

Effect of yoga on the symptoms response in pediatric brain tumor in-patients undergoing chemo and radiotherapy

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SUMMARY Introduction: Children subjected to either radiation therapy or chemotherapy for brain tumors; suffer from short term and long term effects leading to notable restriction in physical activity and mobility due to fatigue. The above factors result in an overall depletion in quality of life. Efforts to localize an intervention within the hospital premises to provide a child-friendly supportive therapy to address the issue of QOL have to be undertaken. Yoga can be implemented as a low-intensity physical activity. The objective of this study is to establish the feasibility and therapeutic effect of yoga in pediatric brain tumor and to provide a foundation for the development of an RCT. Materials and Methodology: 20 potential participants, aged between 6-18 years, planned for either radiation or chemotherapy for brain tumors were screened during the commencement of their treatment from the in-patient department. 18 consented to the program with a written consent signed by the parent/guardian. A basic yoga module consisting of a set of loosening, breathing, postures, relaxation, and meditation was administered for 1 hour over 4 weeks. The primary outcome, feasibility, was defined as the ability to deliver a minimum of three sessions weekly (total - 5). Percentile of attendance will be calculated. A parent proxy-reported feedback form, administered at baseline and at the end of 4 weeks with an open-ended question to assess willingness to continue the practice at home post-discharge. Items are rated on a 4 point Likert scale from 0 (never) to 4 (a lot). The simple paired sample t-test was used with Graph Pad online software for analysis. Results: The mean age of the group was found to be 9.8 yrs All participants achieved minimum required attendance. The median number of sessions attended was 16 with a range of 12. Good acceptability of the program has been established. An extremely significant difference was seen with respect to reduction in appreciation of Pain (0.0001), Relief in headache (0.0005), increase in appetite (0.0005), better sleep (0.0003), reduced fatigue (0.007). Increase in overall daily activity was also significant with p=0.0018. The above result shows sufficient evidence to establish the positive effects of yoga. No other adverse event which can be attributed to the practice of yoga occurred. Conclusion: Individualized yoga is feasible for children with cancer receiving intensive chemo and radiotherapy thereby supporting its therapeutic benefit. An RCT to confirm the findings with a larger sample size will help establish the outcome results.

Key words: pediatric, brain tumor, yoga, chemotherapy, radiotherapy, supportive care

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INTRODUCTION

Children subjected to either radiation therapy or chemotherapy as a line of treatment for brain tumors; suffer from an array of symptoms in addition to the manifestation of the existing pathological condition [1-4]. The short term effects range from increased fatigue [5], anxiety, tremors, nausea, vomiting [6], loss of appetite, pain, sleep disturbances [7], headache and behavioral changes [8]. Long term effects such as endocrine dysfunction, growth hormone deficiency, precocious puberty [9] and impaired cognition [10]. Notable restriction in physical activity and mobility are also found due to fatigue [1]. In some cases, neurological deficits as a result of the tumor are also found [11]. The above factors result in an overall depletion in quality of life [2]. Though having an essential impact on the desired outcome of treatment, it is commonly under-recognized, not reported and poorly managed.

Sparse studies have been conducted addressing these consequences specific to pediatric cancers [12]. The in-patient status of most patients does not allow for the influence of a homely environment which is generally comforting to any patient [13]. Thus, efforts to localize an intervention within the hospital premises to provide a child-friendly supportive therapy to address the issue of QOL has to be undertaken.

Yoga is a unique intervention that combines exercise with mindfulness [14]. Administration of the practice can be individualized to a patient's requirement and can be delivered in any location without the need for specialized equipment. It can be implemented as a low-intensity physical activity program with a relatively high impact on stress [15]. The objective of this study is to establish the feasibility and therapeutic effect of yoga in the said population to address the effects of radiotherapy and chemotherapy in pediatric brain tumor. The study is to further provide a foundation for the development of an RCT of the hypothesized program.

MATERIALS AND METHODOLOGY

20 potential participants, aged between 6-18 years, planned for either radiation or chemotherapy for brain tumors were screened during the commencement of their treatment. 18 of them (Male: 09, Female: 09). The subjects' also include those

with prior surgical excision of the tumors. 18 subjects consented to the program and written consent was duly signed by the parent/guardian. The mean age of the group was found to be 9.8 yrs. Patients with advanced disease, known metastasis at the time of recruitment, developmental or intellectual disorders and prior exposure to yoga were excluded from the program. A basic yoga module consisting of a set of loosening, breathing, postures, relaxation, and meditation was finalized to be tested for a limited duration of 1 hour over a time frame of 4 weeks. An orientation session was conducted to make the participants familiar with the program and its motive. Demographic characteristics are illustrated in Table 1.

Site

All subjects were recruited from the in-patient department of the Kidwai Cancer Institute, Bangalore.

Study procedure

A clean and sanitized environment with good ventilation was chosen for the program, within the hospital premises. All participants received individualized yoga by a trained instructor, for one hour daily on weekdays, conducted after the scheduled chemo or radiotherapy session. Every subject required to complete at least a minimum of 3 days per week with absence owing to either acute effects of cancer treatment or other medical evaluations and procedures. The parent/guardian was required to be present during each session.

A basic structure of the program was followed with sessions starting with chanting of "om" followed with loosening, breathing, postural maintenance, and relaxation. The yoga program was modified to suit each child's comfort and requirement wherein few practices could either be omitted or supported (with props like ropes, cushions or wall support). In this study, our primary focus is to assess the effect of yoga on the most commonly encountered symptoms in pediatric brain tumor cases undergoing conventional treatment.

Outcome analysis

The primary outcome, feasibility, was defined as the ability to deliver a minimum of three sessions weekly (total-5). The time frame was taken from the day of recruitment until 4 weeks or discharge, whichever occurred first. Percentile of attendance will be calculated. For secondary outcomes, parent proxy-reported feedback form,

specially designed to score the most common symptoms in the given population. Parents were the primary respondents while children were encouraged to share their inputs. The form was administered at baseline and at the end of 4 weeks. An open-ended question to assess willingness to continue the practice at home post-discharge was also included as a parameter to assess acceptability. Items are rated on a 4 point Likert scale from 0 (never) to 4 (a lot). Apart from general health and activity, other raw scores that trend toward smaller scores indicate betterment in function. The simple paired sample t-test was used with the help of GraphPad online software for analysis to compare the pre-post design single group data.

RESULTS

The feasibility of the program was defined by the of attendance during the stipulated time frame. All participants achieved the minimum required attendance. The attendance achieved was as follows: (1) 3 sessions: 4 (22.2%), (2) 4 sessions: 8 (44.4%) and (3) 5 sessions: 6 (33.3%). The median number of sessions attended was 16 with a range of 12 (required minimum) to 20 (total number of sessions conducted). With all the 18 respondents agreeing to practice the program post-discharge, the acceptability of the program has been established. Parents revealed that the children were looking forward to the sessions as an ideal opportunity to unwind. The parent proxy feedback is illustrated in (Tables 2 and 3).

An extremely significant difference was seen with respect to reduction in appreciation of Pain (0.0001), Relief in headache (0.0005), increase in appetite (0.0005), better sleep (0.0003), and reduced fatigue (0.007). Increase in overall daily activity was also significant with p=0.0018. The above result shows sufficient evidence to establish the positive effects of yoga. No other adverse event which can be attributed to the practice of yoga occurred (Table 4).

DISCUSSION

In this study, the goal of establishing the feasibility of yoga in pediatric brain tumor population with on-going in patient status was well received. Our results echo the outcomes of a few other studies which were based on a similar population. A 12-week yoga program administered to 8 pediatric cancer out-patients for 2 times/weeks revealed positive effects on fitness and quality of life [16]. Another study on 6 children hospitalized for cancer treatment was given 5 yoga classes

Tab. 1. Demographics of the study cohort

Characteristic	Value N=18
Male (%)	50%
The median age in years (range)	9.8 years
Diagnosis (%)	
Anaplastic ependymoma	6
Medulloblastoma	5
Atypical neurocytoma	1
Glioma	4
CNS Germ cell tumor	1
Retinoblastoma	1
Current treatment	
Chemotherapy+Radiotherapy (%)	78%
Only Radiotherapy (%)	22%
Child previous experience with yoga	Nil

Tab. 2. Raw scores-baseline data

GH1	Activity	Pain	Nausea	Vomiting	Headache	LOA	Sleep	Distress	Fatigue
1	2	2	0	0	3	3	3	2	2
3	2	2	0	0	2	2	2	2	2
3	3	2	1	0	2	3	2	2	2
3	2	2	1	1	2	3	3	3	3
3	3	3	1	0	2	2	2	2	2
3	2	3	2	2	3	3	2	3	3
3	2	2	1	0	2	2	3	2	2
3	2	2	0	0	1	3	3	1	1
2	2	2	1	0	2	2	3	2	3
3	2	2	0	0	2	3	2	2	1
2	2	2	0	0	2	1	2	1	1
3	2	1	0	0	0	2	2	1	1
3	3	2	0	0	1	2	2	1	2
3	3	2	1	2	1	3	2	2	2
2	2	2	1	1	2	3	3	3	3
3	2	3	2	2	3	2	2	2	3
2	2	2	1	1	2	2	3	3	2
3	3	2	0	0	2	3	2	2	2

Tab. 3. Raw scores-post data at 4 weeks

GH1	Activity	Pain	Nausea	Vomiting	Headache	LOA	Sleep	Distress	Fatigue
3	2	1	0	0	1	2	2	2	2
3	2	2	0	0	2	2	2	1	2
3	3	2	1	0	2	2	2	2	2
3	3	2	1	1	1	2	3	2	2
3	3	1	0	0	1	1	1	1	1
3	2	2	2	2	2	3	2	2	3
3	3	1	1	0	1	2	1	2	2
3	3	0	0	0	0	1	2	1	0
2	3	1	1	0	2	2	2	2	3
3	3	0	0	0	1	2	1	1	0
2	3	0	0	0	1	1	1	1	1
3	3	0	0	0	0	1	0	1	1
3	3	0	0	0	1	1	0	1	1
3	3	1	1	1	1	2	2	1	2
3	2	1	1	1	2	3	2	2	3
3	2	0	1	1	2	2	2	1	1
2	3	2	1	1	2	2	2	2	2
3	3	1	0	0	1	2	2	2	1

Tab. 4. Evaluation of results

Variable	Mean		St. Dev.		t-value	p-value	St. error of difference
	Pre	Post	Pre	Post			
GH	2.66	2.83	0.594	0.372	1.3744	0.1872	0.121
Activity	2.27	2.72	0.46	0.447	3.68	0.0018	0.121
Pain	2.11	0.94	0.47	0.779	5.77	0.0001	0.202
Nausea	0.66	0.55	0.685	0.598	0.43	0.667	0.127
Vomiting	0.5	0.38	0.785	0.59	1.45	0.163	0.076
Headache	1.88	1.2	0.758	0.65	4.266	0.0005	0.143
Loss of appetite	2.44	1.8	0.615	0.6	4.266	0.0005	0.143
Sleep	2.38	1.61	0.501	0.755	4.507	0.0003	0.173
Distress	2	1.5	0.685	0.5	0.103	0.919	0.539
Fatigue	2.05	1.61	0.725	0.89	3.06	0.007	0.145

over 2 months which revealed better motor function [17]. A minimum attendance was of 3 days/week was fixed to assess feasibility based on convenience and an expectation that at least more than half the patients have to be able to perform the practice. Our study shows that with respect to attendance, the program is highly feasible. Though yoga sessions were conducted on 5 days/week, every

participant was required to complete a minimum of three days. The leniency was provided taking into account other parallel investigations and medical procedures related to the treatment or current illness of the child on a given day. A higher level of anxiety is found among children who are due for their daily dose of either chemo or radiotherapy. This can override the outcome result of the yoga sessions. Thus, the

children were asked to complete their scheduled therapy and then attend yoga practice. Additional support with the use of accessories was encouraged to achieve the desired effect of the yoga program and make the session interesting. Some children who have residual neurological (tremors, loss of balance) and physical deficits (gait disturbances, weakness of limbs) require the aid of additional support to achieving a given posture prescribed in the yoga module. We noticed children preferred the use of props like ropes and cushions which rendered additional comfort and excitement.

It was mandatory for a patient attendant to be present during each session. In addition to having a reassuring effect on the child, they could also be of help to the therapist to instruct and position the child when necessary. The attendants were also encouraged to learn the proceedings of the session so as to continue as home practice post discharge.

Standard questionnaires pertaining to QOL of pediatric cancer were not included in the program for lack of availability of translation. Most of the subjects recruited, hail from different parts of the country and a common language was difficult to be established. Also, many pediatric questionnaires involve parameters to assess the effect on school life. Most of the children recruited failed to resume school post-diagnosis with a mean absence of more than 6 months. The questionnaires were deemed to be not suitable for the sample and thus a simple questionnaire was designed on a pre-post basis to assess the most common symptoms.

Though only parents were considered as the primary respondents for the feedback, we encouraged children to also give in their inputs. Child proxy questionnaires were not included as the reliability of their feedback was questionable owing to the effect of cancer treatment on their psyche. The mood of the child was highly variable and dependant on the ongoing treatment.

The significant result attained in most symptomatology feedback throws light on the beneficial effect of yoga in a small time frame of 4 weeks. The occurrence of pain and frequent headache greatly influence dependable variables like sleep and appetite. Fatigue, in turn, is the cumulative result of all the

above. Chemo and radiotherapy by itself can cause high fatigue scores. Any means to tackle additional stress and fatigue to the body and mind will be a welcomed acceptance to the patient.

The failure to attain significance in levels of stress which is generally an attribute of yoga can be laid on the fact that children are repeatedly subjected to medical procedures in the hospital set up and a gradient rise in stress over the period is expected. However, an effort to aid stress relief with the inclusion of yoga games and relaxation can be incorporated in the future.

An RCT with a longer time frame and larger sample may help establish these preliminary results. The recruitment can be further narrowed down to children with neurological deficit and without to obtain a fixed yoga module delivery without modifications. The limitation of our study is being single armed and an RCT will be important to clarify the utility of yoga in this setting. Inclusion of established questionnaires to assess the health-related quality of life to confirm the findings are required. We also found that weekly assessments throw more insight into the effect of on-going cancer treatment in children.

CONCLUSION

In summary, individualized yoga is feasible for children with cancer receiving intensive chemotherapy. The program was well-received by all the patients. The results support the therapeutic benefit of yoga therapy in children suffering from brain tumors. An RCT to confirm the findings with a larger sample size can be conducted to further establish the outcome results.

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CONFLICT OF INTEREST

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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