509)	9.764* (<0.001*)	7.656* (<0.001*)
F(p)	0.044 (0.957)			46.795* (<0.001*)					
Overall Coping strategies									
Mean ± SD	55.80±10.13	54.55±7.06	54.55±7.06	56.00±10.36	88.32±8.79	82.40±4.12	0.062 (0.951)	13.262* (<0.001*)	15.236* (<0.001*)
F(p)	0.418 (0.661)			114.880* (<0.001*)					

t: Student t-test F: F test (ANOVA) with repeated measures between the three period in each group *: Statistically significant at $p \leq 0.05$

Table (6): Comparison between control group and study group according to their levels of coping strategies

Coping strategies	Control (n = 20)						Study (n = 20)						χ² (^{MC}p)		
	Pre		Post		Follow up		Pre		Post		Follow up		Pre	Post	Follow up
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%			
Wishful thinking															
Low (<33.3)	10	50.0%	9	45.0%	9	45.0%	10	50.0%	0	0.0%	0	0.0%	0.509 (^{MC}p= 1.000)	13.293 (^{MC}p= 0.001*)	14.050 (^{MC}p= 0.001*)
Moderate (33.3 – <66.6)	9	45.0%	10	50.0%	10	50.0%	8	40.0%	15	75.0%	20	100.0%			
High (≥66.6)	1	5.0%	1	5.0%	1	5.0%	2	10.0%	5	25.0%	0	0.0%			
Fr (p)	0.182 (0.913)						15.174 (0.001*)								
Planning of problem solving															
Low (<33.3)	7	35.0%	5	25.0%	5	25.0%	7	35.0%	0	0.0%	0	0.0%	0.000 (1.000)	22.726 (^{MC}p <0.001*)	24.988 (^{MC}p <0.001*)
Moderate (33.3 – <66.6)	13	65.0%	15	75.0%	15	75.0%	13	65.0%	7	35.0%	6	30.0%			
High (≥66.6)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	13	65.0%	14	70.0%			
Fr (p)	1.000 (0.607)						24.508* (<0.001*)								
Positive reappraisal															
Low (<33.3)	13	65.0%	15	75.0%	15	75.0%	13	65.0%	0	0.0%	0	0.0%	0.290 (^{MC}p= 1.000)	29.091* (<0.001*)	28.429* (^{MC}p <0.001*)
Moderate (33.3 – <66.6)	6	30.0%	5	25.0%	5	25.0%	6	30.0%	6	30.0%	13	65.0%			
High (≥66.6)	1	5.0%	0	0.0%	0	0.0%	1	5.0%	14	70.0%	7	35.0%			
Fr (p)	1.333 (0.513)						24.281* (<0.001*)								
Seeking social support															
Low (<33.3)	11	55.0%	10	50.0%	10	50.0%	10	50.0%	0	0.0%	0	0.0%	0.276 (^{MC}p= 1.000)	25.158* (<0.001*)	29.665* (<0.001*)
Moderate (33.3 – <66.6)	7	35.0%	9	45.0%	9	45.0%	8	40.0%	4	20.0%	2	10.0%			
High (≥66.6)	2	10.0%	1	5.0%	1	5.0%	2	10.0%	16	80.0%	18	90.0%			
Fr (p)	0.000 (1.000)						30.333* (<0.001*)								
Accepting responsibility															
Low (<33.3)	16	80.0%	16	80.0%	16	80.0%	16	80.0%	3	15.0%	2	10.0%	0.000 (^{FE}p= 1.000)	24.246* (^{MC}p <0.001*)	29.369* (^{MC}p <0.001*)
Moderate (33.3 – <66.6)	4	20.0%	4	20.0%	4	20.0%	4	20.0%	4	20.0%	3	15.0%			
High (≥66.6)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	13	65.0%	15	75.0%			
Fr (p)	0.000 (1.000)						25.900* (<0.001*)								
Self-control															
Low (<33.3)	14	70.0%	14	70.0%	14	70.0%	15	75.0%	0	0.0%	0	0.0%	0.125 (0.723)	29.091* (<0.001*)	30.400* (<0.001*)
Moderate (33.3 – <66.6)	6	30.0%	6	30.0%	6	30.0%	5	25.0%	5	25.0%	4	20.0%			
High (≥66.6)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	15	75.0%	16	80.0%			
Fr (p)	0.000 (1.000)						32.433$_{*}$ (<0.001*)								
Scape avoidance															
Low (<33.3)	4	20.0%	4	20.0%	4	20.0%	4	20.0%	0	0.0%	3	15.0%	0.133	6.410	2.109

Moderate (33.3 – <66.6)	12	60.0%	14	70.0%	14	70.0%	12	60.0%	13	65.0%	17	85.0%	(^{MC}p= 1.000)	(^{MC}p= 0.041*)	(^{MC}p=0.378)
High (≥66.6)	4	20.0%	2	10.0%	2	10.0%	4	20.0%	7	35.0%	0	0.0%			
Fr (p)	0.000 (1.000)						11.730* (0.003*)								
Self-blame													0.114 (0.736)	24.250$_{*}$ (<0.001*)	21.734* (^{MC}p <0.001*)
Low (<33.3)	14	70.0%	13	65.0%	13	65.0%	13	65.0%	0	0.0%	0	0.0%			
Moderate (33.3 – <66.6)	6	30.0%	7	35.0%	7	35.0%	7	35.0%	9	45.0%	17	85.0%			
High (≥66.6)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	11	55.0%	3	15.0%			
Fr (p)	0.286 (0.867)						29.931* (<0.001*)								
Overall Coping strategies													0.000 (1.000)	26.138* (^{MC}p <0.001*)	21.538* (<0.001*)
Low (<33.3)	13	65.0%	14	70.0%	14	70.0%	13	65.0%	0	0.0%	0	0.0%			
Moderate (33.3 – <66.6)	7	35.0%	6	30.0%	6	30.0%	7	35.0%	13	65.0%	20	100.0%			
High (≥66.6)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	7	35.0%	0	0.0%			
Fr (p)	0.400 (0.819)						28.964* (<0.001*)								

χ^2: Chi square test MC: Monte Carlo Fr: Friedman test *: Statistically significant at p ≤ 0.05 r: Pearson coefficient

*: Statistically significant at p ≤ 0.0

Table (7): Correlation Matrix of Total Mothers' Knowledge Scores about brain tumor and Post-Operative Care, total parental distress score, and total coping strategies score in study (n=40)

Items	**Parental distress scale**						**Total Mothers' Knowledge Scores about brain tumor and Post-Operative Care**					
	Pre		**Post**		**Follow up**		**Pre**		**Post**		**Follow up**	
	R	**p**	**r**	**p**	**r**	**P**	**r**	**P**	**R**	**p**	**r**	**p**
Total Parental Distress Score	-	-	-	-	-	-	0.084	0.725	0.560*	0.010*	0.008	0.973
Total Coping Strategies Score	-0.035	0.883	-0.314	0.190	-0.238	0.312	0.610*	0.004*	0.498*	0.026*	0.649*	0.002*

r: Pearson coefficient *: Statistically significant at p ≤

DISCUSSION

A child's brain tumor has a significant impact on parents, particularly mothers, causing emotional, financial, and physical burden. However, boosting mothers' understanding of postoperative care and coping skills can help the child heal faster, minimize parental anxiety, and improve overall family well-being. Mothers of children with postoperative brain tumors are under tremendous stress, but appropriate coping skills, emotional support, structured caring, self-care, and resilience-building can assist. Interventions like as educational programs, counseling, and support groups are critical in strengthening parents, particularly mothers, who frequently assume major caregiving responsibilities throughout this difficult journey.

As a result, the current study was designed to examine the effectiveness of an integrated training program on knowledge, parental distress, and coping patterns among mothers of post-operative brain tumor children. In the present study, over half and more than one-third of women in both the study and control groups were aged between 30 and 34 years. The educational attainment of these mothers mostly consisted of secondary education, and more than half were employed. These findings align with a research by Zahid et al. (2024), which shown that a family's demographic features strongly impact their capacity to care for children with brain tumors and their quality of life. Amin et al. (2024) assessed caregiver stress and resource needs in pediatric cancer care and concluded that while higher education is generally linked to a better comprehension of medical conditions, it may also result in heightened stress due to increased awareness of potential risks and expectations for participation in care decisions.

Research by Lu et al. (2021) on determinants affecting the time to diagnosis of pediatric brain tumors revealed that a higher maternal educational level correlates with a reduced parental interval. Conversely, other socioeconomic factors, including maternal age, long-term caregiving, and family economic status, did not exert a significant influence. The researchers have highlighted the significance of maternal demographic variables that influence maternal knowledge, stress levels, and coping strategies.

The results of the current study showed that more than half of children didn’t go to school because of their health condition. In the same line Bates et al (2022) who examined the psychosocial functioning of caregivers of pediatric brain tumor survivors and found that the challenges associated with the child's illness, including disruptions to education, can significantly impact maternal stress levels and coping abilities Additionally, A review by Stavinoha et al. (2021) highlights that survivors of pediatric brain tumors often face significant educational challenges, including frequent school absences, cognitive impairments, and psychosocial difficulties. These factors contribute to lower educational attainment and can lead to increased stress for caregivers, particularly mothers, who often bear the primary responsibility for managing their child's education and well-being. Furthermore, study by Alias, et al (2020) who investigated behavioral outcomes among survivors of childhood brain tumors. The study found that these survivors exhibited more social and attention problems compared to healthy children, which can lead to difficulties in school reintegration and academic performance. Such challenges can further exacerbate maternal stress as mothers navigate the complexities of supporting their child's educational and social needs.

The present study illustrated that more than two-thirds of the study groups had low levels of knowledge about brain tumors and the postoperative care of children with brain tumors. In contrast, after implementation of the integrated program, almost all of the study groups increased their level of knowledge to high levels by ninety percent and one hundred percent during the follow-up. In addition, the findings reveal that there were statistical differences between the study and control group in the pre-, post, and follow-up integrated training program regarding the total mothers' knowledge of childhood brain tumors and post-operative care. The researchers suggested that the insufficient mothers' medical knowledge about brain tumors and the treatment, postoperative care, and prognosis prevents caregivers from developing an accurate understanding of the condition, which leads to a high level of confusion. These findings support the researcher's view that implementing an integrated program can help mothers of children with tumor feel less stress about illness by increasing mother's knowledge of childhood brain tumors and post-operative care, from the announcement of the disease until the palliative care, including knowledge related to brain tumor diseases such as definitions, causes, treatment, and complications, and post-operative care such as pain management, skin care, positioning, wound care, nutrition, and prevention of infections.

These previous findings align with the results of Elfeky et al. (2023), who conducted a quasi-experimental study at the National Cancer Institute of Cairo University. Their study demonstrated that educational programs led to a statistically significant improvement in mothers' quality of care and knowledge levels, enabling them to manage their children's condition more effectively. Similarly Abd Elkhair and Amin (2023) demonstrated the effectiveness of a structured telenursing program in increasing mothers' knowledge regarding ventriculoperitoneal shunt care, their results showed significant improvements in maternal understanding and a concurrent decrease in postoperative complications among children. While their study focused on shunt management, the implications are highly relevant to brain tumor care, where similar post-surgical vigilance is required. Moreover, Mahmoud and Mahmoud (2023) conducted a quasi-experimental study assessing the effect of a nursing education program on postoperative complications in neurosurgical patients. Their results indicated that patients whose caregivers received structured educational sessions experienced fewer complications than those in the control group. These findings affirm the role of nursing-led interventions in equipping caregivers particularly mothers with the skills and confidence needed for effective home care. Recent study highlighted that parental stress level was high in more than half of parents before implementing the integrated program.

Meanwhile, after implementation of the integrated program the parental stress level decreased in post and follow integrated program with a highly statistically significant difference. In contrast in the control group the highest percentage of parents had high level of stress in pre, post, and follow-up program with no statically difference. In comparison between parents stress level the study and control group there was highly statically significance difference in post integrated program) and in follow up. The implementation of the integrated program can decrease parental distress levels by allowing them to employ psychological relaxation techniques like meditation and coping strategies for reducing their stress, as well as supporting them in expressing their feelings and the reasons behind negative psychological emotions. Recent evidence strongly supports the effectiveness of these interventions in improving caregivers' mental health and the overall quality of pediatric care.

For instance Moscato et al (2023) found that greater family cohesion and reduced conflict were strongly associated with improved quality of life in children. This finding supports the integration of psychoeducational nursing programs that aim to promote healthy family functioning, which can indirectly reduce caregiver stress by improving the emotional environment surrounding the child. In a systematic review, Mewes et al. (2021) evaluated family functioning and adaptation after pediatric brain tumor diagnoses. The review concluded that families displaying effective communication, emotional support, and problem-solving skills were better able to adapt to the demands of the illness. The implication is clear: nursing-led family interventions that promote adaptive functioning can play a key role in reducing stress and improving psychosocial outcomes.

In addition, Sahler et al. (2020) demonstrated that structured stress management and coping-skills training significantly reduced maternal anxiety and stress symptoms among mothers of children newly diagnosed with cancer. In same line Perez, et al., (2020) who found that parents report feeling emotionally, physically, and psychologically exhausted during the tumor experience, which makes it harder for them to handle new stresses and plays a part in the emergence or maintenance of psychological distress and recommended that mother of children with brain tumors need to empower them with teaching new skills to strength their coping abilities and to anticipate and maintain positive emotions. Likewise, Wong et al. (2020) provided evidence that multimodal support programs including health education can reduce stress, improve sleep, mood, and perceived support among caregivers of children with brain tumors.

Additionally, the study by Bilani et al. (2019) concluded that a family educational program is effective in enhancing the caregiving ability of parents of children with tumors and in alleviating their adverse emotional responses. This result is supported by Van Warmerdam et al. (2019), who reported that anxiety, depression, and post-traumatic stress disorder are significantly more prevalent among parents of children with tumors compared to the general population. From the researcher's point of view, these collective findings confirm the critical role of integrated nursing programs in alleviating parental stress. Such interventions should not be viewed as optional but as essential components of holistic pediatric brain tumor care. By equipping parents with knowledge, coping strategies, and emotional support, nurses not only empower caregivers but also contribute to better clinical outcomes for the children.

In terms of the levels of coping strategies among mothers of children with brain tumors, the study group in this study demonstrated moderate levels of coping strategies in the post-test and follow-up compared to the pre-test, while the control group displayed lower levels of coping strategies through the three assessment periods (pre, post-test, and follow-up).Furthermore, a highly statistically significant difference in coping strategies was found between the study and control groups before, during, and after the integrated program. This may be due to the beneficial influence of applied the integrated program in this study that involves teaching mothers with new skills such as stress management, problem solving, positive thinking, and emotional regulations to improve levels of coping strategies of caregivers and to reduce parietal’s adverse emotions because parents of children with cancer may experience increased stress as a result of managing extensive treatment regimens, frequent hospital visits, managing parental obligations for other siblings, marital difficulties, financial restraints, fear of recurrence or mortality**.**

These current study findings are supported by Ismael, et al. (2024), who recognized the importance of developing psychological interventions in promoting caregivers' engagement with active coping skills in order to reduce parents' stress and burden. Moreover, Khalili et al. (2024) highlighted the effectiveness of resilience training interventions, which included guided discussions on stress and hope. Their study showed that these sessions helped mothers develop a sense of psychological preparedness, reduced anxiety, and fostered hope, which are essential components of effective coping. This aligns with Nasr’s (2023) findings, which emphasized that coping strategies such as seeking emotional and social support were directly linked to a stronger mother-child relationship. Mothers who engaged in reflective dialogue and received supportive guidance were better able to maintain emotional balance and connection with their children during treatment. Also Elfeky et al. (2023) demonstrated that psych-educational nursing sessions significantly enhanced coping patterns among mothers whose children were newly diagnosed with cancer.

The results of this study showed that there were statistically correlations between total mothers' knowledge scores about brain tumor post-operative care, mothers' coping strategies score in pre, post and follow program and parental distress score in post program. This finding suggests that integrated program inducing mothers gain more knowledge about how to care for their children after brain tumor surgery, enhancing their coping strategies and reduce parental distress. The current study's findings corroborated those of Tang et al. (2020) who illustrated that Caregivers of pediatric brain tumor survivors frequently experience significant psychological distress and burnout, largely attributable to the extended and intricate care requirements of their children. The researchers highlighted that mothers who receive structured information regarding the illness, its management, and various healthy coping strategies exhibit reduced stress levels and more effective coping mechanisms.

As well Zhu et al (2025) found that effective empowered The health teaching programs provide caregivers with coping and communication skill training and psychoeducational strategies, which can help them face the perioperative challenges of caring for patients with early-stage of cancer. These interventions not only benefit the caregivers but also have the potential to positively influence child outcomes.

CONCLUSION

The results of this study indicate a significant improvement in the study group's knowledge regarding postoperative care for brain tumors across pre-, post-, and follow-up assessments. The study group's parental distress levels significantly decreased after the intervention, and coping strategies improved markedly across all domains, especially in planning, social support, and self-control. Most of the study group exhibited strong coping abilities and a high level of knowledge during the follow-up. In addition, the comprehensive program's efficacy in empowering mothers and alleviating psychological burden was emphasized by the strong positive correlations observed between mothers' knowledge, enhanced coping strategies, and reduced parental distress.

RECOMMENDATIONS

Based on the findings and the foregoing conclusion of the current study, the following recommendations are suggested:

1. Implement Integrated Training Programs: Healthcare facilities should adopt integrated training programs for mothers of children undergoing brain tumor surgery, focusing on disease education, caregiving, and emotional support to reduce stress and enhance coping.
2. Provide Ongoing Psychological Support: Continuous counseling and support services should be offered to mothers to address emotional strain and promote healthier coping mechanisms throughout the recovery process.
3. Customize Training Programs: Training programs should be tailored to the specific needs of each mother, considering factors like the child’s treatment plan and the mother’s coping style for maximum effectiveness.

References

Abd Elkhair, S. S., & Amin, G. M. (2023). Impact of Telenursing Program about Ventriculo-peritoneal Shunt Care on Mothers' Knowledge and Complications Occurred among Children. *Egyptian Journal of Health Care*, 14(4), 826–842.

Afifi M ,Abd Elgwad W & Ahmed A . (2019).Psychometric properties of the strategies scale Facing academic pressures among seminar students the second stage of basic education. *Journal of Educational and Social Studies*,27(1):321-340

Amin, S. M., Khedr, M. A., Mansy, A. M. A., El-Monshed, A. H., Malek, M. G. N., & El-Ashry, A. M. (2024). Assessing caregiver stress and resource needs in pediatric cancer care. *BMC Nursing*, 23(1), 911.

Azman, A., Jali, N. A., Singh, P. S. J., Abdullah, J. M., & Ibrahim, H. (2020). Family roles, challenges and needs in caring for traumatic brain injury (TBI) family members: a systematic review. *Journal of Health Research*, 34(6), 495–504. https://doi.org/10.1108/jhr-07-2019-0138

Baalaaji, M. (2023). Postoperative care of pediatric brain tumors: Let\’s work together. *Indian Journal of Critical Care Medicine*, *27*(3), 161–162. https://doi.org/10.5005/jp-journals-10071-24421

Bates, C. R., Fairclough, D., Noll, R. B., Barrera, M. E., Kupst, M. J., Egan, A. M., Gartstein, M. A., Ach, E. L., Gerhardt, C. A., & Vannatta, K. (2022). Psychosocial functioning of caregivers of pediatric brain tumor survivors. *Pediatric Blood & Cancer*, 69(4). https://doi.org/10.1002/pbc.29565

Bilani, N., Jamali, S., Chahine, A., Zorkot, M., Homsi, M., Saab, M., Saab, R., Nabulsi, M., & Chaaya, M. (2019). Illness cognition and health anxiety in parents of children with cancer. *Journal of psychosocial oncology*, 37(6), 713–728. https://doi.org/10.1080/07347332.2019.1600629.

Elfeky, M. G., Mourad, G. M., Ismail, S. S., & Zaki, R. A. (2023). The effect of psychoeducational program on coping patterns of mothers having children newly diagnosed with cancer. Helwan *International Journal for Nursing and Rehabilitation Professions*, 2(4), 13–43. https://doi.org/10.21608/hijnrp.2023.225233.1082.

Ismael, N., Malkawi, S., Al Awady, S., & Ismael, T. (2024). Exploring coping strategies among caregivers of children who have survived pediatric tumor in Jordan. *BMJ Pediatrics Open*, 8(1).

Jebali, S. (2012). Psychological stress and coping strategies among mothers of children with Down syndrome: A field study at the Pedagogical Medical Center, Type 03-05, Batna (Master’s thesis, Ferhat Abbas University, Setif, Algeria).

Khalili, A., Khatiban, M., Ebrahimi, S., & Oshvandi, K. (2024). Effect of resilience training in improving the ability to cope with stress and hope of mothers with cancer children. *SAGE Open Medicine*, 12, doi 20503121241284851.

LaRovere, K. L., Tang, Y., Li, K., Wadhwani, N., Zhang, B., Tasker, R. C., & Yang, G. (2022). Effectiveness of Training Programs for Reducing Adverse Psychological Outcomes in Parents of Children with Acquired Brain Injury: A Systematic Review and Meta-Analysis. *Neurology and Therapy*, 11(4), 1691–1704. https://doi.org/10.1007/s40120-022-00399-9

Lu, P., Raynald, Liu, W., Gong, J., Sun, T., Li, C., ... & Tian, Y. (2021). Factors impacting time to diagnosis in pediatric CNS tumors in Chinese children. *Supportive Care in Cancer*, 29, 3633-3642.

Lutz, K., Jünger, S. T., & Messing-Jünger, M. (2022). Essential management of pediatric brain tumors. *Children*, 9(4), 498. https://doi.org/10.3390/children9040498

Mahmoud, F. H., Ammar, S. A., & Mahmoud, B. H. (2023). Effect of Implementing Nursing Educational Program on Reducing Postoperative Complications for Patients after Intracranial Surgery. *Egyptian Journal of Health Care*, 14(4), 826–842.

Mewes, J., Schouten, B. C., Klinkenberg, A. J., Heins, M. J., & Verdonck-de Leeuw, I. M. (2021). Family functioning and adaptation after a pediatric brain tumor: A systematic review. *Psycho-Oncology*, 30(4), 486–494.

Moscato, E. L., Fisher, A. P., Pillay-Smiley, N., Salloum, R., & Wade, S. L. (2023). Caregivers matter: Neurological vulnerability for pediatric brain tumor survivors. *Neuro-Oncology Practice*, 10(5), 418–428.

Nasr, A. (2023). Mother’s coping while caring for a child with cancer and its relationship with mother-child relationship (Master's thesis, The American University in Cairo). AUC Knowledge Fountain. https://fount.aucegypt.edu/etds/2114.

Paulhan, I. (1994). Les Strategies d'ajustement ou Coping. In M. Bruchon Schweitzer et R. Dantzer (Eds), Introduction a la psychologie de la santé. Paris: PUF, 4: 99-124.

Perez, M. N., Traino, K. A., Bakula, D. M., Sharkey, C. M., Espeleta, H. C., Delozier, A. M., Mayes, S., McNall, R., Chaney, J. M., & Mullins, L. L. (2020). Barriers to care in pediatric cancer: The role of illness uncertainty in relation to parent psychological distress. *Psycho-Oncology*, *29*(2), 304–310. https://doi.org/10.1002/pon.5248

Pointon, L., Grant, R., Peoples, S., Erridge, S., Sherwood, P., Klein, M., & Boele, F. (2023). Unmet needs and wish for support of family caregivers of primary brain tumor patients. *Neuro-Oncology Practice*, 10(3), 271–280. https://doi.org/10.1093/nop/npac099

Prates, P. E. G., Correa-Júnior, A. J. S., Da Silva Russo, T. M., Paraizo-Horvath, C. M. S., Da Silva Teles, A. A., & Sonobe, H. M. (2024). Effectiveness of Family Coping Interventions in Improving Problem-Solving Skills in the Care of Children and Adolescent Cancer Survivors during and after Treatment: A Scoping Review. *Nursing Reports*, 14(3), 2153–2178. https://doi.org/10.3390/nursrep14030161

Sahler, O. J. Z., Dolgin, M. J., Phipps, S., Fairclough, D. L., Askins, M. A., Katz, E. R., ... & Butler, R. W. (2020). Specificity of problem-solving skills training in mothers of children newly diagnosed with cancer: Results of a multisite randomized clinical trial. *Journal of Clinical Oncology*, 38(9), 1037–1045. doi. 10.1200/JCO.19.02692

Schupper, A. J., Yong, R. L., & Hadjipanayis, C. G. (2021). The Neurosurgeon's Armamentarium for Gliomas: An update on intraoperative technologies to improve extent of resection. *Journal of Clinical Medicine*, *10*(2), 236. https://doi.org/10.3390/jcm10020236

Shaygani, F., Jalali, K., Javanmardi Fard, H., Afrasiabi, Z., & Ahmadi Marzaleh, M. (2024). Exploring the lived experience of mothers of children with leukemia: a qualitative study from Iran. *BMC Women's Health*, 24(1), 457.

Stavinoha, P. L., Trinh-Wong, T., Rodriguez, L. N., Stewart, C. M., & Frost, K. (2021). Educational pain points for pediatric brain tumor survivors: Review of risks and remedies. *Children*, 8(12), 1125. Available at: https://doi.org/10.3390/children8121125.

Tang, W. P., Chan, C. W., Leung, D. Y., & Chan, D. N. (2019). The effects of psychoeducational interventions on caregivers of children with cancer: A meta-analysis of randomized controlled trials. *Journal of Child Health Care*, 24(1), 123–142. https://doi.org/10.1177/1367493518814917

Thorbinson, C., & Kilday, J. (2021). Childhood malignant brain tumors: balancing the bench and bedside. *Cancers*, *13*(23), 6099. https://doi.org/10.3390/cancers13236099

van Warmerdam, J., Zabih, V., Kurdyak, P., Sutradhar, R., Nathan, P. C., & Gupta, S. (2019). Prevalence of anxiety, depression, and posttraumatic stress disorder in parents of children with tumor: A meta- analysis. Pediatric blood & tumor, 66(6), e27677.

Wong, M., Choi, E. K. Y., Chan, K. K. L., Choi, S. W., Cheung, C. T. K., & Chan, C. W. H. (2020). Effectiveness of a multimodal family support program on psychological outcomes in parents of children with brain tumors: A pilot study. Children, 7(4), 35.

Young, A. I., Nehzati, S. M., Benonisdottir, S., Okbay, A., Jayashankar, H., Lee, C., Cesarini, D., Benjamin, D. J., Turley, P., & Kong, A. (2022). Mendelian imputation of parental genotypes improves estimates of direct genetic effects. *Nature Genetics*, 54(6), 897–905. https://doi.org/10.1038/s41588-022-01085-0

Zahid, N., Enam, S. A., Mårtensson, T., Azam, I., Mushtaq, N., Moochhala, M., ... & Brown, N. (2024). Factors associated with changes in the quality of life and family functioning scores of primary caregivers of children and young people with primary brain tumors in Karachi, Pakistan: a prospective cohort study. *BMC pediatrics*, 24(1), 389.

Zhou, Z., Bai, L., & Zhao, Q. (2021). A Qualitative Study on the Negative Emotions of Mothers during Chemotherapy of Their Children with Malignant Brain Tumors. Journal of Tumor Therapy, 12(01), 1.

Zhu, S., Yang, C., Bai, Y., Kang, L., Li, T., Yang, X., Chen, S., & Li, J. (2025). Effects of a perioperative support program on reducing psychological distress for family caregivers of patients with early-stage lung cancer: a pilot randomized controlled trial. BMC Nursing, 24(1). https://doi.org/10.1186/s12912-025-02857-9.