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Research Article

A CLINICAL STUDY TO EVALUATE ROLE OF AYURVEDIC MANAGEMENT FOR IMPROVING ACTIVITIES OF DAILY LIVING IN CEREBRAL PALSY AFFECTED CHILDREN

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ABSTRACT

Background: Cerebral palsy is disorder of neuromotor origin due to non progressive brain damage in its early developing period. It is often accompanied by other features like seizures, behavioral disorders and cognitive impairment restricting their normal activities of daily living, making them to be dependent on others. **Aim and Objectives:** The present clinical study was designed with an aim to improve quality of life and establish optimal independence in activities of daily living (ADL) by potentiating the effects of world widely accepted Physiotherapy treatment along with Ayurvedic modality for better management of Cerebral palsy with a ray of new hope. **Material and Methods:** The study was performed on forty five patients of age group one to twelve years of either sex. Patients were therapeutically randomized into three groups and received treatment for six months. Group A (n=14) received Physiotherapy; Group B (n=14) was treated with Physiotherapy and Ayurvedic procedures while Group C (n=14) received Physiotherapy, Ayurvedic procedures and *Syp. Ayurvedic compound*. Out of forty five cases, three of them discontinued treatment. Parameters for assessment were based on standard guidelines of Activities of daily living – Modified Barthel score. **Results:** The effect of therapy observed on total ADL score at end of six months was statistically significant ($p<0.05$) in Group A with a gain of 58.41% while in Group B and C it was statically highly significant ($p<0.001$) with gain of 62.80% and 62.68% respectively. **Conclusion:** The improvement noted in Group B and C was enhanced by effects of Ayurvedic procedures and *Syp. Ayurvedic compound* due to improvement in muscle tone, gain in muscle strength, proper nourishment of *Dhatus* and intelligence for better skilled performance.

KEY WORDS : Cerebral palsy, Physiotherapy, Ayurvedic management, ADL.

INTRODUCTION

Cerebral palsy (CP) is defined as non progressive disorder of movement and posture caused by insult or injury to developing brain during its early stage of development. Being predominantly motor disorder it is often accompanied by cognitive impairment, seizures and extra pyramidal abnormalities. The data about its prevalence and relationship to etiological factor is very scanty in our country. Although the overall prevalence rate is 2.5 per 1000 but may vary from 1 to 6 per 1000.[1,2] The condition poses considerable diagnostic and therapeutic challenge to the treating physician. The disability restrains the child's ability to perform normal activities of daily living thereby rendering him/her to be dependent on others for their needs.

Management of CP in children requires multidisciplinary approach. Physiotherapy is accepted worldwide as standard for rehabilitation procedure. Medical management of spasticity, seizures etc. are associated with minimal effects.

There is no specific disorder similar to CP mentioned in Ayurvedic texts. Much information regarding the different aspects of this condition is found scattered in the various context of antenatal, natal and postnatal care. Based on above information and the clinical manifestations, it may be considered that CP is a

is a disorder of *Vata* predominance manifesting all over body with site of lesion in *Mastishka* (Brain), in form of Monoplegia (*Ekanga Vata*), Hemiplegia (*Pakshaghata*), Diplegia (*Pangu*), Quadriplegia (*Sarvanga Vata*) etc. As the *Mastishka* or *Shira pradesh* is the location of *Gyanendriya* and *Karmanendriya*. So the feature of *Gyanendriyakarmahani* (loss of sensation of sensory organs) are usually accompanied with motor involvement *(Karmenendriya)*. The involvement of *Chaksu – indriya* leads to *Andhata*(optical/ cortical blindess), *Vikrut dusthi* (Squint, strabismus), refractive errors etc. The involvement of *Shotra – indriya* leads to *Badhirya* (sensorineural deafness) and *Sparsha – Indriya* leads to loss of perception of sensations. The higher functions of brain like *Buddhi* is also affected ranging from mild to severe Mental retardation.

Keeping in view of *Doshic* and *sub-doshic* involvement, the treatment was formulated with consideration of Ayurvedic procedures like *Abhyanga*, *Shastik Sali Pinda Sweda*, *Matra basti* and *Shirodhara* along with oral compound containing ingredients with predominantly properties of *Medhya, Balya, Brimhana* and *Vatahara.* The principle was to bring out normalcy of vitiated *Dosha*, providing better nourishment to *Dhatus* and to compensate for brain damage up to certain extent with concept of regenerating neurons and improving cognition.

AIMS AND OBJECTIVES

- To improve quality of life in CP affected children.
- Early rehabilitation to improve the functional capacity of the child.
- To reduce spasticity, deformities and to prevent development of contractures.
- To establish optimal independence in daily life activities by learning skilled movement.

MATERIAL AND METHODS

For the present clinical study total 45 cases of diagnosed CP patients (irrespective of type and cause) were selected from O.P.D and I.P.D of Balroga, National institute of Ayurveda (Jaipur) from year 2008-11. Duration of the trail was for six months. Out of them 3 cases did not turn up for complete follow up hence were dropped out from the study and were completed in 42 patients.

Selected patients were therapeutically randomized into three groups. Group A receiving Physiotherapy treatment, Group B receiving Physiotherapy and *Panchkarma* procedures and Group C receiving *Panchkarma* procedures, Syp. *Ayurvedic* compound and Physiotherapy. In each Group A, B and C 14 patients managed to complete their trial for 6 month duration.

Criteria Adopted

1. **Inclusion criteria:** Age group one to twelve years of either sex.
2. **Exclusion Criteria:** Individuals below one years and above twelve years of age. Progressive neurologic disorders.
3. **Discontinuation Criteria:** Parents / guardian not willing to continue treatment. Patients who develop life threatening complication during treatment.
4. **Assessment Criteria for ADL:** Modified Barthel Score.[3]

Table 1: Modified Barthel Index

Item	Unable to perform task	Attempt task but unsafe	Moderate help required	Minimal help required	Fully Independent
Personal hygiene	0	1	3	4	5
Bathing self	0	1	3	4	5
Feeding	0	2	5	8	10
Toilet	0	2	5	8	10
Stair Climbing	0	2	5	8	10
Dressing	0	2	5	8	10
Bowel control	0	2	5	8	10
Bladder control	0	2	5	8	10
Ambulation (wheel chair)	0 (0)	3 (1)	8 (3)	12 (4)	15 (5)
Chair – bed transfer	0	3	8	12	15

A. Trial Compound

Syp. Ayurvedic compound **–** A compound containing eleven herbs were selected for the present study. It was prepared by the institute pharmacy in the form of syrup for making it palatable.

Method of preparation of Study drug - All the ingredients were taken in the quantities mentioned in table no.2. After making their coarse powder, the powder was soaked in water for one night. Later on coarse powder of the drugs was boiled after adding water (8 times than powder), till it remained 1/8 of total quantity. Then sugar was added to decoction and boiled for 30 min., after that the preparation was allowed to cool. Then preservatives were added in the preparation. At last, flavor and color were added.

Presentation - The drug was packed and sealed in sterile, airtight, each 200 ml quantity glass bottles labeled with date of manufacture and batch no.

Table no. 2: Ingredients of Syp. Ayurvedic compound

S. No	Drug name	Botanical name	Part used	Proportion
1.	*Brahmi*	*Bacopa monnieri (L.) Pennell.*	*Panchanga*	1 part
2.	*Mandookparni*	*Centella asiatica (L.)Urban*	*Panchanga*	1 part
3.	*Vacha*	*Acorus calamus L.*	Root	¼ part
4.	*Jatamansi*	*Nardostachys jatamansi* DC.	Rhizome	½ part
5.	*Ashwagandha*	*Withania somnifera Dunal*	Root	1 part
6.	*Madhuyasthi*	*Glycyrrhiza glabra L.*	Root	1 part
7.	*Bala*	*Sida cordifolia L.*	Root	1 part
8.	*Guduchi*	*Tinospora cordifolia* (Willd.) Hook.F. & Thoms.	Stem	1 part
9.	*Vidarikanda*	*Pueraria tuberosa* (Roxb. Ex. Willd.) Dc.	Tubers	1 part
10.	*Kapikacchu*	*Mucuna pruriens (L.) DC*	Seed	½ part
11.	*Pippali*	*Piper longum L.*	Fruit, Root	¼ part

Drug dose and duration: Doses were calculated according to the body weight of the child (1ml/kg/day) in three divided doses for six months. Children were called for follow up after every 30 days. Any discomfort or untoward side effects were noticed.

B. ***Panchkarma*** **Procedures -** The procedures applied during the course of treatment were

Table 3: Procedures applied during study and their respective duration

Procedures	Ingredients / Medications	Duration of therapy (Same for all age group)
Abhyanga	*Kshirbala Taila*	15 mins. per day continuously for six months
Shastik Sali pinda sweda	*Shastik Sali, Balamula kwatha* and *Godugdha*	30 mins. per day for 21 days continuously followed by a rest of 7 days. Such one cycle was repeated for 6 times.
Matra basti	*Kshirbala taila*	10 days continuously once in a 2 month period. Such one cycle was repeated for 3 times.
Shirodhara	*Balamula kwatha with godugdha*	30 mins. per day for 10 days continuously once in a 2 month period. Such one cycle was repeated for 3 times.

C. Physiotherapy – A set of exercise containing passive and gentle stretching was performed on individual joints. It was also carried out coupled with *Abhyanga* once in a day in form of repetitive passive range of motion exercises to improve and maintain joint mobility.

Statistical analysis – By using Students paired and unpaired 't' test.

OBSERVATION AND RESULTS

The study reported max no. of cases from age group 1 – 4 yrs (54.76%), followed by 5 – 8 yrs (35.71%) & age group 9 – 12 years (8.33%). Affected male were 66.66 % & female with 33.34

%. Among total registered cases 37 were spastic (88.10%) in nature followed by 4 (9.52%) cases of Hypotonic and 1 (2.38%) case of Dyskinetic. Of the total Spastic CP cases, the maximum no of patients i.e. 14 (37.83%) were found to be Quadriplegic followed by 13 (35.13%) patients of Diplegic in nature. 7 (18.91%) cases were found to have Hemiplgic pattern, 2 (5.40%) cases were Monoplegic and 1 (2.70%) of Double hemiplegia in nature.

Table 4: Showing Effect on Activities of Daily living score in Group A

Sr. no	Particulars	Duration in month	Mean BT (n =14)	Mean AT (n =14)	Mean Diff (n =14)	% change	S.D. (±)	S.E. (±)	' t ' value	' p ' value	Result
1.	Personal Hygiene	2 m	0.2857	0.2857	0	0	0	0	0	-	-
		4 m	0.2857	0.4286	0.143	33.36	0.3631	0.0971	1.472	>0.10	In. Sig.
		6 m	0.2857	0.7853	0.5	63.66	1.0919	0.2918	1.713	>0.05	In. Sig.
2.	Bathing Self	2 m	0.7143	0.4615	0	0	0	0	0	-	-
		4 m	0.7143	0.8571	0.143	16.684	0.3631	0.0971	1.472	>0.10	In. Sig.
		6 m	0.7143	01.2143	0.5	41.175	0.8549	0.2285	2.188	<0.05	Sig.
3.	Feeding	2 m	1.2857	1.0769	0	0	0	0	0	-	-
		4 m	1.2857	1.7143	0.429	25.024	1.0894	0.2912	1.472	>0.10	In. Sig.
		6 m	1.2857	2.3571	1.071	45.437	1.3281	0.3549	3.019	< 0.01	Sig.
4.	Toilet	2 m	0.7143	0.8571	0.143	16.684	0.5345	0.1429	1.0	>0.10	In. Sig.
		4 m	0.7143	1.0714	0.357	33.320	0.9288	0.2482	1.439	>0.10	In. Sig.
		6 m	0.7143	1.2857	0.571	44.411	1.5046	0.4021	1.421	>0.10	In. Sig.
5.	Stair climbing	2 m	0.5714	0.5714	0	0	0	0	0	-	-
		4 m	0.5714	0.8571	0.286	33.368	0.7263	0.1941	1.472	>0.10	In. Sig.
		6 m	0.5714	1.2857	0.714	55.533	1.8157	0.4853	1.472	>0.10	In. Sig.
6.	Dressing	2 m	0.8571	0.8571	0	0	0	0	0	-	-
		4 m	0.8571	1.0	0.143	14.3	0.5345	0.1429	1.0	>0.10	In. Sig.
		6 m	0.8571	1.5714	0.714	45.437	1.2044	0.3219	2.129	>0.05	In. Sig.
7.	Bowel control	2 m	0.8571	1.0	0.143	14.3	0.5345	0.1429	1.0	>0.10	In. Sig.
		4 m	0.8571	1.3571	0.5	36.843	1.019	0.2724	1.836	>0.05	In. Sig.
		6 m	0.8571	2.2143	1.357	61.283	2.3074	0.6167	2.201	<0.05	Sig.
8.	Bladder control	2 m	0.8571	1.0	0.143	14.3	0.5345	0.1429	1.0	>0.10	In. Sig.
		4 m	0.8571	1.3571	0.5	36.843	1.019	0.2724	1.836	>0.05	In. Sig.
		6 m	0.8571	2.2143	1.357	61.283	2.3074	0.6167	2.201	<0.05	Sig.
9.	Ambulation	2 m	1.0	1.0	0	0	0	0	0	-	-
		4 m	1.0	1.9286	0.929	48.169	1.9	0.5078	1.829	>0.05	In. Sig.
		6 m	1.0	2.1429	1.143	53.338	1.9556	0.5229	2.187	<0.05	Sig.
10.	Chair bed transfer	2 m	0.7857	0.7857	0	0	0	0	0	-	-
		4 m	0.7857	1.0	0.214	21.4	0.8018	0.2143	1.0	>0.10	In. Sig.
		6 m	0.7857	1.2143	0.429	35.328	1.0894	0.2912	1.472	>0.10	In. Sig.
11.	Total score	2 m	7.9286	8.1429	0.214	2.628	1.4769	0.3947	0.543	>0.10	In. Sig.
		4 m	7.9286	11.571	3.643	31.483	6.6749	1.784	2.042	>0.05	In. Sig.
		6 m	7.9286	19.071	11.14	58.413	15.084	4.0313	2.764	<0.02	Sig.

(Sig. – significant; H.Sig – highly significant; In.sig –insignificant)

Table 5: Showing Effect on Activities of Daily living score in Group B

S. no	Particulars	Duration In month	Mean BT (n=14)	Mean AT (n=14)	Mean diff (n =14)	% change	S.D. (±)	S.E. (±)	' t ' value	' p ' value	Result
1.	Personal Hygiene	2 m	0.5	0.5714	0.0714	12.495	0.2672	0.0714	1.0	>0.10	In. Sig.
		4 m	0.5	1.0714	0.571	53.294	0.7559	0.202	2.828	<0.02	Sig.
		6 m	0.5	1.8571	1.357	73.070	1.1507	0.3075	4.413	<0.001	H. Sig.
2.	Bathing Self	2 m	1.2143	1.2143	0	0	0	0	0	-	-
		4 m	1.2143	1.9286	0.714	37.021	0.9139	0.2442	2.924	<0.02	Sig.
		6 m	1.2143	2.3571	1.143	48.491	0.9493	0.2537	4.505	<0.001	H. Sig.
3.	Feeding	2 m	2.3571	2.3571	0	0	0	0	0	-	-
		4 m	2.3571	3.5714	1.214	33.992	1.4769	0.3947	3.076	<0.01	Sig.
		6 m	2.3571	4.5714	2.214	48.431	1.2514	0.3344	6.621	<0.001	H. Sig.
4.	Toilet	2 m	0.5714	0.7143	0.1429	20.005	0.5345	0.1428	1.0	>0.10	In. Sig.
		4 m	0.5714	1.4286	0.857	59.988	1.2315	0.3291	2.604	<0.05	Sig.
		6 m	0.5714	2.7857	2.214	79.477	2.0821	0.5565	3.979	<0.01	Sig.
5.	Stair climbing	2 m	0.5714	0.7857	0.2143	27.275	0.8017	0.2142	1.0	>0.10	In. Sig.
		4 m	0.5714	1.2857	0.714	55.533	1.2044	0.3219	2.219	<0.05	Sig.
		6 m	0.5714	2.1429	1.571	73.311	1.989	0.5316	2.956	<0.02	Sig.
6.	Dressing	2 m	0.7143	0.8571	0.1429	16.672	0.534	0.1428	1.0	>0.10	In. Sig.
		4 m	0.7143	1.6429	0.929	56.546	1.3281	0.3549	2.616	<0.05	Sig.
		6 m	0.7143	2.9286	2.214	75.599	1.8472	0.4937	4.485	<0.001	H. Sig.
7.	Bowel control	2 m	1.7857	1.9286	0.1429	7.409	0.534	0.1428	1.0	>0.10	In. Sig.
		4 m	1.7857	2.9286	1.143	39.028	1.4064	0.3759	3.04	<0.01	Sig.
		6 m	1.7857	4.2857	2.5	58.333	1.286	0.3437	7.274	<0.001	H. Sig.
8.	Bladder control	2 m	1.7857	1.9286	0.1429	7.409	0.5345	0.1428	1.0	>0.10	In. Sig.
		4 m	1.7857	2.9286	1.143	39.028	1.4064	0.3759	3.04	<0.01	Sig.
		6 m	1.7857	4.2857	2.5	58.333	1.286	0.3437	7.274	<0.001	H. Sig.
9.	Ambulation	2 m	1.6429	1.6429	0	0	0	0	0	-	-
		4 m	1.6429	3.0714	1.429	46.526	2.0649	0.5519	2.589	<0.05	Sig.
		6 m	1.6429	4	2.357	58.92	2.2398	0.5986	3.938	<0.01	Sig.
10.	Chair bed transfer	2 m	1	1	0	0	0	0	0	-	-
		4 m	1	1.7143	0.714	41.649	1.4373	0.3841	1.859	>0.05	In. Sig.
		6 m	1	3.4286	2.429	70.845	2.5333	0.6771	3.587	<0.01	Sig.
11.	Total score	2 m	12.14	13	-0.8571	6.59	1.561	0.417	2.053	>0.05	In. Sig.
		4 m	12.14	22.28	-10.41	46.72	10.21	2.729	3.71	<0.01	Sig.
		6 m	12.14	32.64	-20.5	62.80	13.17	3.521	5.82	<0.001	H. Sig.

(Sig. – significant; H.Sig – highly significant; In.sig –insignificant)

Table 6: Showing Effect on Activities of Daily living score in Group C

Sr. No	Particulars	Duration in month	Mean BT (n=14)	Mean AT (n=14)	Mean diff (n=14)	% Change	S.D. (±)	S.E. (±)	' t ' value	' p ' value	Result
1.	Personal Hygiene	2 m	0.7143	0.7857	0.071	9.036	0.2673	0.0714	1.0	>0.10	In. Sig.
		4 m	0.7143	1.5	0.786	52.4	0.8926	0.2386	3.294	<0.01	Sig.
		6 m	0.7143	2	1.286	64.3	1.069	0.2857	4.5	<0.001	H. Sig.
2.	Bathing Self	2 m	1.5714	1.8571	0.286	15.400	0.6112	0.1634	1.749	>0.10	In. Sig.
		4 m	1.5714	2.4286	0.857	35.287	0.7703	0.2059	4.163	<0.001	H. Sig.
		6 m	1.5714	3.0714	1.5	48.837	1.019	0.2724	5.508	<0.001	H. Sig.
3.	Feeding	2 m	2.7143	2.8571	0.143	5.005	0.5345	0.1429	1.0	>0.10	In. Sig.
		4 m	2.7143	4.1429	1.429	34.492	1.5046	0.4021	3.553	<0.01	Sig.
		6 m	2.7143	5.4286	2.714	49.994	1.4373	0.3841	7.066	<0.001	H. Sig.
4.	Toilet	2 m	1.2143	1.2143	0	0	0	0	0	-	-
		4 m	1.2143	2.5714	1.357	52.7723	1.4469	0.3867	3.51	<0.01	Sig.
		6 m	1.2143	3.7857	2.571	67.913	2.5027	0.6689	3.844	<0.01	Sig.
5.	Stair climbing	2 m	0.9286	1.2143	0.286	23.552	0.7263	0.1941	1.472	>0.10	In. Sig.
		4 m	0.9286	2.0	1.071	53.55	1.3281	0.3549	3.019	<0.01	Sig.
		6 m	0.9286	3.4286	2.5	72.916	2.5038	0.6692	3.736	<0.01	Sig.
6.	Dressing	2 m	1.4286	1.7143	0.286	16.683	0.7263	0.1941	1.472	>0.10	In. Sig.
		4 m	1.4286	2.7857	1.357	48.713	1.4469	0.3867	3.51	<0.01	Sig.
		6 m	1.4286	4.1429	2.714	65.509	2.1989	0.5877	4.619	<0.001	H Sig.
7.	Bowel control	2 m	2.0	2.1429	0.143	6.673	0.5345	0.1429	1.0	>0.10	In. Sig.
		4 m	2.0	3.3571	1.357	40.42	1.4469	0.3867	3.51	<0.01	Sig.
		6 m	2.0	5.0714	3.071	60.555	1.4917	0.3987	7.704	<0.001	H. Sig.
8.	Bladder control	2 m	2.0	2.1429	0.143	6.673	0.5345	0.1429	1.0	>0.10	In. Sig.
		4 m	2.0	3.3571	1.357	40.421	1.4469	0.3867	3.51	<0.01	Sig.
		6 m	2.0	5.0714	3.071	60.555	1.4917	0.3987	7.704	<0.001	H Sig.
9.	Ambulation	2 m	2.0	2.2143	0.214	9.664	0.8018	0.2143	1.0	>0.10	In. Sig.
		4 m	2.0	3.5714	1.571	43.988	2.1381	0.5714	2.75	<0.02	Sig.
		6 m	2.0	5.0714	3.071	60.555	2.5257	0.675	4.55	<0.001	H. Sig.
10.	Chair bed transfer	2 m	0.7857	1.4286	0.643	45.009	1.2774	0.3414	1.883	<0.10	In. Sig.
		4 m	0.7857	2.2143	1.429	64.535	1.7852	0.4771	2.994	<0.01	Sig.
		6 m	0.7857	4.1429	3.357	81.030	3.4776	0.9294	3.612	<0.01	Sig.
11.	Total score	2 m	15.357	17.571	2.214	12.600	3.6623	0.9788	2.262	<0.05	Sig.
		4 m	15.357	27.929	12.57	45.006	10.234	2.735	4.596	<0.001	H. Sig.
		6 m	15.357	41.143	25.79	62.683	15.582	4.1644	6.192	<0.001	H. Sig.

(Sig. – significant; H.Sig – highly significant; In.sig –insignificant)

Table 7: Showing effect on Activities of Daily living score - Inter group (Pre) comparison at end of six month duration

Sr. No	Particulars	Inter Group comparison	Mean diff (n = 28)	S.D. (±)	S.E. (±)	' t_{26} ' Value	' p ' Value	Result
1.	Personal Hygiene	A – B	-0.214	0.9678	0.36583	0.5858	>0.10	In.Sig
		A – C	-0.429	1.06904	0.4040	1.0607	>0.10	In.Sig
		B – C	-0.214	0.9678	0.3658	0.5858	>0.10	In.Sig
2.	Bathing Self	A – B	-0.5	1.3475	0.5093	0.9817	>0.10	In.Sig
		A – C	-0.857	1.4713	0.55611	1.5413	>0.10	In.Sig
		B – C	-0.357	1.3837	0.5230	0.6828	>0.10	In.Sig
3.	Feeding	A – B	-1.071	2.45	0.926	1.157	>0.10	In.Sig
		A – C	-1.429	2.447	0.9249	1.544	>0.10	In.Sig
		B – C	-0.357	2.202	0.8322	0.429	>0.10	In.Sig
4.	Toilet	A – B	0.1429	1.667	0.6302	0.226	>0.10	In.Sig
		A – C	-0.5	1.8523	0.7	0.714	>0.10	In.Sig
		B – C	-0.643	1.237	0.467	1.374	>0.10	In.Sig
5.	Stair Climbing	A – B	0	1.650	0.623	0	>0.10	In.Sig
		A – C	-0.357	1.843	0.6967	0.512	>0.10	In.Sig
		B – C	-0.357	1.245	0.4709	0.7584	>0.10	In.Sig
6.	Dressing	A – B	0.1429	1.6935	0.6401	0.2231	>0.10	In.Sig
		A – C	-0.571	1.991	0.7528	0.7591	>0.10	In.Sig
		B – C	-0.714	1.444	0.5461	1.3079	>0.10	In.Sig
7.	Bowel Control	A – B	-0.929	2.076	0.7847	1.183	>0.10	In.Sig
		A – C	-1.143	2.1636	0.8177	1.3975	>0.10	In.Sig
		B – C	-0.214	2.0602	0.7786	0.2752	>0.10	In.Sig
8.	Bladder Control	A – B	-0.929	2.076	0.7847	1.183	>0.10	In.Sig
		A – C	-1.143	2.1636	0.8177	1.3975	>0.10	In.Sig
		B – C	-0.214	2.0602	0.7786	0.2752	>0.10	In.Sig
9.	Ambulation	A – B	-0.643	2.3139	0.8745	0.735	>0.10	In.Sig
		A – C	-1.0	2.601	0.9833	1.016	>0.10	In.Sig
		B – C	-0.357	2.6254	0.9923	0.3599	>0.10	In.Sig
10.	Chair bed transfer	A – B	-0.214	2.2562	0.8527	0.251	>0.10	In.Sig
		A – C	0	2.224	0.840	0	>0.10	In.Sig
		B – C	0.2143	2.2562	0.8527	0.2512	>0.10	In.Sig
11.	Total effect	A – B	- 4.214	17.1	6.463	0.652	>0.10	In.Sig
		A – C	- 7.429	18.407	6.9575	1.0677	>0.10	In.Sig
		B – C	- 3.214	15.30	5.7850	0.555	>0.10	In.Sig

(Sig. – significant; H.Sig – highly significant; In.sig –insignificant)

Table 8: Showing effect on Activities of Daily living score - Inter group (Post) comparison at end of six month duration

Sr. No	Particulars	Inter Group comparison	Mean diff (n = 28)	S.D.	S.E. (±)	' t_{26} ' Value	' p ' Value	Result
1.	Personal Hygiene	A – B	-1.071	1.5941	0.602	1.778	>0.05	In.Sig.
		A – C	-1.214	1.69112	0.6391	1.899	>0.05	In.Sig.
		B – C	-0.143	1.6608	0.6277	0.227	>0.10	In.Sig.
2.	Bathing Self	A – B	-1.143	1.7272	0.6528	1.7506	>0.05	In.Sig.
		A – C	-1.857	1.873	0.7082	2.6223	<0.02	Sig.
		B – C	-0.714	1.882	0.7115	1.003	>0.10	In.Sig.
3.	Feeding	A – B	-2.429	3.1596	1.1942	2.033	>0.05	In.Sig.
		A – C	-3.071	2.9912	1.1306	2.716	>0.02	Sig.
		B – C	-0.643	3.197	1.208	0.532	>0.10	In.Sig.
4.	Toilet	A – B	-1.5	2.654	1.003	1.495	>0.05	In.Sig.
		A – C	-2.5	3.083	1.165	2.145	<0.05	Sig.
		B – C	-1.0	3.092	1.169	0.8554	>0.10	In.Sig.
5.	Stair Climbing	A – B	-0.857	2.5158	0.9509	0.9014	>0.10	In.Sig.
		A – C	-2.143	3.151	1.191	1.798	>0.05	In.Sig.
		B – C	-1.286	3.045	1.151	1.117	>0.10	In.Sig.
6.	Dressing	A – B	-1.357	2.803	1.059	1.280	>0.10	In.Sig.
		A – C	-2.571	3.083	1.165	2.206	<0.05	Sig.
		B – C	-1.214	2.859	1.080	1.123	>0.10	In.Sig.
7.	Bowel Control	A – B	-2.071	2.982	1.127	1.837	>0.05	In.Sig.
		A – C	-2.857	2.982	1.127	2.534	<0.02	Sig.
		B – C	-1.071	2.730	1.031	0.7614	>0.10	In.Sig.
8.	Bladder Control	A – B	-2.071	2.982	1.127	1.837	>0.05	In.Sig.
		A – C	-2.857	2.982	1.127	2.534	<0.02	Sig.
		B – C	-1.071	2.730	1.031	0.7614	>0.10	In.Sig.
9.	Ambulation	A – B	-1.857	3.709	1.401	1.324	>0.10	In.Sig.
		A – C	-2.929	3.983	1.505	1.944	>0.05	In.Sig.
		B – C	-1.071	4.291	1.622	0.6605	>0.10	In.Sig.
10.	Chair bed transfer	A – B	-2.214	3.2686	1.2354	1.792	>0.05	In.Sig.
		A – C	-2.929	3.464	1.309	2.236	<0.05	Sig.
		B – C	-0.714	4.156	1.570	0.4547	>0.10	In.Sig.
11.	Total effect	A – B	-13.57	25.39	9.597	1.414	>0.10	In.Sig.
		A – C	-22.07	27.245	10.297	2.143	<0.05	Sig.
		B – C	-8.5	27.210	10.284	0.8265	>0.10	In.Sig.

(Sig. – significant; H. Sig – highly significant; In. sig –insignificant)

The overall effect of treatment observed on total ADL score in Group A at end of 2 & 4 months showed improvement which was statistically insignificant ($p > 0.10$ & $p>0.05$) with gain of 2.62% and 31.48% respectively while at the end of 6 months the improvement noted was statistically significant ($p<0.05$) with gain of 58.41% (Table no.3). The result obtained in Group B at end of 2 months showed improvement to be statistically insignificant ($p >0.05$) with gain of 6.59%. The improvement noted at 4 and 6 month was statistically significant ($p < 0.01$) and highly significant ($p<0.001$) with gain of 46.72% and 62.80% respectively (Table no.4). The effect observed in Group C at 2 months showed improvement which was statistically significant ($p<0.05$) with gain of 12.60%. The improvement noted at 4 and 6 months was statistically Highly significant

(p<0.001) with gain of 45% and 62.68% respectively (Table no.5).

Before analyzing the effectiveness of treatment of one group over the other, the Mean BT of both Inter groups were compared by using Unpaired't' test to check the uniformity of sample. The inter Group difference analyzed in all three inter groups showed statistically insignificant result (p>0.10) which indicates uniformity of sample size. (See table no. 6) The Mean AT of both Inter groups were compared by using Unpaired't' test.

The post inter group difference test in Group A – B shows that Group B had advantage over Group A which was statistically insignificant (p>0.10) while in Group A – C, the Group C showed advantage which was statistically significant (p<0.05) whereas in Group B – C the result was statistically insignificant (p>0.10). (Table no.7)

DISCUSSION

The effect of therapy observed on total ADL score at end of six months was better in Group B and C compared to Group A. Thus it signifies the effectiveness of combined approach incorporated for better improvement. Similarly, in post inter group comparison test Group C dominated over Group A marginally to be significant.

The effect achieved in Group C compared to Group B may be due to effects of *Syp. Ayurvedic Compund* having *Medhya*, *Balya, Brihmana* properties. *Medhya* drugs improve cognition because ADL not only requires motor function but also certain level of intelligence and skill training. *Balya* and *Brihmana* drugs helped in the proper nourishment and maintenance of *dhatus*. It also requires continuous support or their actual participation of parents to make him learn. So the result found in this particular test cannot be interrelated fully due to lack of large sample size. It also depends on the educational status of parents how much they are aware of this condition and what is their role hence counseling also plays pivotal role on parents.

Probable mode of Action of Trial drug (*Syp. Ayurvedic compound*)

On evaluation of Ayurvedic pharmacodynamical properties, the ingredients of Syp. *Ayurvedic* compound are predominantly of *Madhura*, *Tikta, Katu* and *Kashaya rasa; Snigdha, laghu* and *Guru guna; Ushna and Sheeta Virya; Madhur* and *Katu Vipaka; Tridosha shamaka* and *with Medhya* and *Balya* properties.

Madhura rasa is *Sarvadhatu Vardhaka, Balya, Brimhana, Jeevaniya, Preenana* and *Sthairyakarana*. *Madhur rasa* is formed by composition of *Prithvi* and *Jala mahabhuta*. The *panchabhautika* composition of *Mansa dhatu* resembles to *Madhura rasa*. Hence by the law of *Samanyam Vridhikarnam*, *Madhura rasa* helps in the growth & proper nourishment of muscular tissue. By virtue of *Sarvadhatu vardhaka* property, *Madhura rasa* is capable of providing support and proper nourishment to neurons in order to take up load of already damaged neurons. *Madhura rasa* along with *Tikta* and *Katu* rasa may help in the proper development of neuron synapses and thereby generating a process of regeneration in neuronal precursor cells. *Katu rasa* is responsible for *Indriya utojetaka* (to stimulate sensory/motor organs to perceive their subject), *Agnidipana* (secretion of hormones in synaptic vesicles) *Margana vivraunati* (to create new pathway for proper functioning and replacement of damaged neurons) so it can be postulated that it may provide stimulus in the regions of brain where cells are capable of regenerating especially hippocampal region.

Ushn*a virya* helps to increase the blood circulation in brain while *Sheeta virya* with *Stambhana* and *Sthirikarana* property may restrict the excessive neuronal discharge that is seen in case of convulsions.

Madhur vipaka is said to increase all the *Sharira dhatu* including brain and muscular tissues. *Katu vipaka* on the other hand increases the overall metabolism in the body, proper enzymatic secretions, thereby minimizing the nutrients deficiencies and stimulates all sense organs to perceive their respective objects.

The effect of Syp. *Ayurvedic Compound* can be further postulated on principles of modern perspective as follows:

i. Drugs capable of Regenerating Neurons are *Mandookparni* which has shown increase in length of dendrites of Amygdaloid neurons;[4] Nerve regeneration;[5] and Hippocampal CA3 neuronal dendritic arborization & neuroprotective effect.[6] *Ashwagandha* has shown effect on Induction of Axon or Dendritic outgrowth;[7] Neuron regeneration and synaptic reconstructions.[8]

ii. Drugs having Neuroprotective role are *Jatamansi;*[9] *Mandookparni;*[6] *Ashwagandha*; [10] *Vacha;*[11] *Pippali;*[12] *Yasthimadhu;*[13] *Kapikacchu.*[14]
iii. Drugs having Anti convulsant action are *Jatamansi;*[15] *Ashwagandh;*[16] *Yasthimadhu.* [17]
iv. Drugs showing effect on cognition, learning and memory are *Jatamansi;*[18] *Brahmi;*[19] *Mandookparni;*[15] *Vacha;*[20] *Guduchi;*[21] *Yasthimadhu.*[22,23]
v. Drugs having *Balya* and *Brimhana* effect are *Bala, Vidarikanda, Ashwagandha and Kapikacchu.*

Effect of *Abhyanga:* The *Abhyanga* was carried out with *Kshirbala taila*. The effect of *Abhyanga* can be assumed in two way i.e. physical manipulations and the effect of medicated oil. The ingredients of *Kshirbala taila* are *Bala, Tila taila and Godugdha*. *Bala* is *Vatashamak* and *Balya* that absorbed locally with the help of oil media provides nutrition to muscular tissue preventing from atrophy of muscles and improving muscular tone.

The main part of *Abhyanga* procedure is the mechanical stimulation more precisely the pressure application during massage therapy. Pressure application done in proper way can help in reduction of motor neurone hyperexcitability by reducing the alpha motor neuron activity. The way of mechanism of action is not clearly understood and the amount of pressure to be given to stimulate deep tendon receptors or superficial mechanoreceptors is still not properly understood. A study reported that in hemiparetic subjects the H-reflex was depressed during both continuous and intermittent tendon pressure. Intermittent pressure was more effective than continuous. [24,25] In a study, cerebral palsy symptoms in children were decreased following massage therapy but the mechanism behind it was not explained in the study.[26] In this way *Abhyanga* acts through the properties of *Sneha* as discussed above that help to encounter vitiated *Vata.*

Effect of *Shastik Sali Pinda Sweda* - *Shastik* rice (*Oryza sativa linn.*) is *Snigdha*, *Bala vardhana* and *Deha dardhyakrita*. *Bala* and *Godugdha* used to cook the *Shastik sali* and to heat the bolus is *Snigdha*, *Balya, Rasayana* and *Vatahara*. The heat provided by bolus of *Shastik sali* dipped in *Balamula kwatha* with *Godugdha* may increase the blood flow locally, relieve muscle spasm, increase tendon extensibility and provide pain relief. *Bala* absorbed locally provides nourishment to muscular tissue and prevents from emaciation.

Thus combined effect of *Abhyanga* and *Shastik shali pinda sweda* along with Physiotherapy helps in reducing spasticity, facilitating the free movement of the joints and preventing from development of deformities and contractures. It also provides nutrition to muscular tissue thereby preventing from atrophy and detrimental changes.

Effect of *Matra Basti* – *Basti* is being the most widely used and highly effective treatment modality for treating neurological disorders. The pharmacodynamical action of *Basti* in alleviating symptoms of neurological manifestation in exact way is still not clearly understood. The ingredients of *Kshirbala taila* are *Vatashamak* and *Balya.* It counteracts the vitiated *Vata* at root level of its origin thereby normalizing and influencing its sub *doshic* level at other distant sites too. This mode of action can be explained on concepts of System biology. The theory says that all organs are interconnected or inter-related functionally with each other at molecular level directly or indirectly. Thereby pathophysiological alteration at one level results into change at another level. The gastro intestinal tract has rich network of nerve fibres known as enteric nervous system and it works in synergism with central nervous system. Thus the effect of *Basti* at gastrointestinal system will definitely affect other system thereby achieving a level of homeostasis. Thus it helps to control and regulate symptoms of cerebral palsy.

Effect of Shirodhara – In a study the psycho – neuro - immunologic changes of *Shirodhara* was studied. The results showed that *Shirodhara* has anxiolytic and Altered state of consciousness - inducing effects, and it promotes a decrease of noradrenaline and exhibits a sympatholytic effect, resulting in the activation of peripheral foot skin circulation and immunopotentiation.[27] Thus chemical constituent of *Shirodhara* may modulate the secretions of various neurotransmitter and hormone thereby controlling seizures, cognitive impairment and behavioral problems like anxiety, attention – deficit hyperactivity disorder etc. associated with cerebral palsy

CONCLUSION

The overall result notes that the effect of Physiotherapy is potentiated by Ayurvedic

procedures and *Syp. Ayurvedic Compound* (with properties of *Medhya*, *Balya* and *Brihmana*) for better reduction in spasticity, prevention of joint deformities and contractures and thereby, promoting for early achievement in areas of ADL by improving muscle tone, gain in muscle strength, proper nourishment of *Dhatus* and intelligence for better skill performance.

The study suggest for further extensive researches in areas of application of *Panchkarma* procedures like *Abhyanga, Shastik Sali pinda sweda, Shirodhara* and *Basti* for understanding better way of mechanism with the help of modern medical aids like EMG, EEG etc.

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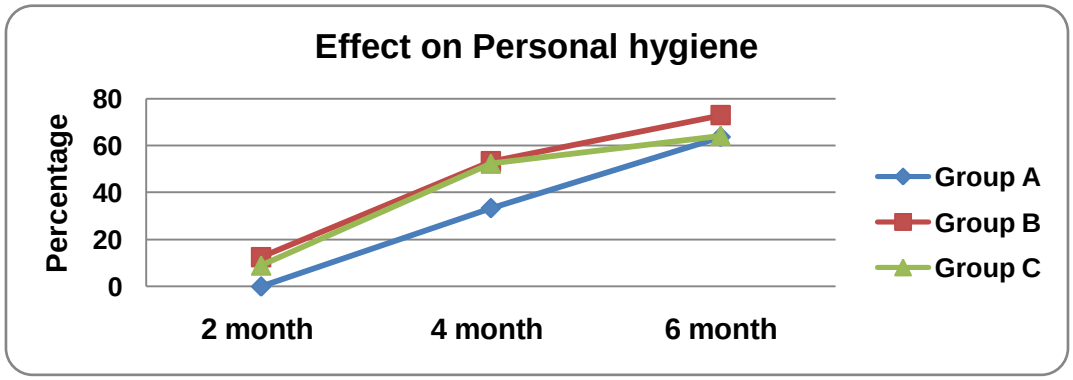
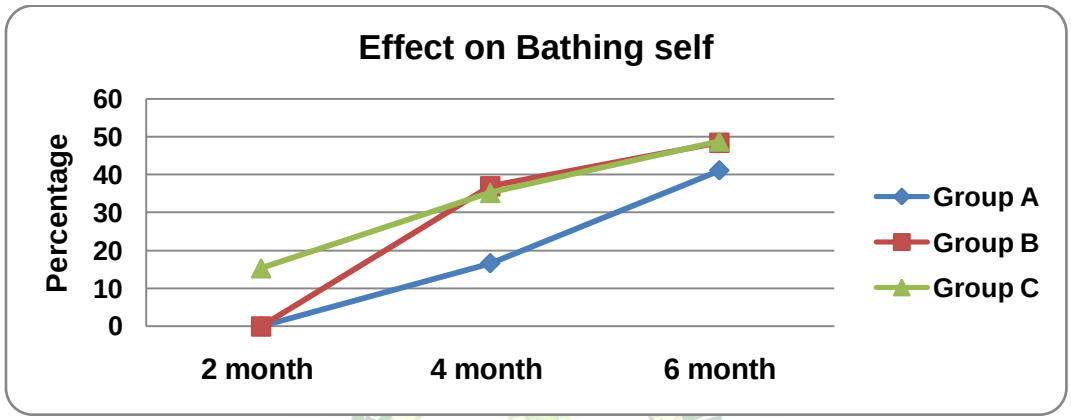
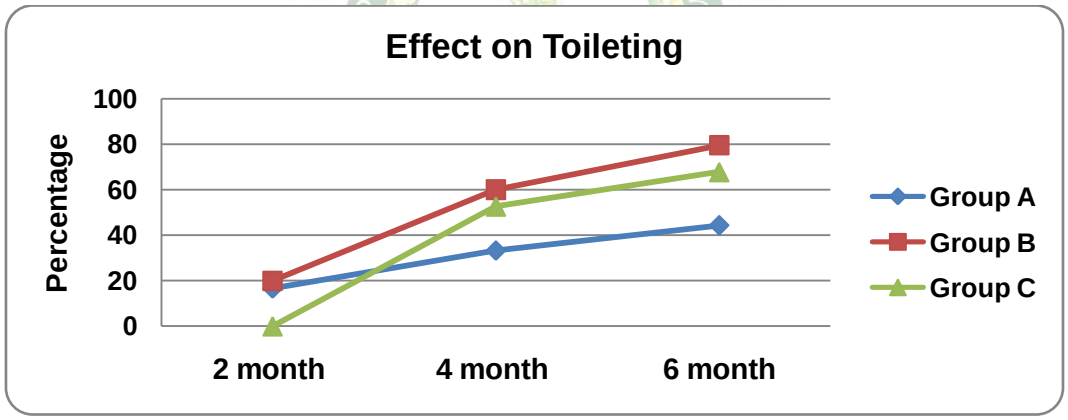
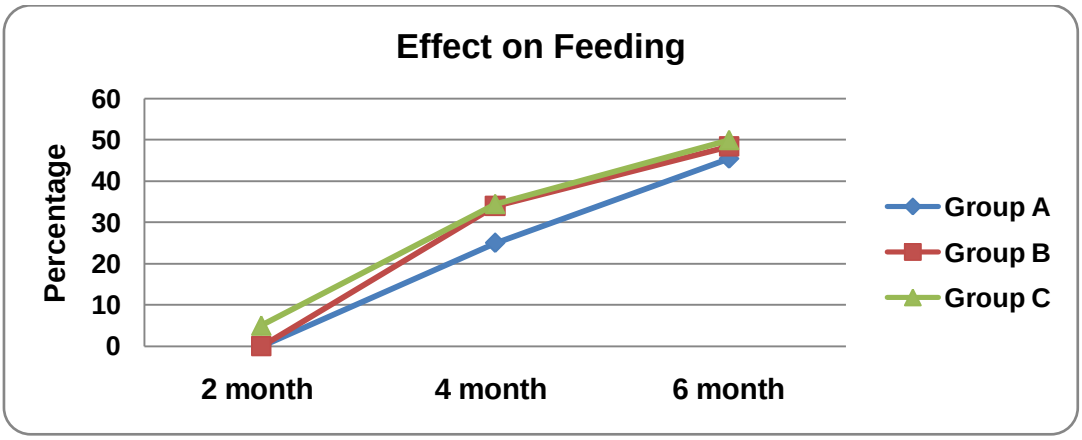
GRAPHS

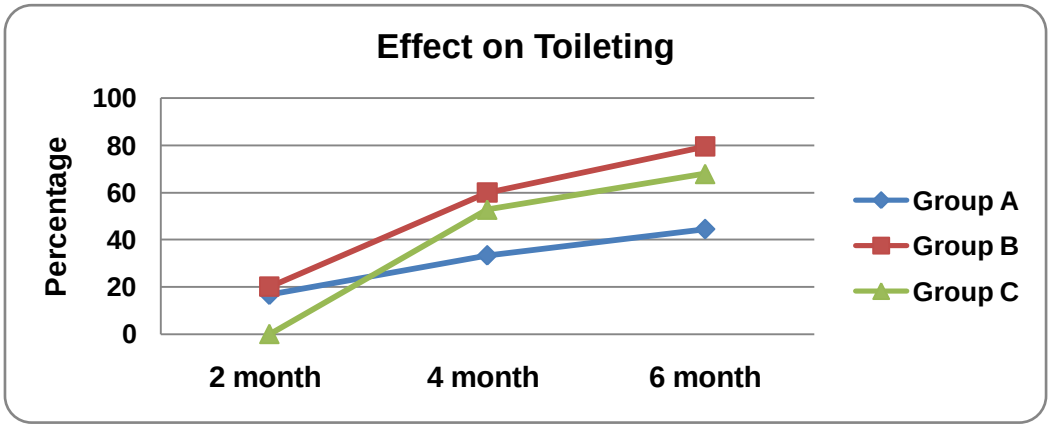
Graphs showing effect of therapy in particular item of Modified Barthel Index










Effect on Toileting
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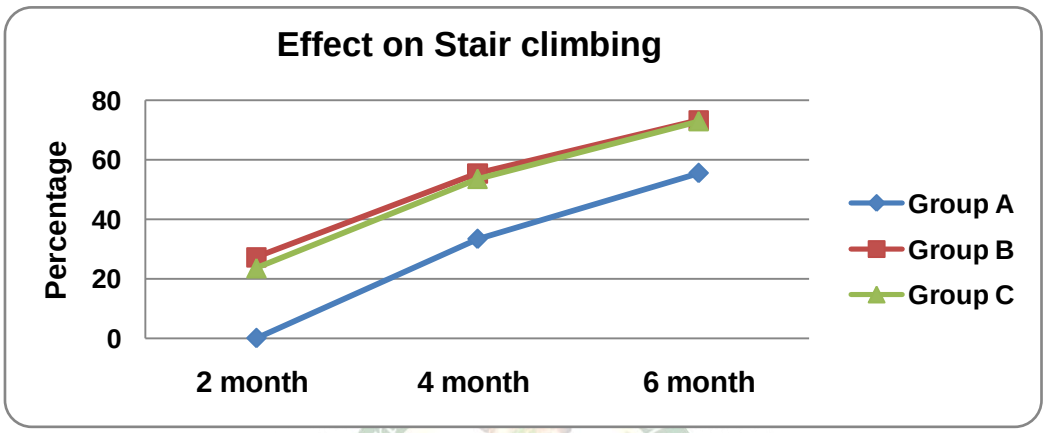
60
40
20
0
2 month
4 month
6 month
Group A
Group B
Group C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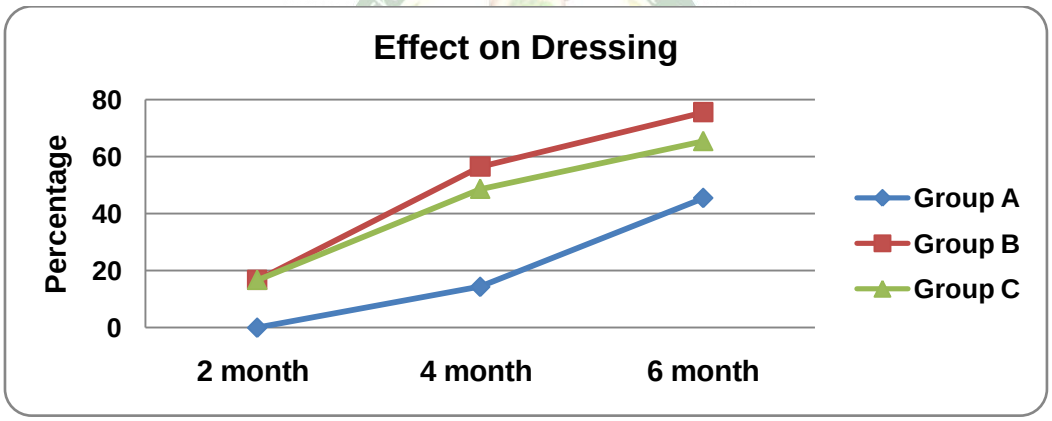
60
40
20
0
2 month
4 month
6 month
Group A
Group B
Group C


Effect on Dressing
Percentage
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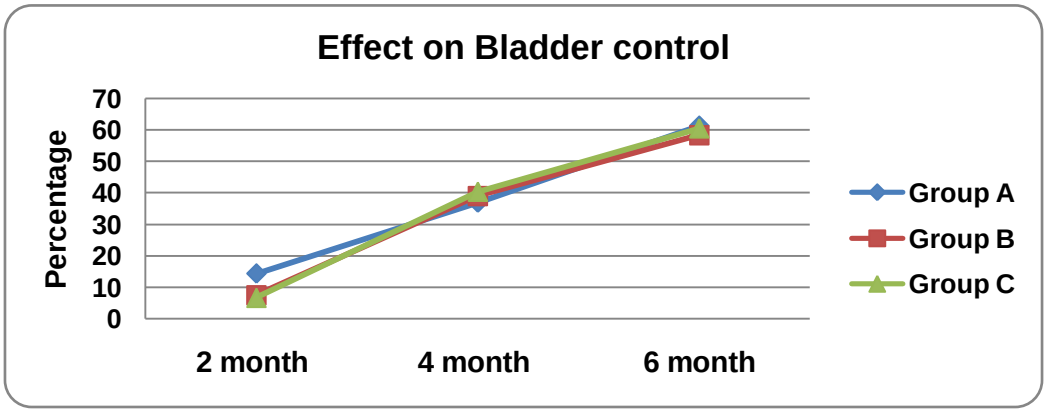
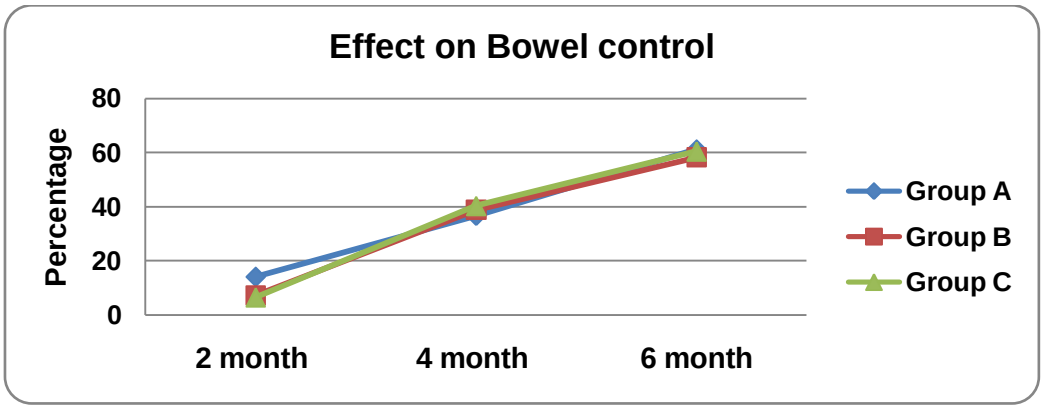
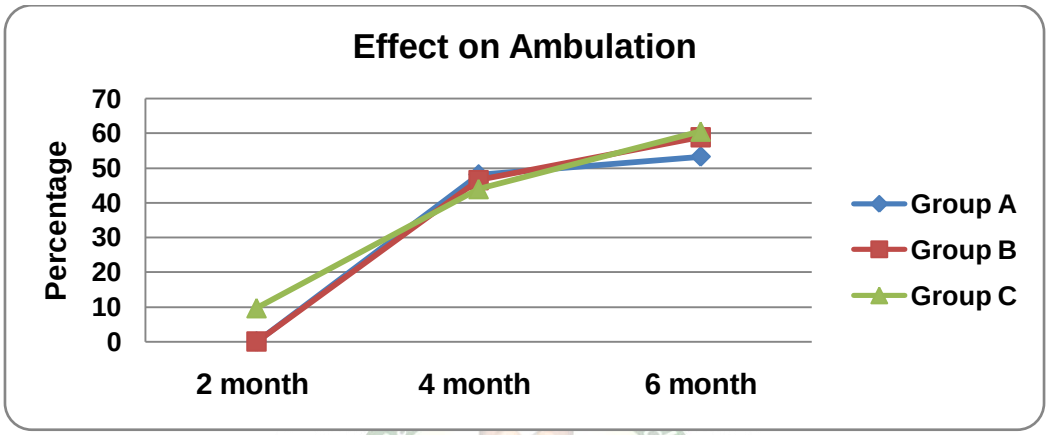
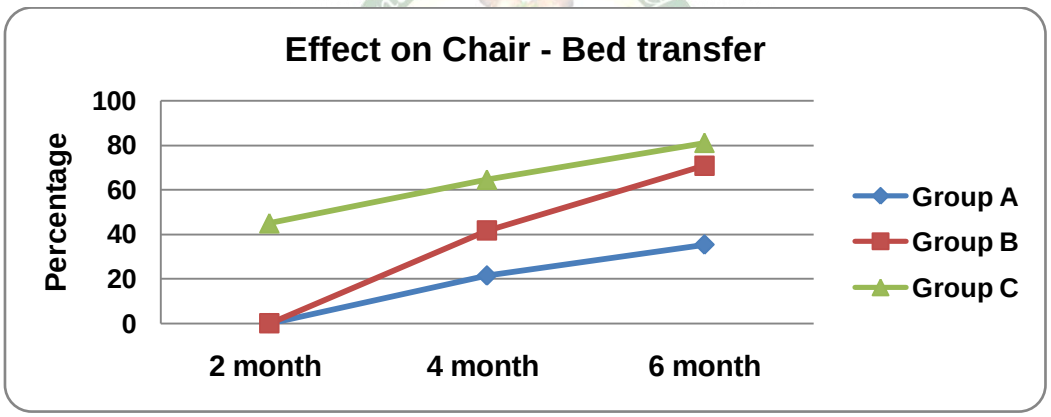
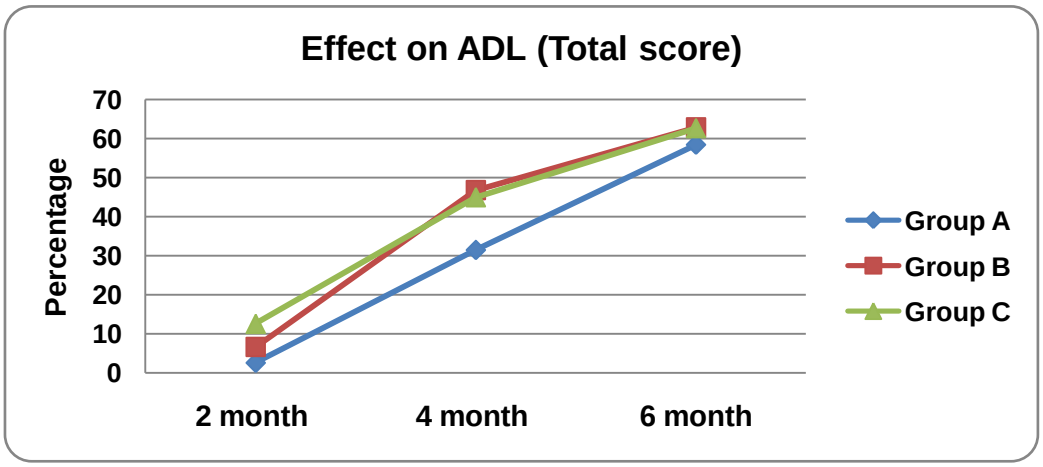
60
40
20
0
2 month
4 month
6 month
Group A
Group B
Group C


Effect on Bladder control
Percentage
70
60
50
40
30
20
10
0
2 month
4 month
6 month
Group A
Group B
Group C


Effect on Bowel control
Percentage
80
60
40
20
0
2 month
4 month
6 month
Group A
Group B
Group C


Effect on Ambulation
Percentage
70
60
50
40
30
20
10
0
2 month
4 month
6 month
Group A
Group B
Group C


Effect on Chair - Bed transfer
Percentage
100
80
60
40
20
0
2 month
4 month
6 month
Group A
Group B
Group C


Effect on ADL (Total score)
Percentage
70
60
50
40
30
20
10
0
2 month
4 month
6 month
Group A
Group B
Group C