

# Determine the Role of Hyperbaric Oxygen Therapy in Pediatric with Cerebral Palsy

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## ABSTRACT

**Aim:** To examine the outcomes of hyperbaric oxygen therapy in children with cerebral palsy.

**Study Design:** Randomized controlled trial.

**Place & Duration of Study:** Department of Pediatric Medicine, Abbasi Shaheed Hospital, Karachi from 1<sup>st</sup> January 2018 to 30<sup>th</sup> June 2018.

**Methods:** A total of one hundred and twenty children of both genders with cerebral palsy were included in this study. Ages were ranging from 3 to 15 years. All the children were equally divided into two groups. Group A (cases group) contains 60 children and received hyperbaric oxygen, Group B (control group) contains 60 children who did not receive hyperbaric oxygen therapy. In cases group children received 5 cycles of hyperbaric oxygen therapy with physical therapy and in control children received only physical therapy. Outcomes were recorded after completed all the sessions.

**Results:** There were 62 (51.67%) females while 48.33% were males. Eighty two (68.33%) patients [57 (95% Group A) and 25 (41.67% Group B)] showed improvement in global motor function measure scale, 77 (64.17%) patients showed improvement in activity dialing living index. According to hearing and speech 65.83% and 32.5% patients showed improvement. According to the parent's satisfaction index (PSI) 70 (58.33%) parents were satisfied while 41.67% were unsatisfied.

**Conclusion:** Patients with cerebral palsy treated with hyperbaric oxygen therapy shows significant improvement regarding neurological outcome. Hyperbaric oxygen therapy considered safe and effective procedure with lesser and minor complications.

**Keyword:** Cerebral palsy, Hyperbaric oxygen therapy, Global motor function measure scale, Activity of daily living, Parents satisfaction index, Safety index

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## INTRODUCTION

Cerebral palsy is one of the severe brain disorder that affects movement and senses abilities of the patient. It is caused due to problems within the developing brain that may occur before, during and soon after birth.<sup>1-5</sup> Cerebral palsy is very critical condition and the symptoms usually observe just after a newly born baby, sometime the symptoms may observed during the first three years of child's life<sup>6,8</sup>. Cerebral palsy resulted many life threatening disorders such as asphyxia, meningitis, CNS and intracranial hemorrhage. Currently, there is no proper cure of cerebral palsy but there is many treatment modalities such as physiotherapy, medication and speech therapy for improving the communication, occupational therapy and surgical treatment for improving the growth and movement of child. All these treatments showed significant results to improve quality of life of affected patients. In some of cerebral palsy cases rhizotomy treatment modality is the most effective to reduce the spasticity. Selective<sup>2</sup>.

In medical treatment of cerebral palsy, Hyperbaric oxygen therapy (HBOT) is most effective treatment modality in which an ambient pressure was used which was higher than sea pressure. Hyperbaric oxygen therapy required a pressure chamber with ability of delivering hundred percent of oxygen.<sup>9</sup> Worldwide, hyperbaric oxygen therapy has been used with different outcomes. Many of previous studies demonstrated a significant outcomes of this therapy regarding improvement in quality of life of cerebral palsy patients.

Multiple researches illustrated that the HBOT treatment is beneficial in cerebro-vascular diseases.<sup>10</sup> The present study was conducted to examine the benefits, side effects and safety of procedure of hyperbaric oxygen therapy in children with cerebral palsy.

## MATERIALS AND METHODS

This randomized controlled trial study was conducted at Department of Pediatric Medicine, Abbasi Shaheed Hospital, Karachi from 1<sup>st</sup> January 2018 to 30<sup>th</sup> June 2018. One hundred and twenty patients of both genders with cerebral palsy were included. Patient's ages were ranging from 3 to 15 years. Patients with severe neurological disorder, abnormal brain MRI, chromosomal or genetic syndromes and patient's parents whom were not interested to participate were excluded from the study. All the children were equally divided into two groups. Group A (cases group) contains 60 children and received hyperbaric oxygen with physical therapy, Group B (control group) contains 60 children who did not receive HBOT. All the patients received 5 cycles over the period of 2 months. Each cycle contains of 40 sessions, each session of 1 hour using 100% oxygen at 1.5 atmospheric absolute (Atmospheric Pressure) ATA. The outcomes was measure with GMFM score >5 was considered as improvement and ADL score <16 was considered as improvement and score >16 taken as no improvement. A questionnaire was recorded for the parents satisfaction index. A safety score

0-2 was taken as measure of safety of the procedure lesser the score demonstrated the safety of the modality.

Data was analyzed by SPSS 21. P-Value <0.05 was considered as significant.

## RESULTS

Sixty two (51.67%) were females while 48.33% were males. Eighteen (15%) patients were ages <5 years, 72(60%) patients had ages 5 to 10 years and 30(25%) patients were ages above 10 years. Types of cerebral palsy were recorded such as spastic quadriplegia in 37 (30.83%) patients, spastic diplegia in 35(29.17%) patients, spastic hemiplegia in 20(16.67%) patients, dysknesia cerebral palsy in 15(12.5%) patients, ataxic cerebral palsy in 10(8.33%) patients, 3 patients had other (Table 1).

Table 1: Demographic information of the patients (n=120)

Variable	Group A	Group B	Total (n=120)
<b>Gender</b>			
Female	30	32	62 (51.57%)
Male	30	28	58 (48.33%)
<b>Age (years)</b>			
>5	8	10	18 (15%)
5 – 10	40	32	72 (60%)
> 10	16	14	30 (25%)
<b>Types</b>			
Spastic quadriplegia	20	17	37 (30.83%)
Spastic diplegia	19	16	35 (29.17%)
Spastic hemiplegia	10	10	20 (16.67%)
Dysknesia cerebral	10	5	15 (12.5%)
Ataxic cerebral	6	4	10 (8.33%)
Others	1	2	3 (2.5%)

Table 2: Outcome after completion of treatment

Outcome	Group A	Group B	Total (n=120)
<b>GMFMS Improvement</b>			
Yes	57	25	82 (68.33%)
No	3	35	18 (31.67%)
<b>ADL Improvement</b>			
Yes	58	19	77 (64.17%)
No	2	41	43 (35.83%)
<b>Hearing Improvement</b>			
Yes	24	55	79 (65.83%)
No	36	5	41 (34.17%)
<b>Speech Improvement</b>			
Yes	21	18	39 (32.5%)
No	39	42	81 (67.5%)
<b>PSI Index</b>			
Yes	36	34	70 (58.33%)
No	24	26	50 (41.67%)
<b>Safety</b>			
Yes	59	57	116 (96.67%)
No	1	3	4 (3.33%)

P-value >0.05

After the treatment completion 82 (68.33%) patients 57(95% Group A and 25(41.67% Group B) showed improvement in GMFMS, 77 (64.17%) 58 in Group A and 19 in Group B patients showed improvement in activity daily living index. According to hearing and speech 65.83% (24 in Group A and 55 in Group B) and 32.5% patients (21 in Group A and 18 in Group B) showed improvement. According to the PSI (parents satisfaction index) 70(58.33%) parents 36 in Group A and 34 in Group B were

satisfied while 41.67% were unsatisfied. According to the safety index 96.67% patients 59 in Group A and 57 in Group B found no side effects related to the procedure (Table 2).

## DISCUSSION

The current study was conducted to examine the efficacy of hyperbaric oxygen therapy in children presented with cerebral palsy. In our study female patient's population was little high as compared to males 51.57%, 48.43%. These results shows similarity to other study conducted regarding hyperbaric oxygen therapy in which female children are high in number as compared to males 53.5% and 46.5%<sup>11</sup>.

In present study majority of patients 60% were ages between 5 to 10 years. Many of other studies demonstrated that the children with ages 5 to 10 years had a high prevalence of cerebral palsy<sup>12,13</sup>. In our study the most common type of cerebral was spastic quadriplegia 30.83% followed by spastic diplegia 29.17%. Some other studies shows similar results in which spastic quadriplegia was the most frequent type of cerebral<sup>14</sup>.

In the present study, after the completion of treatment, 82(68.33%) patients 57(95%) in Group A and 25(41.67%) in Group B showed improvement in global motor function measure score GMFMS. Many of previous studies demonstrated the improvement with use of GMFM scoring system<sup>15</sup>. We found that 77(64.17%) 58 in Group A and 19 in Group B patients showed improvement in activity daily living index (ADL). According to hearing and speech, 65.83% (24 in Group A and 55 in Group B) patients showed a significantly difference and 32.5% patients (21 in Group A and 18 in Group B) showed improvement in speech. These results were comparable to so other studies in which 64 to 68% cases were responsive hearing<sup>16,17</sup>.

Present study illustrated that as per PSI (parents satisfaction index) 70(58.33%) parents (36 in Group A and 34 in Group B) were satisfied while 41.67% were unsatisfied. A study shows the similar results in which 60% parents were satisfied<sup>18</sup>. According to the safety index 96.67% patients (59 in Group A and 57 in Group B) found no side effects related to the procedure. Many of studies use the safety index in which 95 to 97% of patients showed no side effect related to treatment procedure<sup>19</sup>.

Moreover, this research is not sufficient to attain a targeted outcome. There is a need for more work to reduce the morbidity and mortality<sup>20</sup>.

## CONCLUSION

Hyperbaric oxygen therapy with physical therapy showed a significant better results regarding neurological outcome (GMFMS, ADL, PSI index). HBOT considered safe and effective procedure with lesser and minor complications

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