



Faculty of Medicine

University of Dhaka

Effectiveness of Hippo therapy on Gross Motor Function and Balance in the Children with Cerebral Palsy.

By

Asma Islam

Master of Science in Physiotherapy

Session: 2017-2018

Registration No: 2227

Roll No: 120



Department of Physiotherapy

Bangladesh Health Professions Institute (BHPI)

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Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Science in
Physiotherapy



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May 2019

Supervisor's Statement

As supervisor of Asma Islam M. Sc Thesis work, I certify that I have considered her thesis **“Effectiveness of Hippo Therapy on Gross Motor Function and Balance in the Children with Cerebral Palsy”** to be suitable for examination.

Supervisor

Md. Anwar Hossain

Date:

Associate Professor of Physiotherapy (BHPI) and Head of Physiotherapy
Department.CRP, Savar, Dhaka-1343.

Declaration Form

- This work has not previously been accepted in substance for any degree and is not concurrently submitted in candidature for any degree.
- This dissertation is being submitted in partial fulfillment of the requirements for the degree of MSc in Physiotherapy.
- This dissertation is the result of my own independent work/investigation, except where otherwise stated. Other sources are acknowledged by giving explicit references. A Bibliography is appended.
- I confirm that if anything identified in my work that I have done plagiarism or any form of cheating that will directly awarded me fail and I am subject to Disciplinary actions of authority.
- I confirm that the electronic copy is identical to the bound copy of the Thesis.
- In case of dissemination the finding of this project for future publication research supervisor will highly concern and it will be duly acknowledged as undergraduate thesis.

Signature:.....

Name:.....

Date:

Acknowledgement

First of all, I am expressing my gratitude to almighty Allah for giving me the ability to complete this piece of innovation. I am also thanking my family members for all of their supports during the thesis period. I would like to express deepest respect and appreciation to my supervisor Md. Anwar Hossain, Associate Professor of BHPI, for his keen supervision without which I could not able to complete this thesis. In addition, I would like to thank Professor Obaidul Hague, Vice Principal of BHPI for his continuous encouragement and expert opinion regarding this thesis. I also want to give special thanks to Firoz Ahmed Mamin, Associate Professor & Coordinator, M. Sc. in Physiotherapy program, Mohammad Habibur Rahman, Former Associate professor of Physiotherapy. Md. Ehsanur Rahman, Assistant Professor of Physiotherapy , Md. Millat Hossain, Assistant professor of MRS, BHPI for giving their academic support and valuable opinion throughout the thesis period. I am also grateful to Dr. Dorine van Ravensberg. Human Movement Scientist, PhD, PT to help and guide me during questionnaire and treatment Protocol development. I would also like to express my gratitude to Md. Fazlul Karim Patwary, Associate Professor, Jahangir-nagar University who guided me throughout data management. My special thanks go to Mohammad Anwar Hossain, Associate Professor and Head of Physiotherapy department, CRP for giving me permission for data collection. Besides, I would like to appreciate Samena Akter Kakuli and Hosneara Parvin for their direct and indirect support during the thesis period. I am grateful to MD Amimul Ehsan, Mirpur center Manager for his helpful concern in data collection from Mirpur. I would also like to express my deepest respect to Mrs. Nushrat

Khanam to help me in the overall data collection procedure at CRP Mirpur. I also like to thank my thesis data collector for collecting and handed over raw data to me. I am obligated to all Physiotherapists of Pediatric Unit, CRP, Savar and Mirpur, the horse riding person Mintu bhai for their cordial support. I would also like to thank librarians and other staffs of BHPI library as they helped me to find out related books, journals and also access to internet. I am very much thankful to my participants and the mothers for their kind participation and patience. I am also thanking CRP Orthotics and Prosthetic Department for making the sitting base material which was used in the entire treatment session. Finally, I am very grateful to BHPI and CRP authority for the conveniences given to me since last 2 years.

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LIST OF ABBREVIATIONS OR SYMBOLS

BHPI	Bangladesh Health Professions Institute.
CRP	Centre for the Rehabilitation of the Paralysed
SPSS	Statistical Package for the Social Sciences
WHO	World Health Organization
BMRC	Bangladesh Medical Research Association
IBR	Institutional Review Board
BBS	Berg Balance Scale
PBS	Pediatric Balance Scale
GMFM	Gross Motor Function Measure

ABSTRACT

Background: Cerebral palsy is a non-progressive brain lesion causes neuromuscular and musculo-skeletal impairment where spasticity, poor balance, loss of selective motor controls, impairment in the motor functions is evident. Hippo therapy was known to be effective from literature as several scientific evidence has been established in favor of hippo therapy. This study was therefore aimed to evaluate the effectiveness of hippo therapy on Gross motor function and balance in the children with cerebral palsy in the local context. **Methodology:** A clinical trial was conducted with 30 participants randomly assigned and divided into trial (n=15) and control (n=15). Both groups were treated by 2 weeks of conventional physiotherapy where the trial group had additional 8 sessions, 30 minutes of hippo therapy. GMFM and PBS were used to determine the outcome and the pretest and posttest scoring were analyzed using parametric test- paired and independent sample t test. **Result:** The result showed (GMFS-88) in Dimensions A, B, D, E both the hippo therapy and conventional physiotherapy had statistical significant effectiveness ($p < .05$) but only in dimension A and B the hippo therapy with conventional therapy was more effective than conventional physiotherapy. In PBS among 14 variables 10 variables had significant ($p < .05$) improvement both in trial and control group. But in 5 variables - Sit to stand. Stand to sit, Transfer, Standing unsupported and sitting unsupported, hippo therapy combined with conventional physiotherapy had a superior effect. **Conclusion:** Hippo therapy is combined with conventional therapy is effective in most of the parameters of Gross motor function and Balance in the children with cerebral palsy.

Key words: Hippo therapy, Conventional Physiotherapy, Gross Motor function, Balance.

APPENDIX

Appendix-1- Department Head Permission Letter

Date: 1.11.18

Head

Department of Physiotherapy

Centre for the Rehabilitation of the Paralysed (CRP).

Chapain, Savar, Dhaka -1343.

Through: Coordinator, M. Sc in Physiotherapy, BHPI, and CRP.

Subject: Application for the permission of data collection for the Thesis (Part II), M.Sc in Physiotherapy program.

Dear Sir,

Respectfully state that I am Asma Islam, a student of M. Sc in physiotherapy Part-II, 4th batch at Bangladesh Health Professions Institute (BHPI). As per the requirement of the Thesis I would like to collect data form Pediatric Department of CRP-Savar and CRP-Mirpur. The study titled "Effectiveness of Hippo therapy on Gross motor skill and Balance in the Children with cerebral palsy". I need your cordial cooperation regarding data collection for next 4 to 6 months and qualified assessor support from your department (Savar and Mirpur). I would also like to request you to support me with the responsible therapist and other professionals of the Hippo therapy to complete the intervention/experiment sessions.

I therefore hope that you would be kind enough to provide me the necessary supports so that this piece of innovation can accelerate the valuable, exceptional service of CRP.

Sincerely yours



Asma Islam

Student of M. Sc in Physiotherapy Program. (4th Batch). Part-II

Bangladesh Health Professions Institute (BHPI). Savar, Dhaka -1343.

Session – 2017-2018.

Approved
1/11/18

Appendix 2-IRB Approval

Date: 8, 11, 18

To
The Chairman,
Institute Review Board (IRB)
Bangladesh Health Profession Institute (BHPI)
CRP, Chapain, Savar, Dhaka-1343, Bangladesh

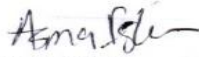
Subject: Application for review and ethical approval of thesis.

Dear Sir,

With due respect, I am Asma Islam, student of Part II, M.Sc in Physiotherapy Program at the Bangladesh Health profession institute (BHPI) under the faculty of medicine, University of Dhaka. As per the course curriculum, I have to conduct a thesis entitled "Effectiveness of Hippo Therapy on Gross motor function and Balance in the Children with Cerebral Palsy." under my honorable supervisor Associate Prof. Mohammad Anwar Hossain. The aim of the study is to find out the effectiveness of the hippo therapy combined with conventional therapy on gross motor function and balance in the children with cerebral palsy. The study will accommodate the participants from CRP Savar (pediatric unit) Total 30-40 patients will be evaluated (2 groups). It is going to be Quasi-Experimental design where participant will get hippotherapy 3-4 days per week, 15-20 minutes for 2 weeks. The participant will be evaluated by two observational tool respectively Pediatric Balance scale (PBS) and gross motor function measure (GMFM). A written consent will be taken prior to the experiment. The confidentiality will be maintain and they can withdraw themselves any time according to their wish. The trained horse riding professionals will be involved and the safety of the children will be ensured. The participant will not be deprived from the usual therapy service. 2 qualified therapists from each area will be assigned for data collection. Hopefully the study will be able to explore a specific hippo therapy treatment protocol/guideline and scientific evidence for this excellent service of CRP so that the patient in near future will be benefited.

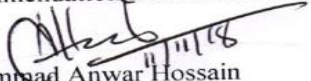
Therefore, I look forward to have your kind approval for the thesis proposal and to start data collection. I can also assure you that I will maintain all the requirements for study.

Sincerely yours,



Asma Islam
Part-II, Roll no-04
Student of M.Sc in Physiotherapy (MPT), 4th batch, session: 2017-18
BHPI, CRP, Savar, Dhaka-1343, Bangladesh.

Recommendation from the thesis supervisor



Mohammad Anwar Hossain
Associate Professor of Physiotherapy & Head of Physiotherapy Department.
Bangladesh Health Professions Institute (BHPI). CRP.

Attachment: Thesis Proposal, Questionnaire & consent.



বাংলাদেশ হেল্থ প্রফেশন্স ইনস্টিটিউট (বিএইচপিআই)
Bangladesh Health Professions Institute (BHPI)
(The Academic Institute of CRP)

Ref.

CRP-BHPI/IRB/11/18/1269

Date: 11/11/2018

To,
Asma Islam
M.Sc. in Physiotherapy (MPT)
Session: 2017-2018, Student ID 111170044
BHPI, CRP-Savar, Dhaka-1343, Bangladesh

Subject: Approval of thesis proposal "Effectiveness of Hippo Therapy on Gross motor function and Balance in the Children with Cerebral Palsy" by ethics committee.

Dear Asma Islam,
Congratulations,

The Institutional Review Board (IRB) of BHPI has reviewed and discussed your application to conduct the above mentioned thesis, with yourself, as the Principal Investigator" The Following documents have been reviewed and approved:

S.N.	Name of Documents
1.	Thesis Proposal
2.	Questionnaire (English version)
3.	Information sheet & consent form.

Since the study involves use of **Pediatric balance scale (PBS)**, **Gross Motor Function measure (GMFM)** to explore the gross motor function and balance status of Cerebral palsy patients that may take 20 to 25 minutes to answer and fill in the questionnaire by assessors. Since, there is no likelihood of any harm to the participants; the members of the Ethics committee have approved the study to be conducted in the presented form at the meeting held at 08.30 AM on 25th September, 2018 at BHPI.

The institutional Ethics committee expects to be informed about the progress of the study, any changes occurring in the course of the study, any revision in the protocol and patient information or informed consent and ask to be provided a copy of the final report. This Ethics committee is working accordance to Nuremberg Code 1947, World Medical Association Declaration of Helsinki, 1964 - 2013 and other applicable regulation.

Best regards,

Muhammad Millat Hossain
Assistant Professor, Dept. of Rehabilitation Science
Member Secretary, Institutional Review Board (IRB)
BHPI, CRP, Savar, Dhaka-1343, Bangladesh

সিআরপি-চাপাইন, সাভার, ঢাকা-১৩৪৩, বাংলাদেশ, ফোন : ৭৭৪৫৪৬৪-৫, ৭৭৪১৪০৪ ফ্যাক্স : ৭৭৪৫০৬৯

CRP-Chapain, Savar, Dhaka-1343, Tel : 7745464-5, 7741404, Fax : 7745069, E-mail : contact@crp-bangladesh.org, www.crp-bangladesh.org

Appendix 3-Informed Consent (English and Bangla)

Consent Form (English version)

Assalamualaikum, I am Asma Islam, Student of M.Sc. in Physiotherapy, Part II , Bangladesh Health Professions Institute (BHPI) which is the Academic Institute of CRP under the Faculty of Medicine, University of Dhaka. As a Part of my study I have to conduct this research. The participants are requested to participate in the study after reading the entire paper.

Through this study I will find the effectiveness of physiotherapy on balance and gross motor function such as sitting, standing, transferring, and some other important activities in the children with cerebral palsy.

If I can complete this study successfully, patients may get benefits from this intervention and eventually it might create evidence based treatment in this regard. So to proceed further, I need to collect data. Therefore, your child can be a respected participant of this research.

The assigned assessor will assess your child twice (before and after 3 sessions). The therapy will be safe for your child. The therapy will be pain free, harmless. I would also like to inform you that this is a purely academic study and will not be used for any other purposes. I assure that all data will be kept confidential. You have all the rights to withdraw the consent and discontinue your participation at any time of the experiment. If you have any query about the study or right as a participant, you may contact with researcher Asma Islam, MPT student, 4th batch, Dept. of Physiotherapy. BHPI, CPR, Savar, Dhaka- 1343.

Do you have any questions before I start?

 Yes No

So, may I have your consent to proceed with the interview? Yes /No

Signature of mother and date (on behalf of the child)

Signature of the Data collector and Date

সম্মতি পত্র (বাংলা সংস্করণ)

আস সালামু ওয়ালাইকুম, আমি আসমা ইসলাম, আমি ঢাকা বিশ্ববিদ্যালয়ের চিকিৎসা অনুষদের অন্তর্ভুক্ত সিআরপিএর একাডেমিক প্রতিষ্ঠান বাংলাদেশ হেলথ প্রফেশন ইন্সটিটিউট (বিএইচপিআই) এর এম.এস.সি ইন ফিজিওথেরাপি পাট II এ অধ্যয়নরত একজন শিক্ষার্থী। আমার কোর্সের অংশ হিসেবে এই গবেষণাটি পরিচালনা করতে হবে। অংশগ্রহণকারীদেরকে সম্পূর্ণ পাতাটি পড়ে তারপর অংশ নিতে অনুরোধ করা হচ্ছে।

এই গবেষণার মাধ্যমে আমি সেরেব্রাল পালসি তে আক্রান্ত বাচ্চাদের ভারসাম্যরক্ষা এবং গ্রস মোটর পারদর্শিতার ক্ষেত্রে ফিজিওথেরাপির কার্যকারিতা যেমন বসা, দাঁড়ানো, স্থানান্তর করন এবং আরোও কিছু গুরুত্বপূর্ণ কর্মকাণ্ডের কার্যকারিতা বের করার চেষ্টা করবো। যদি আমি গবেষণাটি সাফল্যের সাথে সম্পাদনা করতে পারি তাহলে রোগীরা এথেকে উপকৃত হবে এবং এটা এই চিকিৎসার ক্ষেত্রে একটি সঠিক পদ্ধতি হিসেবে বিবেচিত হবে। তাই এজন্য আমাকে কিছু তথ্য অনুসন্ধান করতে হবে। আপনার বাচ্চা এই গবেষণা কার্যক্রমে একজন সম্মানিত অংশগ্রহণকারী হিসেবে বিবেচিত হবে।

একজন নির্ধারিত পরীক্ষক আপনার বাচ্চাকে দুইবার পরিক্ষণ করবে (চিকিৎসার আগে এবং চিকিৎসার পরে)। এই থেরাপি ব্যথা মুক্ত এবং নিরাপদ। আমি আপনাকে আশ্বস্ত করছি এই গবেষণাটি সম্পূর্ণরূপে শিক্ষণীয় কার্যক্রমে ব্যবহার করা হবে এবং এটা আর অন্য কোন কাজে ব্যবহার করা হবে। আমি আপনাকে আরোও আশ্বস্ত করছি আপনার দেয়া তথ্য গোপন রাখা হবে। এই গবেষণা কার্যক্রম থেকে আমি যেকোন মুহুর্তে আপনার নাম প্রত্যাহার করতে পারবন। আপনার যদি এই বিষয়ে অধিকতর তথ্য জানার প্রয়োজন পরে তাহলে আপনি যোগাযোগ করতে পারেন গবেষক আসমা ইসলাম, এমপিটি শিক্ষার্থী, ৪র্থ ব্যাচ, ফিজিওথেরাপি বিভাগ, বিএইচপিআই, সিআরপি, সাতার, ঢাকা- ১৩৪৩।

Mob: 01866833866

গুরু করার পূর্বে আপনার কি কোন প্রশ্ন রয়েছে ?

 হ্যাঁ না

Appendix 4 Questionnaire (English and Bangla)

Questionnaire

Title: Effectiveness of Hippo Therapy on Gross Motor Function and Balance in the Children with Cerebral Palsy.

Section A: (Basic Information and Socio-Demographic Data)

Patient Code:	Date of Assessment:
Age (in months):	Evaluator's Name:
Height (cm):	Weight (KG):
Sex: Male/Female	Functional level: (GMFCS): II, III, IV
Type of CP:	Parent Occupation (father and mother):
Parent monthly income:	Birth history (cause of brain damage):
Parent educational status (Father and mother):	
Delivery at:	Delivery mode:
Area of home: Urban /Rural/Semi urban	
Family type (joint/Nuclear) and size (mention the number of members):	
Social status: Upper class /middle /lower	
Any other Disabled child? : Any Hippo therapy before? Yes/No	
Is it the 1st time admission at CRP? Yes /No	

Section B (Classification guideline)

GMFCS – E & R- Gross Motor Function Classification System Expanded and Revised

Is the child between 2th and 4th birthday? please indicate his level of functioning on the scale below.

LEVEL I: Children floor sit with both hands free to manipulate objects. Movements in and out of floor sitting and standing are performed without adult assistance. Children walk as the preferred method of mobility without the need for any assistive mobility device.

LEVEL II: Children floor sit but may have difficulty with balance when both hands are free to manipulate objects. Movements in and out of sitting are performed without adult assistance. Children pull to stand on a stable surface. Children crawl on hands and knees with a reciprocal pattern, cruise holding onto furniture and walk using an assistive mobility device as preferred methods of mobility.

LEVEL III: Children maintain floor sitting often by "W-sitting" (sitting between flexed and internally rotated hips and knees) and may require adult assistance to assume sitting. Children creep on their stomach or crawl on hands and knees (often without reciprocal leg movements) as their primary methods of self-mobility. Children may pull to stand on a stable surface and cruise short distances. Children may walk short distances indoors using a hand-held mobility device (walker) and adult assistance for steering and turning.

LEVEL IV: Children floor sit when placed, but are unable to maintain alignment and balance without use of their hands for support. Children frequently require adaptive equipment for sitting and standing. Self-mobility for short distances (within a room) is achieved through rolling, creeping on stomach, or crawling on hands and knees without reciprocal leg movement.

LEVEL V: Physical impairments restrict voluntary control of movement and the ability to maintain antigravity head and trunk postures. All areas of motor function are limited. Functional limitations in sitting and standing are not fully compensated for through the use of adaptive equipment and assistive technology. At Level V, children have no means of independent movement and are transported. Some children achieve self-mobility using a powered wheelchair with extensive adaptations.

Is the child between 4th and 6th birthday ? Please indicate his level of functioning on the below scale

LEVEL I: Children get into and out of, and sit in, a chair without the need for hand support. Children move from the floor and from chair sitting to standing without the need for objects for support. Children walk indoors and outdoors, and climb stairs. Emerging ability to run and jump.

LEVEL II: Children sit in a chair with both hands free to manipulate objects. Children move from the floor to standing and from chair sitting to standing but often require a stable surface to push or pull up on with their arms. Children walk without the need for a handheld mobility device indoors and for short distances on level surfaces outdoors. Children climb stairs holding onto a railing but are unable to run or jump.

LEVEL III: Children sit on a regular chair but may require pelvic or trunk support to maximize hand function. Children move in and out of chair sitting using a stable surface to push on or pull up with their arms. Children walk with a hand-held mobility device on level surfaces and climb stairs with assistance from an adult. Children frequently are transported when traveling for long distances or outdoors on uneven terrain.

LEVEL IV: Children sit on a chair but need adaptive seating for trunk control and to maximize hand function. Children move in and out of chair sitting with assistance from an adult or a stable surface to push or pull up on with their arms. Children may at best walk short distances with a walker and adult supervision but have difficulty turning and maintaining balance on uneven surfaces. Children are transported in the community. Children may achieve self-mobility using a powered wheelchair.

LEVEL V: Physical impairments restrict voluntary control of movement and the ability to maintain antigravity head and trunk postures. All areas of motor function are limited. Functional limitations in sitting and standing are not fully compensated for through the use of adaptive equipment and assistive technology. At Level V, children have no means of independent movement and are transported. Some children achieve self-mobility using a powered wheelchair with extensive adaptations

Section C

GROSS MOTOR FUNCTION MEASURE (GMFM) SCORE SHEET (GMFM-88)

SCORING KEY

0 = does not initiate; 1 = initiates; 2 = partially completes; 3 = completes.

Dimension A (LYING & ROLLING)

Item no	Function	Score (Before treatment)	Score (After treatment)
1	SUP: Head in midline: turns head with extremities symmetrical.		
2	SUP: Brings hands to midline, fingers one with the other.		
3	SUP: Lifts head 45°		
4	SUP: Flexes R hip & knee through full range.		
5	SUP: Flexes L hip & knee through full range.		
6	SUP: Reaches out with R arm, hand crosses midline toward toy.		
7	SUP: Reaches out with L arm; hand crosses midline toward toy.		
8	SUP: Rolls to PR over R side.		
9	SUP: Rolls to PR over L side.		
10	PR: Lifts head upright.		
11	PR on forearms: Lifts head upright, elbows ext., chest raised.		
12	PR on forearms: Weight on R forearm, fully extends opposite arm forward.		

13	PR on forearms: Weight on L forearm, fully extends opposite arm forward.		
14	PR: Rolls to SUP over R side.		
15	PR: Rolls to SUP over L side.		
16	PR: Pivots to R 90° using extremities.		
17	PR: Pivots to L 90° using extremities.		
	Maximum score (17*3=51)		

SUP-Supine, PR-Prone, R-Right side, L-Left side

Dimension B (SITTING)

Item no	Function	Score (Before treatment)	Score (After treatment)
18	SUP, hands grasped by examiner: pulls self to sitting with head control.		
19	SUP: Rolls to R side, attains sitting.		
20	SUP: Rolls to L side, attains sitting.		
21	Sit on mat, supported at thorax by therapist: lifts head upright, maintains 3 seconds.		
22	Sit on mat, supported at thorax by therapist: lifts head midline, maintains 10 seconds.		
23	Sit on mat, arm(s) propping: maintains, 5 seconds.		
24	Sit on mat: maintain, arms free, 3 seconds.		
25	Sit on mat, with small toy in front: leans forward, touches toy, re-erects without arm propping.		
26	Sit on mat: Touches toy placed 45° behind child's R side, returns to start.		

27	Sit on mat: Touches toy placed 45° behind child's L side, returns to start.		
28	R side sit: Maintains, arms free, 5 seconds.		
29	L side sit: Maintains, arms free, 5 seconds.		
30	Sit on mat: Lowers to PR with control.		
31	Sit on mat with feet in front: Attains 4 point over R side.		
32	Sit on mat with feet in front: Attains 4 point over L side.		
33	Sit on mat: Pivots 90°, without arms assisting.		
34	Sit on bench: Maintains, arms and feet free, 10 seconds.		
35	STD: attains sit on small bench.		
36	On the floor: attains sit on small bench.		
37	On the floor: attains sit on large bench.		
	Max score 20 * 3=60		

SUP-Supine, STD-Standing

Dimension D (STANDING)

Item no	Function	Score (Before treatment)	Score (After treatment)
52	On the floor: Pulls to STD at large bench.		
53	STD: Maintains, arms free, 3 seconds.		
54	STD: Holding on to large bench with one hand, lifts R foot, 3 seconds.		
55	STD: Holding on to large bench with one hand,		

	lifts L foot, 3 seconds.		
56	STD: Maintains, arms free, 20 seconds.		
57	STD: Lifts L foot, arms free, 10 seconds.		
58	STD: Lifts R foot, arms free, 10 seconds.		
59	Sit on small bench: Attains STD without using arms.		
60	High KN: Attains STD through half KN on R knee, without using arms.		
61	High KN: Attains STD through half KN on L knee, without using arms.		
62	STD: Lowers to sit on floor with control, arms free.		
63	STD: Attains squat, arms free.		
64	STD: Picks up object from floor, arms free, returns to stand.		
	Max score (13*3=39)		

Dimension E (WALKING, RUNNING & JUMPING)

Item no	Function	Score (Before treatment)	Score (After treatment)
65	STD, 2 hands on large bench: cruises 5 steps to R.		
66	STD, 2 hands on large bench: cruises 5 steps to L.		
67	STD, 2 hands held: walks forward 10 steps.		
68	STD, 1 hand held: walks forward 10 steps.		
69	STD: Walks forward 10 steps.		

70	STD: Walks forward 10 steps, stops, turns 180 returns.		
71	STD: Walks backward 10 steps.		
72	STD: Walks forward 10 steps, carrying a large object with 2 hands.		
73	STD: Walks forward 10 consecutive steps between parallel lines 20cm (8") apart.		
74	STD: Walks forward 10 consecutive steps on a straight line 2cm (3/4") wide.		
75	STD: Steps over stick at knee level, R foot leading.		
76	STD: Steps over stick at knee level, L foot leading.		
77	STD: Runs 4.5m (15'), stops & returns..		
78	STD: Kicks ball with R foot.		
79	STD: Kicks ball with L foot.		
80	STD: Jumps 30cm (12") high, both feet simultaneously.		
81	STD: Jumps forward 30 cm (12"), both feet simultaneously.		
82	STD on R foot: Hops on R foot 10 times within a 60cm (24") circle.		
83	STD on L foot: Hops on L foot 10 times within a 60cm (24") circle.		
84	STD, holding 1 rail: walks up 4 steps, holding 1 rail, alternating feet.		
85	STD, holding 1 rail: walks down 4 steps, holding 1 rail, alternating feet.		
86	STD: Walks up 4 steps, alternating feet.		

87	STD: Walks down 4 steps, alternating feet.		
88	STD on 15cm (6") step: Jumps off, both feet simultaneously.		
	Max score (24*3=72)		

STD- Standing

Section D

Pediatric Balance Scale (PBS)

Name of patient:

Area of examination	Pretest score	Post test score
<p><u>1. Sitting to standing</u></p> <p>“Hold your arms up and stand up.”</p> <p>4- Able to stand without using hands and stabilize independently.</p> <p>3- Able to stand independently using hands.</p> <p>2- Able to stand using hands after several tries.</p> <p>1-Needs minimal assist to stand or to stabilize.</p> <p>0-Needs moderate or maximal assist to stand.</p>		
<p><u>2. Standing to sitting</u></p> <p>“Sit down slowly without using your hands.”</p> <p>4-Sits safely with minimal use of hands.</p> <p>3- Controls descent by using hands.</p> <p>2-Uses back of legs against chair to control descent.</p> <p>1-Sits independently, but has uncontrolled decent.</p> <p>0-Needs assistance top sit.</p>		

<p><u>3. Transfers</u></p> <p>4-Able to transfer safely with minor use of hands.</p> <p>3-Able to transfer safely; definite need of hands.</p> <p>2-Able to transfer with verbal cuing and /or supervision (spotting).</p> <p>1-Needs one person to assist.</p> <p>0-Needs 2 person to assist or supervise (close guard) to be safe.</p>		
<p><u>4. Standing unsupported</u></p> <p>4-Able to stand safely 30 seconds.</p> <p>3-Able to stand 30 seconds with supervision (spotting).</p> <p>2-Able to stand 15 seconds unsupported.</p> <p>1-Needs several tries to stand 10 second unsupported.</p> <p>0-Unable to stands 10 seconds unassisted.</p>		
<p><u>5. Sitting unsupported</u></p> <p>“Sit with your arms folded on your chest for 30 seconds.”</p> <p>4-Able to sit safely and securely 30 seconds.</p> <p>3-Able to sit 30 seconds under supervision (spotting)or may require definite use of upper extremities to maintain sitting position.</p>		

<p>2-Able to sit 15 seconds.</p> <p>1-Able to sit 10 seconds without support.</p> <p>0-Unable to sit 10 seconds without support.</p>		
<p><u>6. Standing with eyes closed</u></p> <p>“When I say close your eyes, I want you to stand still, close your eyes, and keep them closed until I say open.”</p> <p>4-Able to stand 10 seconds safely.</p> <p>3-Able to stand 10 seconds with supervision (spotting).</p> <p>2-Able to stand 3 seconds.</p> <p>1-Unable to keep eyes closed 3 seconds but stays steady.</p> <p>0-Needs help to keep from falling.</p>		
<p><u>7. Standing with feet together</u></p> <p>4-Able to place feet together independently and stand 30 seconds safely.</p> <p>3-Able to place feet together independently and stand for 30 seconds with supervision (spotting).</p> <p>2-Able to place feet together independently but unable to hold for 30 seconds.</p> <p>1-Needs help to attain position but able to stand 30 seconds with feet together.</p> <p>0-Needs help to attain position and/or unable to hold for 30 seconds.</p>		

<p><u>8. Standing with one foot in front</u></p> <p>4- Able to place feet tandem independently and hold 30seconds ;</p> <p>3-Able to place foot ahead of other independently and hold 30 seconds.</p> <p>2-Able to take small step independently and hold 30 seconds, or required assistance to place foot in front, but can stand for 30 seconds.</p> <p>1- Needs help to step, but can hold 15 seconds.</p> <p>0-Loses balance while stepping or standing.</p>		
<p><u>9. Standing on one foot.</u></p> <p>4- Able to lift leg independently and hold 10 seconds.</p> <p>3-Able to lift leg independently and hold 5-9 seconds.</p> <p>2- Able to lift leg independently and hold 3-4 seconds.</p> <p>1-Tries to lift leg; unable to hold 3 seconds but remains standing.</p> <p>0-Unable to try or needs assist to prevent fall.</p>		
<p><u>10. Turning 360 degrees.</u></p> <p>"Turn completely around in a full circle, STOP, and then turn a full circle in the other direction."</p> <p>4- Able to turn 360 degrees safely in 4 seconds or less each way.</p> <p>3-Able to turn 360 degrees safely in one direction only in 4</p>		

<p>seconds or less.</p> <p>2-Able to turn 360 degrees safely but slowly.</p> <p>1- Needs close supervision (spotting) or constants verbal cuing.</p> <p>0-Needs assistance while turning.</p>		
<p><u>11. Turning to look behind.</u></p> <p>"Follow this object as I move it. Keep watching it as I move it, but don't move your feet."</p> <p>4-Looks behind /over each shoulder; weight shifts include trunk rotation.</p> <p>3-Looks behind/over one shoulder with trunk rotation.</p> <p>2-Turns head to look to level of shoulders, no trunk rotation.</p> <p>1-Needs supervision (spotting) when turning; the chin moves greater than half the distance to the shoulder.</p> <p>0-Needs assistance to keep from losing balance or falling; movement of the chin is less than half the distance to the shoulder.</p>		
<p><u>12. Retrieving object from floor.</u></p> <p>4-Able to pick up chalk board eraser safely and easily.</p> <p>3-Able to pick up eraser but needs supervision(spotting)</p> <p>2-Unable to pick up eraser but reaches 1-2 inches from eraser and keeps balance independently.</p> <p>1-Unable to pick up eraser, needs spotting while attempting.</p> <p>0-Unable to try needs assist to keep from losing balance or</p>		

<p>falling.</p>		
<p><u>13. Placing alternate foot on stool.</u></p> <p>4-Stands independently and safely and completes 8 steps in 20 seconds.</p> <p>3-Able to stand independently and complete 8 steps less than 20 seconds.</p> <p>2-Able to complete 4 step without assistance, but requires close supervision (spotting).</p> <p>1- Able to complete 2 steps; needs minimal assistance.</p> <p>0-Needs assistance to maintain balance or keep from falling, unable to try.</p>		
<p><u>14. Reaching forward with outstretched arm.</u></p> <p>“Stretch out your fingers, make a fist, and reach forward as far as you can without moving your feet.”</p> <p>4-Reaches forward confidently more than 10 inches.</p> <p>3-Reaches forward more than 5 inches, safely.</p> <p>2-Reaches forward more than 2 inches safely.</p> <p>1-Reaches forward but needs supervision (spotting).</p> <p>0-Loses balance while trying, requires external support.</p>		

Max score 56		

Signature and date of Data collector:

Thank you!!

প্রশ্নাবলী

শিরোনামঃ সেরেব্রাল পালসি আক্রান্ত শিশুদের গ্রস মোটর ফাংশন সংক্রান্ত কার্যাবলী ও ভারসাম্যের উপর হিপ্লোথেরাপি প্রয়োগের কার্যকারিতা।

অধ্যায় কঃ (মৌলিক তথ্য এবং সামাজিক-জনসংখ্যা বিষয়ক উপাত্ত)

রোগীর কোডঃ	মূল্যায়নের তারিখঃ
বয়স (মাসের ভিত্তিতে): মূল্যায়নকারীর নামঃ	
উচ্চতা (সেমি):	ওজন (কেজি):
লিঙ্গঃ ছেলে/ মেয়ে	কার্যকরী স্তর(GMFCS): II, III, IV
সেরেব্রাল পালসির ধরণঃ	পিতামাতার পেশা(বাবা এবং মা):
পিতামাতার মাসিক আয়ঃ	জন্ম ইতিহাস (মস্তিষ্কে ক্ষয়ের কারণ):
পিতামাতার শিক্ষাগত অবস্থা (বাবা এবং মা):	
প্রসবের স্থানঃ	প্রসবের ধরণঃ
বাড়ির এলাকাঃ শহর/ গ্রাম/ উপশহর	
পরিবারের ধরণ (যৌথ/ ছোট) এবং আকার (সদস্য সংখ্যা উল্লেখ করুন)	
সামাজিক অবস্থানঃ উচ্চবিত্ত/ মধ্যবিত্ত/ নিম্নবিত্ত	
অন্য অ্যারো প্রতিবন্ধী শিশু?:	আগে কখনো হিপ্লোথেরাপি নিয়েছেনঃ হ্যাঁ/ না
এবারই কি প্রথম বারের মত সিআরপিতে ভর্তি হলেন? হ্যাঁ/ না	

অধ্যায় খ (শ্রেণীবিভাগ নির্দেশিকা)

GMFCS – E & R-পুরো প্রেরণাদান সংক্রান্ত কার্যাবলীর শ্রেণীবিভাগ পদ্ধতি সম্প্রসারিত এবং সংশোধিত

বাচ্চাটি কি তার ২য় এবং ৪র্থ জন্মদিনের মাঝামাঝি? দয়াকরে নিচের পরিমাপক স্কেলের দ্বারা তার কার্যকারিতার স্তর নির্দেশ করুন।

স্তর I: বাচ্চা মেঝেতে বসবে এবং সাথে দুই হাত কোন বস্তু ধরার জন্য উন্মুক্ত থাকবে। মেঝেতে বসা এবং দাঁড়ানো অবস্থায় সব নড়াচড়া করবে কোন প্রাপ্তবয়স্কের সাহায্য ছাড়া। বাচ্চা হাঁটবে পছন্দের হাঁটার পদ্ধতি অনুযায়ী কোনোরূপ হাঁটার সাহায্যকারী যন্ত্রের সাহায্য ছাড়া।

স্তর II: বাচ্চা মেঝেতে বসবে কিন্তু ভারসাম্য বজায় রাখতে সমস্যা হবে যখন দুই হাত কোন বস্তু ধরার জন্য উন্মুক্ত থাকবে। মেঝেতে বসা অবস্থায় সব নড়াচড়া করবে কোন প্রাপ্তবয়স্কের সাহায্য ছাড়া। বাচ্চা একটি স্থিতিশীল পৃষ্ঠে দাঁড়ানোর জন্যে টানবে। বাচ্চা একটি পরিবর্তিত নমুনায় হাত ও হাঁটুর সাহায্যে হামাগুড়ি দিবে, আসবাবপত্রে ধরে দাঁড়াবে এবং বাচ্চা হাঁটার সাহায্যকারী যন্ত্রের সাহায্যে হাঁটবে পছন্দের হাঁটার পদ্ধতি অনুযায়ী।

স্তর III: বাচ্চা প্রায়ই "W" আকার নিয়ে মেঝেতে বসবে (কোমড় এবং হাঁটু ভিতরের দিকে ভাঁজ করে বসা) এবং বসার ক্ষেত্রে প্রাপ্ত বয়স্কের সাহায্যের প্রয়োজন হবে। বাচ্চা তাদের পাকস্থলীর উপর ভর করে হামাগুড়ি দিবে অথবা হাত এবং হাঁটুর সাহায্যে হামাগুড়ি দিয়ে চলবে (প্রায়শই পায়ের পরস্পর বিপরীত নড়াচড়া হবে) তাদের স্ব-গতিশীলতার প্রাথমিক পদ্ধতি হিসাবে। বাচ্চা একটি স্থিতিশীল পৃষ্ঠে দাঁড়ানোর জন্যে টানতে পারে এবং শক্ত করে ধরে কিছুদূর যাবে। বাচ্চা বাসার ভিতর স্বল্প দূরত্বে হাঁটার জন্য হাতে ধরা যায় এমন চলাচলের যন্ত্র (ওয়াকার) এবং প্রাপ্ত বয়স্কের সাহায্য নিবে ঘোরা এবং বাক নেয়ার জন্য।

স্তর IV: বাচ্চাকে মেঝেতে রাখলে বসবে কিন্তু অবস্থান এবং ভারসাম্য ধরে রাখতে পারবে না তাদের হাতের সাহায্য ছাড়া। বাচ্চার বসা এবং দাঁড়ানোর জন্য বারবার অভিযোজন সহায়ক সরঞ্জামের প্রয়োজন হবে। স্বল্প দূরত্বে স্ব-গতিশীলতা অর্জনে (একটি রুমের ভিতর) গড়ানো, পাকস্থলীর উপর ভর করে হামাগুড়ি অথবা হাত এবং হাঁটুর সাহায্যে হামাগুড়ি দিবে পায়ের পরস্পর বিপরীত নড়াচড়া ছাড়া।

স্তর V: শারীরিক দুর্বলতা স্বাভাবিক নড়াচড়ার নিয়ন্ত্রণ এবং অভিকর্ষের বিপরীতে মাথা এবং দেহের অবস্থান ধরে রাখার ক্ষেত্রে বাধাপ্রদান করে। সব জায়গার প্রেরণাদান সংক্রান্ত কার্যাবলী সীমাবদ্ধ হয়ে পড়ে। বসা এবং দাঁড়ানোর ক্ষেত্রে কার্যকরী সীমাবদ্ধতার পুরোপুরি ক্ষতিপূরণ অভিযোজন সহায়ক সরঞ্জাম এবং সাহায্যকারী প্রযুক্তির দ্বারা করা যায় না। স্তর V এ, বাচ্চার কোন ধরণের নিজস্ব নড়াচড়া থাকবে না এবং পরিবহণ নির্ভরশীল হবে। কিছু বাচ্চা স্ব-গতিশীলতা অর্জন করবে বৈদ্যতিক হুইলচেয়ারে ব্যাপক অভিযোজনের মাধ্যমে।

বাচ্চাটি কি তার ৪র্থ এবং ৬ষ্ঠ জন্মদিনের মাঝামাঝি ? দয়াকরে নিচের পরিমাপক স্কেলের দ্বারা তার কার্যকারিতার স্তর নির্দেশ করুন।

স্তর I: বাচ্চাভিতরে এবং বাইরে যেতে পারবে এবং চেয়ারে বসতে পারবে হাতের কোন রূপ সাহায্য ছাড়া। বাচ্চা মেঝে এবং চেয়ারে বসা থেকে দাঁড়াতে পারবে কোন জিনিসের সাহায্য ছাড়া। বাচ্চা বাইরে এবং ভিতরে হাঁটবে এবং সিঁড়ি বেয়ে উঠবে। আস্তে আস্তে দৌড়ানো এবং লাফ দেয়ার সক্ষমতা অর্জন করবে।

স্তর II: বাচ্চা চেয়ারে বসবে সাথে দুইহাত কোন বস্তু ধরার জন্য উন্মুক্ত থাকবে। বাচ্চা মেঝে থেকে দাঁড়াবে এবং চেয়ারে বসা থেকে দাঁড়াবে কিন্তু প্রায়ই একটি স্থিতিশীল পৃষ্ঠের প্রয়োজন হবে যাতে সে তার হাত দিয়ে ধাক্কা বা টান দিতে পারে। বাচ্চা হাতে ধরা যায় এমন চলাচলের যন্ত্রের সাহায্য ছাড়া ভিতরে হাঁটবে এবং বাইরে অল্প দূরত্বে সমতল পৃষ্ঠে হাঁটবে। বাচ্চা সিঁড়ির রেলিং বেয়ে উঠতে পারবে কিন্তু দৌড়াতে বা লাফাতে পারবে না।

স্তর III: বাচ্চা সাধারণ চেয়ারে বসবে কিন্তু কোমড় অথবা দেহের সাহায্য লাগবে হাতের সর্বোচ্চ কার্যবলীর জন্য। বাচ্চাচেয়ারে বসা থেকে ভিতরে এবং বাইরে যেতে হাত দিয়ে ধাক্কা বা টান দিতে একটি স্থিতিশীল পৃষ্ঠ ব্যবহার করবে। বাচ্চা হাতে ধরা যায় চলাচলের যন্ত্রের সাহায্যে সমতল পৃষ্ঠে হাঁটবে এবং প্রাপ্তবয়স্কের সাহায্যে সিঁড়ি বেয়ে উঠতে পারবে এমনকি বাচ্চা অনেক দূরত্বে ঘুরতে বা বাইরে অসমতল জায়গায় গেলে সচরাচর পরিবহণ করতে হবে।

স্তর IV: বাচ্চা চেয়ারে বসবে কিন্তু দেহের নিয়ন্ত্রণ এবং হাতের সর্বাধিক কার্যকারিতার জন্য বসানো শিখাতে হবে। বাচ্চা চেয়ারে বসা থেকে ভিতরে এবং বাইরে যেতে পারবে প্রাপ্তবয়স্কের সাহায্যে অথবা একটি স্থিতিশীল পৃষ্ঠ ব্যবহার করবে হাত দিয়ে ধাক্কা বা টান দিতে। বাচ্চা স্বল্প দূরত্বে সবচেয়ে ভাল হাঁটতে পারবে ওয়াকার দিয়ে এবং প্রাপ্তবয়স্কের তত্ত্বাবধানে। কিন্তু সমস্যা বোধ করবে পাশে ঘুরতে এবং অসমতল পৃষ্ঠে ভারসাম্য বজায় রাখতে। বাচ্চা সমাজে পরিবহণ নির্ভরশীল হবে। বাচ্চা স্ব-গতিশীলতা অর্জন করবে বৈদ্যতিক হুইলচেয়ার ব্যবহারের মাধ্যমে।

স্তর V: শারীরিক দুর্বলতা স্বাভাবিক নড়াচড়ার নিয়ন্ত্রণে এবং অভিকর্ষের বিপরীতে মাথা এবং দেহের অবস্থান ধরে রাখার ক্ষেত্রে বাধাপ্রদান করে। সবজায়গার প্রেরণা দানসংক্রান্ত কার্যবলী সীমাবদ্ধ হয়ে পড়ে। বসা এবং দাঁড়ানোর ক্ষেত্রে কার্যকরী সীমাবদ্ধতা রপুয়োপূরি ক্ষতিপূরণ অভিযোজন সহায়ক সরঞ্জাম এবং সাহায্যকারী প্রযুক্তির দ্বারা করা যায় না। স্তর V এ, বাচ্চার কোন ধরনের নিজস্ব নড়াচড়া থাকবেনা এবং পরিবহণ নির্ভরশীল হবে। কিছু বাচ্চা স্ব-গতিশীলতা অর্জন করবে বৈদ্যতিক হুইল চেয়ারে ব্যাপক অভিযোজনের মাধ্যমে।

অধ্যায় গ

পুরো প্রেরণা দানসংক্রান্ত কার্যাবলী পরিমাপ (GMFM) স্কোরিং পাতা (GMFM-88)

স্কোরিং এর মৌলিক দিকঃ

০ = শুরু করে নি; ১ = শুরু করেছে; ২ = আংশিকভাবে সম্পন্ন; ৩ = পুরোপুরি সম্পন্ন

মাত্রা ক(A) (শোয়া এবং বিছানার একপাশ থেকে অন্য পাশে গড়ান)

আইটেম নং	কার্যক্রম	মান (চিকিৎসার আগে)	মান (চিকিৎসার পরে)
১	চিত হয়েঃ মাথা মাঝ বরাবরঃ মাথা দেহের সমান্তরালে ঘুরাবো		
২	চিত হয়েঃ হাতগুলো মাঝ বরাবর আনবে, আঙ্গুলগুলো একটার সাথে অপরগুলো থাকবে		
৩	চিত হয়েঃ মাথা ৪৫° তোলা		
৪	চিত হয়েঃ ডান পাশের কোমর এবং হাঁটু পুরোটা ভাঁজ করতে পারা		
৫	চিত হয়েঃ বাম পাশের কোমর এবং হাঁটু পুরোটা ভাঁজ করতে পারা		
৬	চিত হয়েঃ ডান হাত দিয়ে ধরতে পারা , হাত খেলনা বরাবর দেহের মাঝ রেখা অতিক্রম করবে		
৭	চিত হয়েঃ বাম হাত দিয়ে ধরতে পারা , হাত খেলনা বরাবর দেহের মাঝ রেখা অতিক্রম করবে		
৮	চিত হয়েঃ ডান পাশে ঘুরে কাত হওয়া		
৯	চিত হয়েঃ বাম পাশে ঘুরে কাত হওয়া		
১০	কাত হয়েঃ মাথা উপরের দিকে তোলা		
১১	বাহুর উপর কাত হওয়াঃ মাথা উপরের দিকে তোলা , কনুই সোজা, বুক উপরে উঠবে		

১২	বাহুর উপর কাত হওয়াঃ ডান হাতের উপর ভর থাকবে, অপর হাত সামনের দিকে সোজা থাকবে।		
১৩	বাহুর উপর কাত হওয়াঃ বাম হাতের উপর ভর থাকবে অপর হাত সামনের দিকে সোজা থাকবে।		
১৪	কাত হয়েঃ ডান পাশে ঘুরে চিত হওয়া।		
১৫	কাত হয়েঃ বাম পাশে ঘুরে চিত হওয়া।		
১৬	কাত হয়েঃ হাত ও পায়ের দ্বারা ডান পাশে ৯০°ঘুরা।		
১৭	কাত হয়েঃ হাত ও পায়ের দ্বারা বামপাশে ৯০°ঘুরা।		
	সর্বাধিক স্কোর(১৭ * ৩ = ৫১)		

মাত্রা খ (B) (বসা অবস্থায়)

আইটেম নং	কার্যক্রম	মান (চিকিৎসার আগে)	মান (চিকিৎসার পরে)
১৮	কাত হয়ে, পরীক্ষক হাত ধরে রাখবে, বসা থেকে মাথার নিয়ন্ত্রণ রেখে নিজে উঠবে।		
১৯	কাত হয়েঃ ডানপাশে ঘুরে কাতহওয়া, বসতে পারবে।		
২০	কাত হয়েঃ বামপাশে ঘুরে কাত হওয়া, বসতে পারবে।		
২১	মাদুরে বসতে পারা, পিঠে খেরাপিষ্ট ধরে থাকবেঃ মাথা উপরে তুলবে, ৩ সেকেন্ড ধরে রাখবে।		
২২	মাদুরে বসতে পারবে, পিঠে খেরাপিষ্ট ধরে থাকবেঃ মাথা মাঝ বরাবর তুলবে, ১ সেকেন্ড ধরে রাখবে।		
২৩	মাদুরে বসতে পারবে, হাতে ভর দিবেঃ ৫ সেকেন্ড ধরে রাখবে।		
২৪	মাদুরে বসবেঃ হাত ব্যবহার না করে ৩ সেকেন্ড থাকবে।		
২৫	মাদুরে বসবে, সামনে একটি ছোট খেলনা থাকবেঃ সামনে ঝুঁকবে, খেলনাটা ধরবে, আবার সোজা হবে হাতে ভর না দিয়ে।		

২৬	মাদুরে বসবেঃ বাচ্চা খেলনা ধরতে পারবে যেটা ডান পাশে ৪৫কোনে পিছনে থাকবে, পুনরায় আগের অবস্থায় ফিরে আসবে।		
২৭	মাদুরে বসবেঃ বাচ্চা খেলনা ধরতে পারবে যেটা বামপাশে ৪৫°কোনে পিছনে থাকবে, পুনরায় আগের অবস্থায় ফিরে আসবে।		
২৮	ডান দিকে ফিরে বসাঃ হাতে ভর না দিয়ে ৫ সেকেন্ড থাকবে।		
২৯	বাম দিকে ফিরে বসাঃ হাতে ভর না দিয়ে ৫ সেকেন্ড থাকবে।		
৩০	মাদুরে বসবেঃ শরীরের নিয়ন্ত্রণ রেখে প্রায় চিত হবো।		
৩১	মাদুরে পা সামনে রেখে বসবেঃ ডান পাশে ৪ পয়েন্ট অর্জন করবে।		
৩২	মাদুরে পা সামনে রেখে বসবেঃ বাম পাশে ৪ পয়েন্ট অর্জন করবে।		
৩৩	মাদুরে বসবেঃ হাতের সাহায্য ছাড়া ৯০° ঘুরতে পারবে।		
৩৪	বেঞ্চ বসবেঃ হাত এবং পা ব্যবহার না করে ১০ সেকেন্ড থাকবে।		
৩৫	দাঁড়ানো অবস্থায়ঃ ছোট বেঞ্চ বসার ক্ষমতা অর্জন করবে।		
৩৬	মেঝের উপরঃ ছোট বেঞ্চ বসার ক্ষমতা অর্জন করবে।		
৩৭	মেঝের উপরঃ বড় বেঞ্চ বসার ক্ষমতা অর্জন করবে।		
	সর্বাধিক স্কোর (২০ * ৩ = ৬০)		

মাত্রা ঘ (D) (দাঁড়ানো)

বিষয় নং	কাজ	স্কোর (চিকিৎসার পূর্বে)	স্কোর (চিকিৎসার পরে)
৫২	মেঝের উপর, দাঁড়ানো অবস্থায় বড় বেঞ্চ টানা		
৫৩	দাঁড়ানো, ৩ সেকেন্ড হাত ছেড়ে নিজেকে নিয়ন্ত্রণ করা		
৫৪	দাঁড়ানো, এক হাত দিয়ে বড় বেঞ্চকে ধরা, ডান পা উঠানো ৩ সেকেন্ড		
৫৫	দাঁড়ানো, এক হাত দিয়ে বড় বেঞ্চকে ধরা, বাম পা উঠানো ৩ সেকেন্ড		
৫৬	দাঁড়ানো, ২০ সেকেন্ড হাত ছেড়ে নিজেকে নিয়ন্ত্রণ করা		
৫৭	দাঁড়ানো, বাম পা উঠানো হাত ছেড়ে ১০ সেকেন্ড		
৫৮	দাঁড়ানো, ডান পা উঠানো হাত ছেড়ে ১০		

	সেকেন্ড		
৫৯	ছোট বেঞ্চের উপর বসা, হাতের সাহায্য ছাড়া দাঁড়ানো		
৬০	অর্ধবসাঃ হাতের সাহায্য ছাড়া অর্ধবসা থেকে ডান হাটুর উপর দাঁড়ানো		
৬১	অর্ধবসাঃ হাতের সাহায্য ছাড়া অর্ধবসা থেকে বাম হাটুর উপর দাঁড়ানো		
৬২	দাঁড়ানোঃ হাতের সাহায্য ছাড়া দাঁড়ানো থেকে মেঝের উপর বসা		
৬৩	দাঁড়ানোঃ হাতের সাহায্য ছাড়া উবু হওয়া		
৬৪	দাঁড়ানোঃ হাতের সাহায্য ছাড়া মেঝে থেকে কিছু উঠিয়ে আবার দাঁড়ানো		
সর্বোচ্চ স্কোর (১৩×৩=৩৯)			

মাত্রা ও E (হাঁটা, দৌড়ানো, লাফানো)

বিষয় নং	কাজ	স্কোর (চিকিৎসার পূর্বে)	স্কোর (চিকিৎসার পরে)
৬৫	দাঁড়ানো, ২ হাত বেঞ্চের উপর, ডান দিকে ৫ কদম আগানো		
৬৬	দাঁড়ানো, ২ হাত বেঞ্চের উপর, বাম দিকে ৫ কদম আগানো		
৬৭	দাঁড়ানো, ২ হাত ধরা, ১০ কদম সামনে হাঁটা		
৬৮	দাঁড়ানো, ১ হাত ধরা, ১০ কদম সামনে হাঁটা		
৬৯	দাঁড়ানো, ১০ কদম সামনে হাঁটা		
৭০	দাঁড়ানো, ১০ কদম সামনে হাঁটা, ১৮০° ঘুরা, ফিরে আসা		
৭১	দাঁড়ানো, ১০ কদম পিছনে হাঁটা		
৭২	দাঁড়ানো, ১০ কদম সামনে হাঁটা ২ হাতে বড় একটি বস্তু বহন করা।		
৭৩	দাঁড়ানো, সামনে পরপর ১০ কদম, সমান্তরাল লাইনের মাঝে থেকে ২০ সেগমি (৮-ইঞ্চি) দূরে সরানো		
৭৪	দাঁড়ানো, সামনে পরপর ১০ কদম, সোজা লাইনের উপর ২ সেগমি (৮-ইঞ্চি) প্রশস্ত		
৭৫	দাঁড়ানো, হাঁটু উচ্চতায় রেখে লাঠির উপর ধাপ, ডান পা শোয়ানো		
৭৬	দাঁড়ানো, হাঁটু উচ্চতায় রেখে লাঠির উপর ধাপ, বাম পা শোয়ানো		
৭৭	দাঁড়ানো, ৪।৫ মিটার (১৫ ফুট) দৌড়ানো, থামা এবং ফিরে আসা		

৭৮	দাঁড়ানো, ডান পা দিয়ে বল পদাঘাত করা।		
৭৯	দাঁড়ানো, বাম পা দিয়ে বল পদাঘাত করা।		
৮০	দাঁড়ানো, দুই পা একসঙ্গে করে ৩০ সেগমি (১২ইঞ্চি) উচ্চতায় লাফানো।		
৮১	দাঁড়ানো, দুই পা একসঙ্গে করে ৩০ সেগমি (১২ইঞ্চি) সামনে লাফানো।		
৮২	ডান পায়ের উপর দাঁড়ানো, ৬০ সেগমি (২৪ ইঞ্চি) বৃত্তের মধ্যে ১০ বার ডান পা দিয়ে লাফানো		
৮৩	বাম পায়ের উপর দাঁড়ানো, ৬০ সেগমি (২৪ ইঞ্চি) বৃত্তের মধ্যে ১০ বার ডান পা দিয়ে লাফানো		
৮৪	দাঁড়ানো, ১টি খুঁটি ধরা, ৪ কদম উপরে হাঁটা, ১ টি খুঁটি ধরা, পর্যায়ক্রমে আগানো।		
৮৫	দাঁড়ানো, ১টি খুঁটি ধরা, ৪ কদম নিচে হাঁটা, ১ টি খুঁটি ধরা, পর্যায়ক্রমে আগানো।		
৮৬	দাঁড়ানো, পর্যায়ক্রমে ৪ কদম উপরে হাঁটা।		
৮৭	দাঁড়ানো, পর্যায়ক্রমে ৪ কদম নিচে হাঁটা।		
৮৮	১৫ সেগমি (৬ইঞ্চি) কদমে দাঁড়ানো, উভয় পা এক সংগে করে লাফানো		
সর্বাধিক স্কোর (২৪×৩=৭২)			

অধ্যায় ঘ

পেডিয়াট্রিক ব্যালেন্স স্কেল (পিবিএস)

রোগীর নামঃ

পরীক্ষার স্থান	পরীক্ষার পূর্বে স্কোর	পরীক্ষার পূর্বে স্কোর
<p><u>১। বসা থেকে দাঁড়ানো</u> “আপনার হাত উপরে উঠান এবং দাঁড়িয়ে যান” ৪- হাত ব্যবহার না করে দাঁড়াতে সক্ষম এবং স্বাধীনভাবে স্থিরা ৩- হাত ব্যবহার করে স্বাধীনভাবে দাঁড়াতে সক্ষম ২- হাত ব্যবহার বিভিন্নভাবে চেস্টার পর দাঁড়াতে সক্ষম ১- দাঁড়ানোর জন্য অথবা স্থায়ীত্বের জন্য অল্প সাহায্যের প্রয়োজন। ০- দাঁড়ানোর জন্য পর্যাপ্ত অথবা সর্বোচ্চ সাহায্যের প্রয়োজন।</p>		
<p><u>২। দাঁড়ানো থেকে বসা</u> “আপনার হাতের সাহায্য ছাড়াই ধীরে ধীরে বসতে হবে” ৪- হাতের সূক্ষ্ম সাহায্যের দ্বারা নিরাপদে বসা ৩- হাতের সাহায্যে অবতরন নিয়ন্ত্রনা ২- অবতরন নিয়ন্ত্রনের জন্য চেয়ারের বিরুদ্ধে পায়ের পেছন ব্যবহার ১- স্বাধীনভাবে বসা কিন্তু অবতরন অনিয়ন্ত্রিত ০- সর্বোচ্চ উচ্চতায় বসার জন্য সাহায্যের প্রয়োজন।</p>		
<p><u>৩। স্থানান্তরঃ</u> ৪- হাতের সূক্ষ্ম ব্যবহারে স্বাধীনভাবে স্থানান্তরে সক্ষম ৩- হাতের নির্দিষ্ট ব্যবহারে স্বাধীনভাবে স্থানান্তরে সক্ষম ২- মৌখিক এবং / অথবা তত্ত্বাবধানে সঙ্গে স্থানান্তর করতে সক্ষম ১- সাহায্যের জন্য একজন ব্যক্তির প্রয়োজন ০- সাহায্যের জন্য দুইজন ব্যক্তির প্রয়োজন অথবা নিরাপত্তা তত্ত্বাবধান করা</p>		
<p><u>৪। অসমর্থিত দাঁড়ানো</u> ৪- ৩০ সেকেন্ড নিরাপদে দাঁড়ানোর সামর্থ্য ৩- স্থান নির্ণয় করে ৩০ সেকেন্ড দাঁড়ানো ২- অসমর্থিতভাবে ১৫ সেকেন্ড দাঁড়ানোর সামর্থ্য ১- প্রয়োজনে সামান্য চেস্টার ১০ সেকেন্ড অসমর্থিতভাবে দাঁড়ানোর জন্য ০- সাহায্য ছাড়া ১০ সেকেন্ড দাঁড়ানোর অসক্ষমতা।</p>		
<p><u>৫। অসমর্থিতভাবে বসা</u> “আপনার হাত বুকে মুড়িয়ে ৩০ সেকেন্ড বসা”</p>		

<p>৪- ৩০ সেকেন্ড সতর্কভাবে এবং নিরাপদে বসার সক্ষমতা</p> <p>৩- তত্ত্বাবধানের অধীনে ৩০ সেকেন্ডে বসতে পারবেন বা বসার অবস্থান বজায় রাখার জন্য উপরের প্রান্তের নির্দিষ্ট ব্যবহারের প্রয়োজন হতে পারে</p> <p>২- ১৫ সেকেন্ড বসে থাকার সক্ষমতা</p> <p>১- অবলম্বন ছাড়া ১০সেকেন্ড বসে থাকার সক্ষমতা</p> <p>০- অবলম্বন ছাড়া ১০সেকেন্ড বসে থাকার অক্ষমতা</p>		
<p>৬। চোখ বন্ধ করে দাঁড়িয়ে থাকা</p> <p>“যখন আমি বলি চোখ বন্ধ করুন, আমি চাই আপনি দাঁড়িয়ে থাকুন, চোখ বন্ধ করুন এবং বন্ধ করে থাকুন যতক্ষণ পর্যন্ত আমি খুলতে না বলি”।</p> <p>৪- নিরাপদে ১০ সেকেন্ড দাঁড়িয়ে থাকার সামর্থ্য</p> <p>৩- অবলম্বনের সাহায্যে ১০ সেকেন্ড দাঁড়িয়ে থাকার সামর্থ্য</p> <p>২- ৩ সেকেন্ড দাঁড়িয়ে থাকার সামর্থ্য</p> <p>১- ৩ সেকেন্ড চোখ বন্ধের অক্ষমতা কিন্তু দৃঢ়ভাবে অবস্থান</p> <p>০- পতনশীল হওয়া থেকে সাহায্যের প্রয়োজন</p>		
<p>৭- পা একসাথে করে দাঁড়িয়ে থাকা</p> <p>৪- স্বাধীভাবে পা একসাথে অবস্থান করানো এবং ৩০ সেকেন্ড দাঁড়িয়ে থাকার সক্ষমতা</p> <p>৩- স্বাধীনভাবে পা একসাথে করানোর সক্ষমতা এবং ৩০ সেকেন্ড রক্ষণাবেক্ষনের সাথে দাঁড়িয়ে থাকা</p> <p>২- স্বাধীভাবে পা একসাথে অবস্থান করাতে সক্ষম কিন্তু ৩০ সেকেন্ড ধরে রাখতে অক্ষম</p> <p>১- অবস্থান নির্ণয়ের জন্য সাহায্যের প্রয়োজন কিন্তু ৩০ সেকেন্ড পা একসাথে করে দাঁড়িয়ে থাকতে সক্ষম</p> <p>০- অবস্থান নির্ণয়ের জন্য সাহায্যের প্রয়োজন এবং/অথবা ৩০ সেকেন্ড ধরে রাখতে অক্ষম</p>		
<p>৮। এক পা সামনে করে দাঁড়ানো</p> <p>৪- পায়ের ট্যান্ডেস স্বাধীনভাবে অবস্থানে এবং ৩০ সেকেন্ড ধরে রাখতে সক্ষম</p> <p>৩- অন্য পা স্বাধীনভাবে সামনে এগোতে এবং ৩০ সেকেন্ড ধরে রাখতে সক্ষম</p> <p>২- স্বাধীনভাবে ক্ষুদ্র কদম ফেলতে সক্ষম এবং ৩০ সেকেন্ড ধরে রাখতে অথবা সাহায্যের প্রয়োজন পা সামনের দিকে অবস্থান করাতে কিন্তু ৩০ সেকেন্ড ধরে রাখতে সক্ষম</p> <p>১- কদম ফেলানোর জন্য সাহায্যের প্রয়োজন কিন্তু ১৫ সেকেন্ড ধরে রাখতে পারে</p> <p>০- নিয়ন্ত্রন হারায় যখন কদম ফেলায় অথবা দাঁড়ায়</p>		

<p>৯। এক পায়ে দাঁড়ানোঃ</p> <p>৪- স্বাধীনভাবে পা উঠাতে এবং ১০ সেকেন্ড ধরে রাখতে সক্ষম</p> <p>৩- স্বাধীনভাবে পা উঠাতে এবং ৫-৯ সেকেন্ড ধরে রাখতে সক্ষম</p> <p>২- স্বাধীনভাবে পা উঠাতে এবং ৩-৪ সেকেন্ড ধরে রাখতে সক্ষম</p> <p>১- পা উঠানোর চেষ্টা করে, ৩ সেকেন্ড ধরে রাখতে অক্ষম কিন্তু অবশেষে দাঁড়ানো</p> <p>০- চেষ্টা করতে অক্ষম অথবা পড়ে যাওয়া প্রতিরোধের জন্য সাহায্যের প্রয়োজন</p>		
<p>১০। ৩৬০ ডিগ্রিতে ঘূর্ণনঃ</p> <p>“পুরোপুরিভাবে একটি পুরো বৃত্তের মধ্যে ঘূর্ণন, থামা এবং পরে অন্য গতিপথে একটি পূর্ণ বৃত্তে ঘূর্ণন”</p> <p>৪- সঠিকভাবে ৩৬০ ডিগ্রি ঘূর্ণনে সক্ষম, ৪ সেকেন্ডের মধ্যে অথবা কমে, উভয় অক্ষে</p> <p>৩- শুধুমাত্র গতিপথের দিকে ৪ সেকেন্ড বা তার কমে সঠিকভাবে ৩৬০ ডিগ্রি ঘূর্ণনে সক্ষম</p> <p>২- সঠিকভাবে ৩৬০ ডিগ্রি ঘূর্ণনে সক্ষম কিন্তু ধীরে ধীরে</p> <p>১- ঘনিষ্ঠ তত্ত্বাবধান বা মৌখিক সাহায্য প্রয়োজন</p> <p>০- ঘূর্ণনে সাহায্য প্রয়োজন</p>		
<p>১১। পিছনে ঘুরে ঘূর্ণনঃ</p> <p>“উদ্দেশ্যকে অনুসরণ করুন, যেভাবে আমি পদক্ষেপ দেই। এটা দেখতে থাকুন, যেমন আমি পদক্ষেপ দেই কিন্তু আপনার পা নড়বে না”।</p> <p>৪- পিছনে দেখে / বাহুর উপর, ট্রাংকের ঘূর্ণন সহ ওজন পরিবর্তন</p> <p>৩- পিছনে দেখে / এক বাহুর উপর, সঙ্গে ট্রাংকের পরিবর্তন</p> <p>২- কাধের উচ্চতে দেখার জন্য মাথা ঘুরানো, ট্রাংকের পরিবর্তন ছাড়া</p> <p>১- ঘূর্ণনের জন্য সাহায্যের প্রয়োজন, কাঁধ থেকে অর্ধেক দূরত্বের চেয়েও বেশি।</p> <p>০- ভারসাম্য হারানো বা পতন থেকে রাখা সাহায্য প্রয়োজন; চিবুকের গতি কাঁধের অর্ধেকেরও কম।</p>		
<p>১২। জিনিস মেঝে থেকে নেওয়াঃ</p> <p>৪- সঠিকভাবে এবং সহজে চক বোর্ডগুলো তুলতে সক্ষম</p> <p>৩- ইরেজার তোলতে সক্ষম কিন্তু সাহায্যের প্রয়োজন</p> <p>২- ইরেজার তোলতে অক্ষম কিন্তু ১-২ ইঞ্চি পৌঁছায় ইরেজার থেকে এবং স্বাধীনভাবে সমতে নির্গয়ে সক্ষম</p> <p>১- ইরেজা তোলতে অক্ষম, অংশগ্রহনের জন্য সাহায্যের</p>		

<p>প্রতোলতে অক্ষম কিন্তু ১-২ ইঞ্চি পৌছায় ইরেজার থেকে এবং স্বাধীনভাবে সমতে নির্ণয়ে সক্ষম</p> <p>১- ইরেজা তোলতে অক্ষম, অংশগ্রহনের জন্য সাহায্যের প্রয়োজন</p> <p>০- সমতা হারানোর জন্য অথবা পতনের জন্য সাহায্য নেয়ার চেষ্টার অক্ষমতা</p>		
<p>১৩। একান্তর পা টুলে অবস্থান করানো</p> <p>৪- স্বাধীন এবং নিরাপদে দাঁড়ানো এবং ২০ সেকেন্ড ৮ কদম সম্পূর্ণ করে</p> <p>৩- ২০ সেকেন্ডের কম সময়ে স্বাধীনভাবে এবং সম্পূর্ণভাবে দাঁড়িয়ে ৮ কদম দিতে সক্ষম</p> <p>২- সাহায্য ছাড়া ৪ কদম সম্পূর্ণ করতে কিন্তু প্রয়োজন ঘনিষ্ঠ রক্ষনাবেক্ষনের</p> <p>১- ২ কদম সম্পূর্ণ করতে সক্ষম, প্রয়োজন সূক্ষ্ম সাহায্যের</p> <p>০- ভারসাম্য নিয়ন্ত্রনে সাহায্যের প্রয়োজন অথবা পড়ে যাওয়া থেকে বাচার জন্য চেষ্টা করতে অক্ষম</p>		
<p>১৪। বাহু প্রসারিত করে সামনে পৌঁছানোঃ</p> <p>“আপনার আংগুল প্রসারিত করুন মুষ্টিবদ্ধ করুন এবং সামনে পৌঁছান যতদূর আপনি পারেন, আপনার পা চালানো ছাড়া”</p> <p>৪- আত্মবিশ্বাসের সাথে ১০ ইঞ্চির থেকে বেশি সামনে পৌঁছানো</p> <p>৩- নিরাপদে ৫ ইঞ্চির থেকে বেশি সামনে পৌঁছানো</p> <p>২- নিরাপদে ২ ইঞ্চির থেকে বেশি সামনে পৌঁছানো</p> <p>১- সামনে পৌঁছানো কিন্তু রক্ষনাবেক্ষনের প্রয়োজন</p> <p>০- চেষ্টার সময় ভারসাম্য হারায়, বহিরাগত সাহায্যের প্রয়োজন</p>		
<p>সর্বোচ্চ স্কোর- ৫৬</p>		

তথ্য সংগ্রাহকের স্বাক্ষর ও তারিখঃ

ধন্যবাদ!!

1.1 Background

Cerebral Palsy is one of the major causes of childhood disability which imposes a great demand in Health, education and social service. It doesn't cause only physical limitation but also causes familial, social and personal problems (Cans, 2000). Preterm babies and babies born with low birth weight are very prone to develop Cerebral palsy than the full term babies. The development of technology since last few decades causing a big change in this issue. The services of intensive care units causing reduction in neonatal mortality thus the vulnerable babies are surviving more (McCormick, 1993). The overall prevalence of Cerebral palsy globally was found to be 2.11 per 1000 live birth. It was further stratified by gestational age where highest prevalence found in children who born before 28 weeks (111.80 per 1000 live births) and also highest prevalence (59.18 per 1000 live births) was found in neonate who has weight 1000 to 1499 g (Oskoui, Coutinho, Dykeman, Jette, & Pringsheim, 2013). In united states the estimated prevalence of neurological disorder such as autism spectrum disorder per thousand was 5.8, cerebral palsy was 2.4, epilepsy 7.1 and migraine 121, multiple sclerosis 0.9 (Hirtz, Thurman, Gwinn- Hardy, Mohamed, & Chaudhuri, 2007). In some low income countries the prevalence was reported 2.0 and 2.8 per 1000 live birth (Gladstone 2010). In Africa it is 3.8 to 10 per 1000 live births (Donald, 2014). In USA there is a great increase in rate of Cerebral palsy approximately 20% from 1960 to 1986 (Bhushan, 1993). In Bangladesh the prevalence of Cerebral palsy was found 3.4 per thousand live children. It was also estimated that there are about 233514 children with cerebral palsy in Bangladesh.

This is causing a great burden on the population because most of the time the diagnosis is delayed and the early intervention is limited. Although majority of them having preventable risk factor but due to lack of appropriate health service prevention is difficult (Khandaker et al. 2018). The definition of Cerebral palsy has been reviewed several times for different reason. The modern brain imaging techniques give new information regarding brain injury, neurobiology and pathology associated with brain development. In modern concept the amount of activity limitation becomes the part of Cerebral palsy definition therefore if someone not having any activity limitation should not include in cerebral palsy group. The previous definition did not emphasize on the non-motor neuro-developmental activities such as behavioral problem and also the progressive musculoskeletal deformation which take place in the advance stage (Rosenbaum et al. 2007). Cerebral palsy which was defined as a non-progressive brain lesion causes neuromuscular and musculo-skeletal impairment where spasticity, poor balance, loss of selective motor controls, impairment in the motor functions and weakness are evident. Therefore along with physical limitation they also suffer from restriction in the social participation (Kim and Park, 2010). According to several expert consensuses a modern and updated definition of Cerebral palsy was developed as, “Cerebral palsy (CP) describes a group of permanent disorders of the development of movement and posture, causing activity limitation that is attributed to non-progressive disturbances that occurred in the developing fetal or infant brain. The motor disorders of cerebral palsy are often accompanied by disturbances of sensation, perception, cognition, communication, and behavior, by epilepsy, and by secondary musculoskeletal problem (Rosenbaum et al. 2007). According to Roelie-Wolting, Enablement Cerebral palsy project and Handicap International group there are mainly 3 major types of Cerebral palsy. Those are

spastic (70-80%), Dyskinetic (10-20%) and Ataxic (5-10%). There is also a type of combination of 2 or more of these called mixed type which is rare. There are some other classifications such as according to severity- mild, moderate, severe. According to topographical distribution-Monoplegia, Diplegia, Hemiplegia, triplegia, double hemiplegia and Quadriplegia. On the basis of muscle tone- Hypertonia, hypotonia. There are also some other functional classification system such as The Gross Motor Function Classification System (GMFCS) which was published in 1997 and revised in 2007 by Can Child Centre for childhood Disability Research (Canada). Another classification system which is Communication Function Classification System (CFCS) was established in 2011 by an expert team of University of Central Arkansas (US) (Slate et al. nd). In the etiological point of view cerebral palsy has diverse and multidirectional etiology. The principle causes are congenital, genetic, inflammatory, infectious, lack of Oxygen, traumatic and metabolic. Injury may occur prenatal, natal and postnatal period. Surprisingly in 75% - 80% cases it is prenatal and less than 10% due to birth trauma or birth asphyxia. Premature delivery and low birth weight is the most important cause of development of cerebral palsy. In 12% of term infant and 28% in premature infants have chorioamnionitis which is a risk for Cerebral palsy. In 60-100% patient with Cystic Periventricular leukomalacia (CPVL) also a risk factor for cerebral palsy. Other parental risks such as intrauterine infections, teratogenic exposures, placental complications, multiple births, mental retardation, seizures a, hyperthyroidism are also very important to consider (Sankar & Mundkur, 2005). A review by Gladstone (2010) found in hospital base studies that the rate of spastic quadriplegia is increasing faster than diplegia or hemiplegia. He also mentioned that there is an increase rate of meningitis, jaundice and asphyxia as the responsible cause

for development of cerebral palsy. Khandaker et al. (2015) mentioned in his study that the causes of cerebral palsy are not similar in developing and developed countries. A study by Lagunju and Fatunde (2009) found in Nigeria about 39.0 % CP has birth asphyxia, 24.4 % have bilirubin encephalopathy and 18.3 % CP have history of post-infectious brain damage. In india 39.6% of CP had a history of birth anoxia, 16.7% developed kernicterus and 31.3% was epileptic. The lower education status was strongly associated with the development of Cerebral palsy (Bannered et al. 2009). In Bangladesh etiology of Cerebral palsy related studies are not found however a pilot study by Khandaker et al. (2014) found 17.9% cerebral palsy are associated with maternal infection such as congenital rubella syndrome (1.1%), clinically confirmed infections (7.1%) and other probable infections are (10.8%). The literature claims that about half of cerebral paralysis caused by prematurity. Therefore intervention to make the gestational age longer will prevent the risk. The common ways of prevention of premature birth are-limiting the embryo transfer to the vitro fertilization, by quite smoking of mother while pregnant, administration of anti-platelet drugs in order to prevent pre-eclampsia, treatment of viral and bacterial infection during pregnancy, progesterone therapy, and cervical cerclage for the woman with short cervix and if they have a previous history of preterm birth. Besides some drugs are found effective to prolong the gestational period such as calcium channel blockers, oxytocin antagonist for the ladies with history of preterm labor and erythromycin for those who had history of premature membranes rupture. It was also found that glucocorticoids were effective in prolonging the period and reduce the development of cerebral palsy. Magnesium sulphate administration also reduces the risk of preterm birth before 30 week and also reduces the gross motor function disorder; reduce cerebral white matter damage (O'Shea, 2008). A systematic review and meta-analysis by Conde-Agulelo

and Romero (2009) found that administration of magnesium sulfate to the women who were prone to have a premature delivery (before 34 weeks of gestation) was effective in the reduction of the development of cerebral palsy. According to Cerebral palsy guide (2019), prevention of cerebral palsy during pregnancy can be accelerated by avoidance of exposure to virus and bacterial infections such as German Measles, Zika, vaccination before getting pregnant, maintenance of healthy blood pressure and blood sugar level, avoidance of alcohol, smoking or other harmful drugs, identification of possibility of Rh incompatibility. During birth use of advanced technology such as x-ray, ultrasound, monitoring fetal and mother heart rate, relaxation of mother. After delivery proper protection to prevent head trauma, the usual vaccinations, treatment of neonatal jaundice. The following study will reflect many of the above mentioned situations and was aimed to find out the changes after providing hippo therapy in conjunction with the conventional physiotherapy and compare the effect with conventional therapy alone.

1.2 Rational:

Several experimental studies have been conducted to find out the effectiveness of hippo therapy in several physical, psychological disease conditions both for children and adult world wide. Most of them found that hippo therapy is an effective means of treatment for balance, Gross motor function, and psychological disorders. It was also evident that hippo therapy is a very effective therapy to improve balance and Gross motor function in the children with Cerebral palsy. Regardless of the evidence of effectiveness, hippo therapy is not that much familiar in Bangladeshi community people. Therapists are also not aware that much about this area of management. Centre for the Rehabilitation of the Paralyzed (CRP) is a Non-Government Organization which is running this service since 1994 as a part of therapy service at the pediatric Unit (Hosneara Parveen, personal communication, October 10, 2017). Currently this service is provided for the inpatient of Pediatric unit and the inclusive school. There is a healthy trained pony for the Hippo therapy and a group of trained Physiotherapist, Occupational therapist and other trained associates, who are operating the service in regular basis following a specific protocol developed by the Pediatric unit and the inclusive school (Abdullah Al Zubayer, personal communication, October 10, 2007). Despite the availability of this expensive scope, there was no attempt that had been taken to find out the effectiveness of hippo therapy through any scientific study. It is very important to identify whether the service that has been provided by CRP since many years is effective or not. Is the existing protocol of treatment is sufficient? Is there any change in the treatment protocol requires? So these is a gap in existing knowledge have been identified by the researcher. Therefore the inspiration came and an attempt was taken to identify the

statistical effectiveness of hippo therapy on Gross motor function and balance in the children with cerebral palsy at the local context.

1. 3. Hypothesis

1.3. 1. Null Hypothesis (H_0)

The Trial group and Control group initial and final mean difference is same.

1. 3. 2. Alternative Hypothesis (H_a)

The Trial group and Control group initial and final mean difference is not same.

1.4. Objectives

1.4.1. General objective

To explore and compare the effectiveness of Hippo therapy on Gross motor function and Balance in the children with cerebral palsy.

1.4. 2. Specific Objective:

- To explore the Socio-Demographic features of participants.
- To find out the outcome of the combined therapy on static and dynamic balance ability.
- To find out the changes in different parameters of Gross motor function as the result of Hippo therapy.
- To formulate a general guideline/treatment protocol for hippo therapy.
- To establish scope and interest for the further interest of good quality research in this field.

1.5. Operational definition

Cerebral Palsy: A posture and movement disorder caused by damage to immature growing brain.

Balance: A state of body position where an even distribution of weight causes the body to be upright and steady and prevent from fall.

Gross motor function: The gross motor function is the motor function which requires whole body movement with the help of large or core stabilizing muscles of the body. Example: Rolling, sitting, walking etc.

Hippo therapy: A therapeutic horse riding where children will ride the horse with the supervision of therapist, horse riding person, mother and other support persons and perform specific therapeutic activities on the horse. E.g. Sitting, reaching for object or own body parts etc.

Conventional Physiotherapy to improve Gross motor function and balance: This refers to the usual physiotherapy treatment applied to improve Gross motor function and balance such as neuro-developmental therapy, stretching, strengthening, balance training.

An extensive literature search was conducted and has found several scholarly articles regarding Cerebral palsy management and predominantly Hippo therapy and the scientific evidence of other physiotherapy management. Besides, the review also focused to find out the basic information regarding cerebral palsy, development of balance and gross motor function in normal children, the relationship among them and with other variables such as age, sex, and race.

According to literature a group of neurological disorder in infancy or early child hood which arises from the damage to a developing brain is termed as Cerebral Palsy. This condition predominantly causes the movement control problem, posture and balance problem. poor coordination, spasticity, muscle weakness, abnormal tone, difficulties in gross and fine motor function, gait abnormality, tremor , excessive drooling, difficulties in swallowing and speaking, developmental delay and many more (Bax, Goldstein, Rosenbaum & Leviton, 2005). Cerebral palsy is a static encephalopathy where permanent brain damage occur which is non-progressive in nature. As the age progress the clinical manifestations might change because of growth and development, neural plasticity and the maturation process of Central Nervous system (Sankar, 2005). Cerebral palsy is responsible for development of permanent motor disorder and abnormal movement pattern (Rosenbaum et al. 2007). The disease course depends on the type of neuromotor abnormality, age, deformities and topographical classification. The prognosis is good if it diagnosed and treated earlier (Hadders-Algra, 2014). The children with cerebral palsy are very prone to develop contracture and deformity. The children who have poor ambulation are more

in risk of development of muscular contracture, scoliosis, dislocation and subluxation (Porter 2007).

As Cerebral palsy is a sensory-motor disorder it might also cause some associated disorder such as vision, hearing problems (Brunstrom, 2001). Stoop posture, Delayed responses in ankle muscles, poor sequencing in muscle response, hyper co-activation of agonist and antagonist muscle lead the poor ability to recover balance with requiring longer time and increase postural sway are evident in the children with Cerebral palsy (Woollacott & Shumway-Cook, 2005).

The first year of life is very crucial period of child development as many important functional skills such as crawling, sitting, walking, running, climbing, hand eye coordination and fine motor function develop in variety of ways. To perform that child need to have a postural stability term as balance which also supports the primary movement. There are several theories which describe the relationship between maturation of nervous system and the behavior of child development. The classical reflex/hierarchy theory expressed that the appearance and disappearance of primitive and postural reflexes show the cortical structural maturity which inhibit and integrate reflex control (Howle, 2002).The recent theory such as System theory demonstrates that the postural control develops by the interaction of musculoskeletal and neural system during the period of development. In the musculoskeletal system change in muscle strength and muscle mass in different parts of the body are important and in neuromuscular system synergic pattern are important, somato-sensory, visual , vestibular system are also crucial. Finally the adaptive and anticipatory activities which cause the child to modify the sensory perception and help in postural control (Woollacott & Shumway-Cook, 2005). Ostensjo, Carlberg, Brogren and Vollestad (2004) claimed that the loss of selective motor control as the key factor for the poor

Gross motor function. He also mentioned that the selective motor control is compromised due to the spasticity and ROM.

Gross motor function achievement in normal babies also varies in a certain proportion. About 90 to 95% of children follow the normal gross motor development milestone sequence where 5 to 10% often skip any one or two of the major gross motor function such as typical crawling (hands and knees crawling). The major gross motor function such as sitting, standing, crawling, kneeling, walking, running etc has age overlap but vary in width (WHO Multi-center Growth Reference Study Group, & de Onis, 2006).

A study by Capute (1985) found in a longitudinal study analyzed eight selected milestone of first two years of 284 normal children. All was term baby and were found to be normal at one year. A high percentage of parents were able to recall the ages of milestone and they have mentioned those with variations. They found that children achieve milestone earlier than traditionally documented milestones. They found very little sex related variation. They also found that black children achieve milestone earlier than white children.

Balance is the ability to establish and maintain the body equilibrium within and out of Base of support. The balance ability in infant and children are related to the fundamental motor skill development and voluntary motor control. It is widely accepted that ability to control static and dynamic balance ability is the most important component of daily living activities of children. Several studies proved that there is also association of balance with age, gender, motor activity (Figura, Cama, Capranica, Guidetti, & Pulejo, 1991).

A scientific study has explored the postural response in normally developed children and children with cerebral palsy. The study found that several lower limb

function specially weight bearing function such as pull to stand activate the distal muscle such as ankle muscles first in normally developed children. As the age and development accelerate child develops the additional agonist muscles are involved in distal to proximal fashion. At the initial part walking and standing a well-organized muscle activation observed with reduced the antagonist co activation. The children with cerebral palsy who are already walking are found to have absence of this normal pattern of muscle activation. They have comparatively disorganized muscle response and increased proximal-distal, agonist-antagonist co-activation. To understand the musculoskeletal contribution normal children were asked to perform standing from a stooped posture, they revealed the same postural response pattern like spastic hemiplegic type of cerebral palsy children (Hadders-Algra, Fits, Stremmelaar, & Touwen, 1999).

A study by Kaga, Suzuki, Marsh and Tainaka (1981) found head control and independent walking in infants might be delayed due to vestibular dysfunction. About 55% incidence of vestibulo-ocular reflex hypo activity were evident in congenital hearing impaired children and absent of that reflex in 10% of children. Though it was clear that impairment or absent of the reflex was associated with the delay of gross motor function the children acquired the skill in later life.

Several treatment strategies have been adopted to treat the balance and gross motor function such as gross motor task training, hippo therapy, treadmill training with no body weight support (no-BWS), trunk-targeted training, and reactive balance training claimed to have moderate effectiveness along with some Interventions which are weak or convicting in evidence such as functional electrical stimulation (FES), hippo therapy simulators, neurodevelopment therapy (NDT), treadmill training with body Weight support, virtual reality, and visual biofeedback, progressive resistance

(Dewar, Love & Johnston, 2015). Science past the different interventions are applied for the children with cerebral palsy who have movement disorders. Bobath concept is one of them. It was developed in 1940 by a physical therapist and Neuropsychologist named Berta Bobath and Dr Karel respectively (Dos Santos, 2015). This concept consists of strategies to improve gross motor function and postural control through facilitation of different key points of body (Bobath, 1990). The name Bobath approach had changed in 1960 into neuro-developmental treatment (NDT) though the basic concepts remain unchanged therefore NDT and Bobath is same intervention (Howle, 2002).

Initially NDT was based on a scientific reasoning that voluntary movement controlled by a higher cortical region and lower centers control the primitive reflex which was also known as hierarchical reflex model. The NDT applied aiming to stop the abnormal pattern of movement and posture by holding the child in a fixed position which was thought to be effective in inhibition of reflex. Later on it was proved incorrect as it was a passive procedure (Mayston, 2008).

Currently NDT is a Client Centered, practical and problem solving approach used to treat function, movement and postural disorders. It not just to treat sensory motor disorders but it treats the whole person includes emotion, social and functional limitation, cognition and perception (Velickovic, 2005). In NDT a sensory input is used to improve a motor learning. It also inhibits compensatory motor reaction and 24 hours interdisciplinary management (Graham, 2009). NDT concentrates Task oriented posture and movements and the key consideration is functional activities in daily life situation therefore they improves the Quality of life and ensures maximum participation (Mayston, 2001).

Among all interventions, Hippo therapy is one of the treatment strategies which have been proven to have effectiveness in improving balance and gross motor function in the children with cerebral palsy. It not only improves the balance and gross motor function in the children with cerebral palsy but also other physical, emotional , social, sensory, cognitive aspects in cerebral palsy and other neuromuscular disorders.

According to Meregillano (2004) Hippo therapy is a Greek word meaning treatment by the means of hippo or horse. Horseback riding was first introduced in ancient Greece as a therapeutic intervention to promote mental and physical wellbeing. After 2nd world war in Europe it became admired to improve in physical, mental and emotional aspects. Later by 1960'ts In Canada and United States several therapeutic riding centers and Community Riding Association of Riding for the Disabled (CANtra) were established. Hippo therapy is a term that refers to the use of the movement of the horse as his strategy is used as part of an integrated treatment program to achieve functional outcomes (Benjamin, 2000). These days riding is used in several neuromuscular, neurological, muscular, chromosomal, psychological, behavioral disorders where both children and adult can be addressed for the therapeutic and recreational purpose. There are two terms, Hippo therapy and Therapeutic horse riding which often confuse us. In General population both means same but actually it's not. Even many rehabilitation professionals are not aware about that. To have the optimum result it is very important to clarify that. Therapeutic horse riding (THR) and Hippo therapy are the types of horseback riding where in the Therapeutic horseback riding, the basic riding skill training for disable person is given. On the other hand Hippo therapy is performed in the presence of

Physiotherapist or Occupational therapist aiming to improve balance posture gross and fine motor skills (Snider, Bitensky, Kamman, Warner & Saleh, 2007).

According to American Hippo therapy Association (2015), Hippo therapy is a physical, occupational and speech therapy where movement of the horse is used as a therapeutic tool. It is not just a horseback riding. It should be implemented by a team containing physician, Physiotherapist, occupational therapist, speech therapist combined with trained competent horse handler and of course with a healthy trained horse. It is the direct hands on treatment by the rehabilitation professionals. The movement of the horse plays the key role in the treatment. The aim of the hippo therapy is mainly to improve physical function, balance, movement, reduce spasticity and to improve sensory processing, higher mental functions. It is the individual treatment procedure where participants need several sessions. The therapists usually have a series of assessment and reassessment and modification of treatment throughout the sessions. Therapeutic Horseback riding on the other hand is designed as recreational purpose for person with disabilities. It can be performed by trained horseback riding instructor with some volunteers. Therapeutic riding often performed in group which usually runs in certain season. The instructor usually instructs from Centre but often has hands on guideline. The appropriate temperament of horse is essential. It mainly focuses on riding skill, recreation, sports rather functional therapeutic goals.

Snider et al. (2007) described several therapeutic effects of hippo therapy such as improve flexibility, postural control, balance and mobility. They described that the warmth, rhythmicity and three dimensional movements of real horse contributes to those improvement. Additionally, they mentioned that movements of horse during walking mimics the weight shifting phenomenon of human pelvis and the effort of

being straight while this unstable situation stimulates the righting and balance reaction. This is a treatment a strategy by Physical Therapists, Occupational Therapists, and speech-Language Pathologists to treat impairments, functional limitations, and disabilities in patients with neuro-musculoskeletal dysfunction.

Sitting balance is a very important physical functional component to perform activities of daily living. The spinal stabilizer muscles play very important role in this regard. The balance is maintained by a synchronization of global and local muscle control system. The movement of the trunk controlled by global muscles where local muscle controls the global muscles (Saether, Helbostad, Riphagen & Vik, 2013). A randomize control trial by Kang, Jung and YU (2012) was conducted, aiming to find out the effectiveness of hippo therapy in the children with cerebral palsy on sitting balance. 45 cerebral palsy children were randomly divided in 3 groups. Hippo therapy group (15), Physical Therapy Group (15) and control group (15). Two qualified expert physiotherapist provide the hippo therapy and conventional physiotherapy consisting of strengthening, stretching and other in 30 minutes, semi-weekly for 8 weeks. They found that, hippo therapy with traditional physiotherapy improves the sitting balance significantly than the traditional physiotherapy alone.

A study by Benda, McGibbonand Grant (2003) was conducted aimed to find out the effectiveness of hippo therapy on muscle activity of spastic cerebral palsy children. 15 children with cerebral palsy aged from 4 to 12 were treated by 8 minutes of hippo therapy and 8 minutes of riding on a stationary barrel for 2 weeks. A surface electromyography was used to identify the muscle actively of trunk and legs while performing sitting, standing and walking before and after interventions. After completion of the treatment sessions hippo therapy group revealed a significant improvement in symmetry of muscle activity in those muscles which had gross

asymmetry before hippo therapy. The static barrel group didn't show any significant change in muscle symmetry. The study suggested that eight minutes of hypnotherapy can be effective to improve muscle activity in the children with spastic cerebral palsy where static barrel sitting has no effect on promoting muscle activity.

According to Kwon et al. (2015) hippo therapy is a treatment approach which provides dynamic base of support and it is an excellent method to improve trunk muscle strength, control and balance. They conducted a RCT aiming to find out the effect of hippo therapy on gross motor function in the children with cerebral palsy. 92 children with cerebral palsy were treated with 30 minutes of Hippo therapy, twice a week for 8 weeks. GMFM-88 and GMFM-66, and Pediatric balance scale were used to find out the outcome. They conclude that hippo therapy significantly improve the gross motor function in the children with cerebral palsy.

Randomize Control Trial by Temcharoensuk, Lekskulchai, Akamanon, Ritruethai, and Sutcharitpongsa (2015) was conducted to find out the immediate effect of horseback riding, dynamic and static horse riding simulator on sitting ability in the children with cerebral palsy. 30 cerebral palsy were randomized and assigned into 3 groups. All of them got 30 minutes of riding hippo-riding, static simulator riding and dynamic simulator riding. Trunk control and gross motor function were assessed using Segmental Assessment of Trunk control (SATC) and Gross motor function Measure (GMFM) before and after interventions. After this study claimed that Horseback riding is the best intervention among those 3 interventions for promoting sitting ability of children with spastic cerebral palsy. They also recommend the dynamic horse riding simulator as a substitute for horseback riding when horseback riding facility is not available.

A systematic review and meta-analysis was conducted by Zadnikar and Kastrin (2011) to provide an overview of the effect of hippo therapy on postural control and balance in the children with cerebral palsy. From 77 articles only 10 met the inclusion criteria therefore involved those for the study. 2 studies were further excluded as they didn't have any control group. Remaining 8 studies revealed that hypnotherapy has statistically significant effectiveness on postural control or balance in children with cerebral palsy. Hippo Therapy was found to be effective in the eight studies among eight to improve postural control and balance.

Outcome measurement tool is a very important component of every research and has to be valid and reliable. The following research project used two outcome measurement tools GMFM and Pediatric Balance Scale (PBS) to measure the post intervention outcome of r gross motor function and balance respectively. The Gross Motor Function Measure (GMFM) is tool which is observational in nature. It is the tool that has been intended to find out the change in gross motor function especially with the children with Cerebral palsy. Two versions are available under this tool, original version that is GMFM-88 and later on another version GMFM-66 was developed in order to make the administration easy. The numbers correspond the items of function to measure. Cerebral palsy children from 5 months to 16 years can be assessed by this scale. The scale was first introduced in late 1980 for treatment and research purpose. The scale has 5 dimensions of function. Dimension A- Lying and Rolling, B: Sitting, C: Crawling and Kneeling, D: Standing and E: Walking, Running and Jumping. It is a four point scoring system where 0 is does not initiate, 1 is Initiates, 2 is partially completes and 3 is completes. The total score is summed in the area of interest and can be used in statistical way. The Administration is easy. It is rated by therapist. It takes approximately 45 to 60

minutes which will further depend on assessor skill, the situation of child and level of cooperation. Therapists who are experienced in pediatric area and familiar with assessment of motor skill of children with cerebral palsy can use the tool. The necessary equipments are mat, bench, toys, stairs which contains at least 5 steps. Evidence found that GMFM is highly reliable tool. With ICCs of greater than .98 (95% confidence interval=0.965-0.994) and can be used in research and clinical practice. It was also found highly valid tool with an ICC of .99 (95% confidence interval=0.972-0.997) (Ko & Kim, 2013).

Brunton and Bartlett (2011) also found high level of reliability with ICCs of greater than .98 (95% confidence interval0.965–0.994) and validity with an ICC of .99 (95% confidence interval0.972–0.997).

According to Russell et.al. (2000) The GMFM is a standardized observational instrument designed and validated to measure change in gross motor function over time in children with cerebral palsy.

Pediatric balance scale (PBS) has been proven to be reliable and recommended as the measurement tool for measuring the functional balance tasks which are routine components of physical therapy examination. It has good test-retest reliability and inter-rater reliability. This scale is applicable on the school aged child with the mild to moderate physical impairment. The administration and scoring is easy and quick. Total time taken less than 15 minutes. Moreover it doesn't require any special equipment (Franjoine, Gunther & Taylor, 2003).

According to Franjoine et al. (2010) PBS is a 14 item tool used to identify the functional balance and it is most appropriate for 3 to 6 years children.

According to Chen et al. (2013), PBS scale is moderately responsive to detect change in balance ability. They recommend the clinician and researchers to use this scale for balance performance change because the changes are true and have clinical meaningfulness. It can effectively find out the post treatment and follow-up changes in the children with cerebral palsy.

The study was designed to reveal the combined effectiveness of hippo therapy and conventional physiotherapy and to compare the best effect among them. To achieve the aim the following methodological strategies were adopted.

3.1. Study design: The aim of the study was to find out the effectiveness of hippo-therapy combined with conventional physiotherapy on gross motor function and balance in the children with cerebral palsy who were admitted at CRP Pediatric unit (Savar). An experimental study (clinical trial) was conducted to find out the combined effect.

Experimental designs are useful to address evaluation of the effectiveness of any interventions. Experimental designs increase the confidence of researchers and it probably give us the idea that the outcome is not by chance. A true experimental design consists of more than 1 group, common outcome measure, and random assignment and intervention. The following study had a lack of randomization. It is mainly due to the lack of feasibility to do a randomization (Hyman, 1982). In the following study randomization was not feasible due to the unavailability of participants. Moreover Hippo therapy is considered as usual therapy service at pediatric unit of Savar who met the eligible criteria therefore the participants cannot be deprived. If some of them assigned to the control group, it was the deprivation from the usual service and the violation of ethics.

3.2: Study area

Data was collected from the inpatient of Pediatric department of Centre for the Rehabilitation of the Paralyzed (CRP). The Trial group samples were taken from CRP Savar. The control group was taken from CRP Mirpur and Savar. The participants who refused hippo therapy for any reason but match with the inclusion criteria were taken as control participant from CRP Savar. CRP is the only organization that runs the Hippo therapy service in Bangladesh. So for the study area CRP was selected by the researcher. For control group CRP Mirpur was selected as both centre Physiotherapists apply identical conventional management for Gross Motor Function and Balance. The indoor patients were selected because they usually stay at CRP hospital for 2 weeks period. Within this time it is easy to get them as a participant for the study. On the other hand out patients were excluded because it was almost impossible to conduct scheduled hippo therapy for out-patients due to time, manpower, availability of horse (only one) and communication system constraint.

3.3: Study population

Cerebral palsy children who admitted as in patient at the pediatric unit of CRP Savar (Trial group and control) and CRP Mirpur (Control group) .Data was collected from Centre for the Rehabilitation of the Paralyzed (CRP), Savar and CRP Mirpur, Dhaka. Because these patients came at CRP from all over the Bangladesh from all economic groups for the comprehensive rehabilitation therefore it reflects the entire population.

3.4: Study duration

The study was conducted in period of July 2018 to June 2019. Data collection period was November 2018 to April 2019.

3.5.1: Sample size and Sampling technique: Total 30 samples were taken randomly who came to the department for admission. Those who met the inclusion criteria were taken. As at CRP patient come from overall Bangladesh and the researcher had no control over them it is one kind of randomization. The further group allocation was done according to the area of admission (CRP Savar and Mirpur). 15 in trial group and 15 in control group. It was not possible to make a random allocation as only CRP Savar has the facility of Hippo therapy. There were very limited amount of participant who met the eligibility for the experiment therefore those who met the criterion were immediately assigned in both group from different settings. The control was taken from CRP Mirpur as the conventional physiotherapy service for gross motor function and balance are almost identical which could not be achieved at any other setting of Bangladesh. At Savar setting 25 participants met the eligibility criteria for hippo therapy within 5 months of the data collection period. 15 of them assigned to trial group who were agreed to attend the hippo-therapy group. 10 of them refuse to participate due to hippo-phobia. They were excluded from the trial group and 7 of them taken to control group. Rest of 3 refused to be participant. In Mirpur Setting 8 participants matched the criterion and all of them included in control group. It is important to mention here that the participants were the indoor pediatric patient who stayed at CRP pediatric unit for 2 weeks rehabilitation program.

3.5. 2. Flow Diagram of sampling procedure

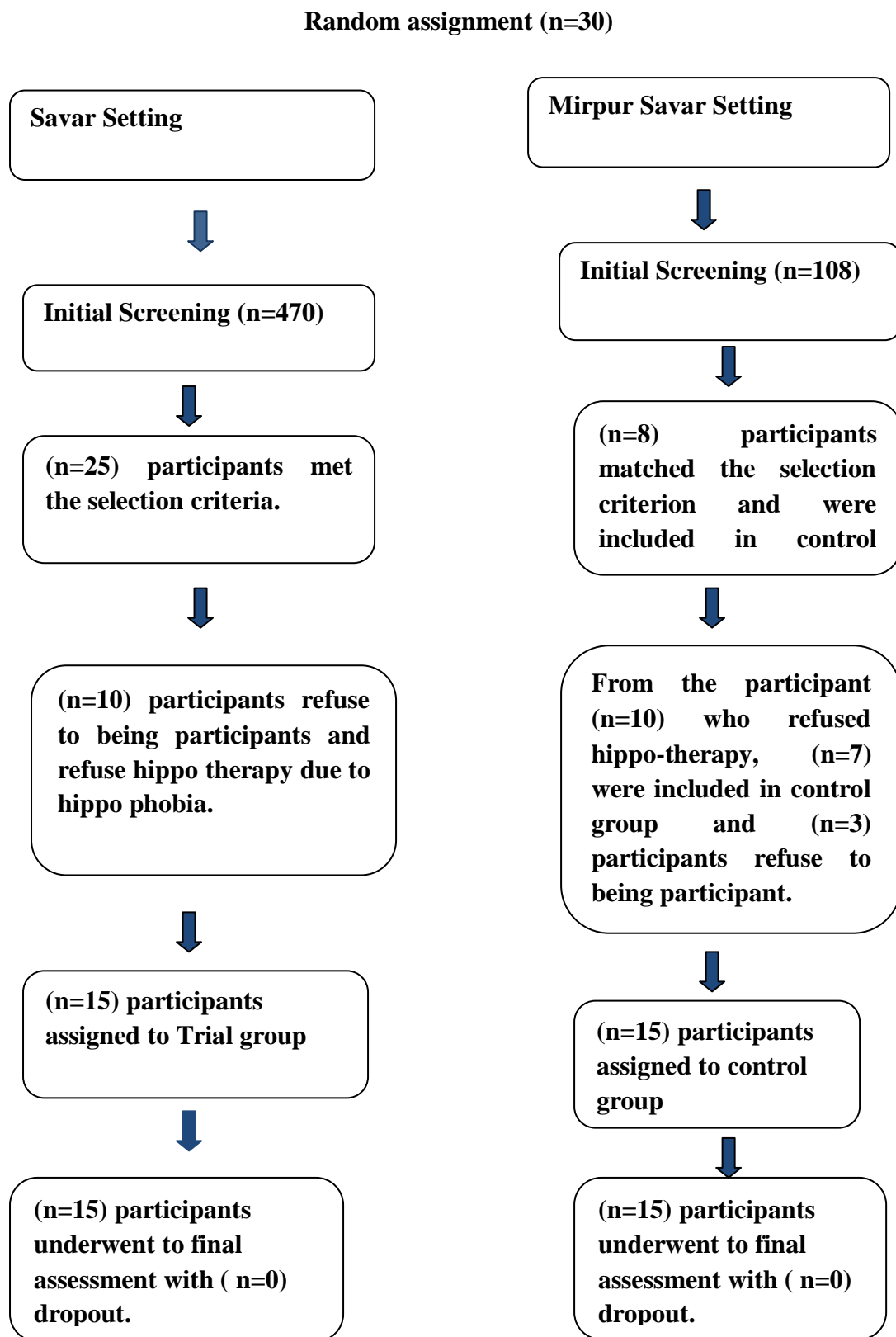


Fig: 1. Sample assignment procedure flow chart

3.6. Eligibility Criteria

3.6. 1. Inclusion criteria

1. Age range between 3 to 6 years: This age range was selected from the recommended aged in pediatric balance scale. It is most appropriate in the children within this age range (Franjoine et al. 2010).
2. Male and female both were included because both male and female can be affected by cerebral palsy (Romeo et al. 2016).
3. Mild to moderate type of cerebral palsy patient was selected. According to (GMFCS): II, III, IV
4. Willing to continue the experiment.
5. No history of hippo therapy experience before.
6. For control group first time admission at CRP.

3.6. 2. Exclusion criteria

1. Unwillingness, hippo phobic participants were excluded.
2. Severe uncontrolled epileptic cases excluded.

3.7. Data Collection:

It is a purposeful systemic process of acquiring information relevant to the area of interest and also involved the measurement of those to get the complete picture (Paradis, O'Brien, Nimmon, Bandiera, & Martimianakis, 2016).

3.8.1. Data collection material/tools:

1. Structured Questionnaire
2. GMFCS – E & R- Gross Motor Function Classification System Expanded and Revised.

Other tools: Pen, Pencil, Paper, Calculator etc.

3.8.2. Questionnaire:

Questionnaire is a group of standard purposeful Questions or items that have been sort in a piece of paper. In research questionnaire is the main tool for data collection (Lavrakas, 2008). During development of the Questionnaire the objectives of the thesis were considered. The Questionnaire was structured in nature where every question contained some fixed answer. It contained major 3 parts. The Base line criteria, Gross Motor Function Measure (GMFM-88) - 88 items and Pediatric Balance Scale (PBS):

3.9: Outcome measurement tools

Outcome measurement is the scientific way to find out the change due to any kind of intervention in health research. The tools those have been use to do so will be considering as outcome measurement tool (Maloney & Chaiken, 1999).

3.9.1. The Gross Motor Function Measure (GMFM)-88: The Gross Motor Function Measure (GMFM) is tool which is observational in nature. It is the tool that has been intended to find out the change in gross motor function especially with the children with Cerebral palsy. Two versions are available under this tool, original version that is GMFM-88 and later on another version GMFM-66 was

developed in order to make the administration easy. The numbers is the items of function to measure present in the version of the Question. Cerebral palsy children from 5 months to 16 years can be assessed by this scale. The scale was first introduced in late 1980 for treatment and research purpose. The scale has 5 dimensions of function. Dimension A- Lying and Rolling, B: Sitting, C: Crawling and Kneeling, D: Standing and E: Walking, Running and Jumping. It is a four point scoring system where 0 is does not initiate, 1 is Initiates, 2 is partially completes and 3 is completes. The total score is summed in the area of interest and can be used in statistical way. The Administration is easy. It is rated by therapist. It takes approximately 45 to 60 minutes which will further depend on assessor skill, the situation of child and level of cooperation. Therapists who are experienced in pediatric area and familiar with assessment of motor skill of children with cerebral palsy can use the tool. The necessary equipments are mat, bench, toys, stairs which contains at least 5 steps. Evidence found that GMFM is highly reliable tool. With ICCs of greater than .98 (95% confidence interval=0.965-0.994) and can be used in research and clinical practice. It was also found highly valid tool with an ICC of .99 (95% confidence interval=0.972-0.997) (Ko & Kim, 2013).

According to Russell et al. (2000).It is the observational, therapist rated tool and has proven to be reliable and valid to measure the gross motor functional ability of the children with cerebral palsy from the age 5 months to 16 years.

3.9.2. Pediatric Balance Scale (PBS).

Pediatric balance scale (PBS) has been proven to be reliable and recommended as the measurement tool for measuring the functional balance tasks which are routine components of physical therapy examination. It has good test-retest

reliability and inter-rater reliability. This scale is applicable on the school aged child with the mild to moderate physical impairment. The administration and scoring is easy and quick. Total time taken less than 15 minutes. Moreover it doesn't require any special equipment (Franjoine, Gunther & Taylor, 2003). According to Franjoine et al. (2010) PBS is a 14 item tool used to identify the functional balance and it is most appropriate for 3 to 6 years children. According to Chen et al. (2013), PBS scale is moderately responsive to detect change in balance ability. They recommend the clinician and researchers to use this scale for balance performance change because the changes are true and have clinical meaningfulness. It can effectively find out the post treatment and follow-up changes in the children with cerebral palsy.

3.10. Data collection methods:

The Data was collected by five qualified physiotherapists who were working at indoor pediatric unit of CRP Savar and CRP Mirpur. Different assessors were assigned for Balance and gross motor skill assessment. The questionnaire and the measurement tool were described and trained to the assessors in order have uniform data collection. Only participants were blinded in this study. They were informed that they are the participants of the research but they didn't inform at which group they are belonging to. The Assessor blinding was not possible due to different settings and lack of random allocation. Therefore it can be considered as a single blinded study. The patients who were admitted as inpatient were assessed according to selection criteria. Those who were matched with the criteria were assigned for the experiment from Savar and control group from Mirpur. Some patients from Savar who were matched with the selection criteria but were not interested in hippo therapy were assigned as control participants. The participants were given a written informed

consent and signed the consent form. A face to face interview was conducted to find out the first part of the questionnaire. The Gross motor function and balance were assessed by the assessors in a quite isolated place where participant and the mother were present. The mother and the children were described very well about the whole procedure. It was an interactive sessions among the mother, participants and therapists. After the observation and examination the assessors immediately recorded the information in the given questionnaire. During the entire period of data collection the researcher had no direct contact with the assessors. In case of any trouble solution advices were given through another senior physiotherapist of CRP Mirpur and Savar.

3.11. Intervention:

3. 11. 1: Hippo therapy (Preface):

A personal communication with McKenna Wood, Member Services coordinator of American Hippo therapy Association Inc. was conducted through e-mail. He further referred to another expert Heather Ajzenman who is the head of the research committee of American Hippo Therapy Association in the months of October 2018. They gave consensus that there is no fixed treatment protocol for Hippo therapy. It will entirely depend on the diagnosis, Physical condition of children, functional limitation, and patient's interest, availability of the resource and the aim of the treatment. However they have suggested a scholarly article and suggested to take help for the formulation of treatment protocol Later on another foreign expert physiotherapist, who is a volunteer of CRP suggested many ideas of Hippo therapy and also suggested to continue hippo therapy over a blanket sitting base rather on a saddle.

Horse riding exercises program for children with Cerebral palsy

Children with cerebral palsy will have the most optimal contact with the horse when they don't sit on a saddle but sit on a thick blanket on its back. With the blanket, it normally uses a kind of a belt around the horse (about the same place as the saddle belt) with a 'handle' on top so the child can grip the handle if needed. But the child will always be guided by one person at its left side, one person at its right side.

Hippo therapy group at CRP usually used a Saddle which was very firm and made up of Leather. It had a problem of poor contact between the skin of Horse and the children. The children could not feel the warmth and texture of horse which supposed to be the core elements of hippo therapy. By sitting on a blanket instead of sitting on a saddle, the child can feel the horse's warmth as well as his movements: his respiration movements, the movements while the horse is walking, the movements when the horse is turning around, movements when he stops. To ensure the best effect a blanket sitting base was designed and produced from CRP orthotic and prosthetic unit which was used to the entire therapy sessions. The children liked to sit on blanket rather sit on a saddle.

The Hippo therapy was conducted by a group of qualified physiotherapist, occupational therapist, highly experienced horse man, students volunteers, mother of children and Ayes (female facilitator). First a briefing and training session were conducted. Researcher explained the aim and objective of the study to the hippo therapy provider group and Practical session demonstrated how to continue the exercises practically. A pictorial treatment protocol that has been developed was provided to them as well. The control group treatment was monitored by the two senior physiotherapists from the two settings.

The exercises such as Riding over horse and try to sit upright as much as possible, Making head movements: rotating head to left, then to right, 'looking' down, 'looking' up, Feeling the horse's head, between the horse's ears: first one hand, then the other hand, then both hands, Feeling the horse's back, as far as possible to its tail: first one hand, then the other hand, Make trunk rotations with arms close to body and then make trunk rotations with arms widespread left-right. Putting knee high up, then down with one leg at a time and when the balance has been improved: putting both knees high up and down, Reaching practice for interesting object forward and sideways, lying prone onto the neck of the horse and lying backwards onto the trunk of the horse were conducted. Each participant got 30 minutes of hippo therapy along with conventional therapy in total 8 sessions in 3 weeks time. First all exercises were performed while the horse is standing still, then all movements when the horse stepped slow speed forward and later phase when the horse walked on a big round stepping first to the left, then to the right.(Please see on Appendix A)

3.11.2: Conventional therapy (Gross motor function and balance)

1. Stretching exercise.
2. Passive ROM exercise.
3. Free active and resisted exercise.
2. Normal movement and function facilitation exercise-rolling, crawling, sitting, standing etc.
3. Sitting, standing balance practice using different tool such as physioball, mini-trampoline, balance board, Gait training.

4. Mother education

5. Group therapy.

3.12. Ethical Issues

This research project was conducted by the guidelines of Medical Research Council (BMRC) and World Health Organization (WHO) Research guidelines. The proposal of the dissertation including methodology was presented to the Institutional Review Board (IRB) of Bangladesh Health Professions Institute (BHPI) (Appendix- A). Prior to Data collection researcher obtained permission (Appendix- B) from the head of physiotherapy Department to access patient data based management and allow full involvement of Physiotherapist who have been working in Pediatric Department of CRP Savar and Mirpur. A copy of the Departmental head permission letter was mailed to CRP Mirpur Centre Manger for his concern. The Study was strictly followed the organizational rules and regulation. A written consent was taken from each mother of participants and those who agreed only involved in the study (Appendix-C). They also informed that they can withdraw their participation at any time if they needed. The autonomy and malfeasance were ensured. They were ensured that withdrawal of participation from the study did not affect their treatment in the physiotherapy department and they still had the chance to receive same facilities. Every subject had the opportunity to discuss their problems with the senior authority or administration of CRP and had any questioned answer to their satisfaction. The entire data collection period the researcher didn't have any communication with the participants. The assessors and 2 senior physiotherapists conducted the whole data collection process. The study did not interfered the regular treatment sessions therefore no participant was deprived from usual service. The

information of the participants kept confidential and maximum care was taken to make the participants comfortable. No harmful event took place as strong precaution was taken in order to prevent fall or any type of injury.

3.13. Informed Consent:

It is the process of taking permission verbal or written prior to any intervention and health related research. Taking consent from participants is very important for conducting research (Bowling, 1997). In this research the researcher provided a consent letter to every mother and taken their written consent. The data collector read the consent from them and they also went through the letter and signed prior to data collection. They were informed that this will be a voluntary participial for them. Their information will kept confidence and in case of any emergency they can withdraw themselves without any negative effect on their regular treatment. Information might be published in the way of presentation or writing format but they did not be identified. The study results may not have any direct effects on them but the members of Physiotherapy population may be benefited from the study in future. The study will not cause any harm of children. If they have any question they can ask the concern authority.

3.14. Data Analysis:

3.14.1. Software: Statistical analysis was performed by using statistical package for social science (SPSS) version 20.

3.14.2. Statistical tests: Statistical analysis refers to the well-defined organization and interpretations of the Data by systemic and mathematical procedure and rules (DePoy and Gitlin, 2015).

A descriptive statistical analysis done to assess for the socio-demographic part of the thesis and were presented in table, pie chart, bar chart. Column with short description.

The Inferential statistical analysis was conducted to compare the mean difference of within group and between groups resulting from the interventions. The parametric tests that are paired t-test and independent sample t-test were conducted. To compare within group difference paired t test and to compare between group difference Independent sample t tests were performed (Hicks, 2009).The test assumptions were done for pair t test - the variables were paired, quantitative and appropriately normally distributed. On the other side for independent sample t test the assumptions were independent or different variables, Quantitative data and approximately normally distributed. The researcher had calculated the variables mean, mean difference, standard deviations, standard error, degree of freedom and significant level to show the trial group and control group mean difference and within group difference and their statistical significance.

3.15. Level of Significance

5% level of significance was considered by researcher in this study to test the hypothesis. The value at 5% significance will be considered as p value. In order to find out the significance of the study, the “p” value was calculated. The p Values refer to the probability of the results for experimental study. The word Probability refers to the accuracy of the findings. A “p” value is called level of Significance for an experiment and a p value of <0.05 was accepted as significant result for health service research. If the p value is equal or smaller than the significant Level, the results are said to be significant (DePoy and Gitlin, 2015).

In the following way the researcher has analyzed the data.

3.16. Data summery

In the following way the researcher has performed the statistical test and presented in table:

3.16. 1: Table-I: Gross Motor Function Measure (GMFM-88)-Paired sample test

Variable	Trial Group					Control group			
	Mean	SD	t	Sig(2 tailed)	df	Mean	SD	t	Sig(2 tailed)
D-A: Lying and Rolling	10.400	4.733	8.510	.000*	14	3.33	3.132	4.122	.001*
D-B: Sitting	10.600	5.026	8.169	.000*	14	2.600	1.404	7.172	.000*
D-D: Standing	3.200	3.234	3.833	.002*	14	4.267	3.674	4.498	.001*
D-E: Walking And Running	.800	.676	4.583	.000*	14	.933	.704	5.137	.000*

D=Dimension, SD=Standard deviation, df=degree of freedom, *significant.

3.16. 2. Table-II- Gross Motor Function Measure (GMFM-88)-Independent

Sample t test.

Dimension	Variable	Mean differen ce	t	df	Sig. (2- tailed)
Dimension A	Lying and Rolling Pretest	1.200	352	28	.728
	Lying and Rolling posttest	8.267	3.345	28	.002*
Dimension B	Sitting Pretest	1.333	365	28	.718
	Sitting posttest	9.333	3.012	28	.005*
Dimension D	Standing Pretest	2.933	1.112	28	.276
	Standing Posttest	1.867	.709	28	.484
Dimension E	Walking and Running Pretest	1.333	.352	28	.728
	Walking and Running posttest	1.200	.319	28	.752

D=Dimension, SD=Standard deviation, df=degree of freedom, *significant.

3.16. 3: Table III-Pediatric Balance Scale (PBS)-Paired sample t test

Variable	Mean		SD		t		df	Sig. (2-tailed)	
	Trial	Control	Trial	Control	Trial	Control		both	Trial
1. Sit to stand	.800	.467	.561	.516	5.527	3.500	14	.000*	.004*
2. Stand to sit	.733	.200	.458	.414	6.205	1.871	14	.000*	.082*
3. Transfer	.667	.400	.488	.507	5.292	3.055	14	.000*	.009*
4. Standing unsupported	.733	.467	.458	.516	6.205	3.500	14	.000*	.004*
5. Sitting unsupported	.867	.400	.352	.507	9.539	3.055	14	.000*	.009*
6. Standing eye closed	.333	.267	.488	.458	2.646	2.256	14	.019*	.041*
7. Standing with feet together	.400	.333	.507	.488	3.055	2.646	14	.009*	.019*
8. Standing one foot in front	.267	.133	.458	.352	2.256	1.468	14	.041*	.164
9. Standing on one foot	.267	.067	.458	.258	2.256	1.000	14	.041*	.334
10. Turning 360 degree	.533	.267	.516	.458	4.000	2.256	14	.001*	.041*
11. Turning to look behind	.533	.333	.516	.488	4.000	2.646	14	.001*	.019*
12. Retrieving object from floor	.133	.067	.352	.258	1.468	1.000	14	.164*	.334
13. Placing alternate foot on a stool	.067	.067	.258	.594	1.000	.435	14	.334	.670
14. Reaching forward with outstretched arm	.467	.267	.743	.458	.467	2.256	14	.029*	.041*

D=Dimension, SD=Standard deviation, df=degree of freedom, *significant.

3.16.4: Table-IV: Pediatric Balance Scale (PBS) -Independent sample t test

SL no	Variable	Mean difference	t	df	Sig. (2-tailed)
1(a)	Sit to stand Pretest	.067	.292	28	.772
1(b)	Sit to stand Posttest	.400	2.223	28	.034*
2(a)	Stand to sit Pretest	.000	.000	28	1.000
2(b)	Stand to sit posttest	.533	2.296	28	.029*
3(a)	Transfer pretest	.133	.642	28	.526
3(b)	Transfer posttest	.400	2.683	28	.012*
4(a)	standing unsupported pretest	.133	.656	28	.517
4(b)	Standing unsupported posttest	.400	2.103	28	.045*
5(a)	Sitting unsupported pretest	.067	.354	28	.726
5(b)	Sitting unsupported posttest	.400	2.316	28	.028*
6(a)	Standing with eye closed pretest	.000	.000	28	1.000
6(b)	Standing with eye closed posttest	.067	.323	28	.749
7(a)	Standing with feet together pretest	.200	1.197	28	.242
7(b)	Standing with feet together posttest	.267	1.169	28	.252
8(a)	Standing one foot in front pretest	.000	.000	28	1.000
8 (b)	Standing one foot in front posttest	.413	.714	28	.481
9 (a)	Standing on one foot pretest	.067	.354	28	.726
9 (b)	Standing on one foot posttest	.133	.756	28	.456
10 (a)	Turning 360 degree pretest	.067	.386	28	.702
10 (b)	Turning 360 degree posttest	.333	1.538	28	.135
11(a)	Turning to look behind pretest	.067	.357	28	.724
11(b)	Turning to look behind posttest	.133	1.058	28	.299
12(a)	Retrieving object from floor pretest	.067	.386	28	.702
12(b)	Retrieving object from floor posttest	.133	.727	28	.473
13(a)	Placing alternate foot on a stool pretest	.133	.807	28	.426
13(b)	Placing alternate foot on a stool posttest	.133	.756	28	.456
14(a)	Reaching forward with outstretched arm pretest	.067	.367	28	.716
14(b)	Reaching forward with outstretched arm posttest	.267	1.673	28	.105

3.17. Quality control and assurance

The Researcher has acquired a good knowledge background regarding this study from literature. Therefore every relevant information were described and presented elaborately. The structured format of questionnaire was able to find out definite information from the participants. The Questionnaire was formulated according to the objective of the researcher and the Good Quality scholarly articles in the relevant area. Moreover expert opinions from experienced physiotherapist of home and abroad, thesis supervisor and senior colleagues were taken. There was no problem in understanding of English language of the outcome measurement scale therefore translation into Bangla was not performed. The assessors were quite confident with the outcome measurement tools as those were very easy and familiar to them. The investigator tried to avoid selection bias by strictly maintained inclusion and exclusion criteria. The study was avoided conflict the selection of the participants. The data was collected by qualified physiotherapists of the concern areas.

3.18: Phases of the clinical trial.

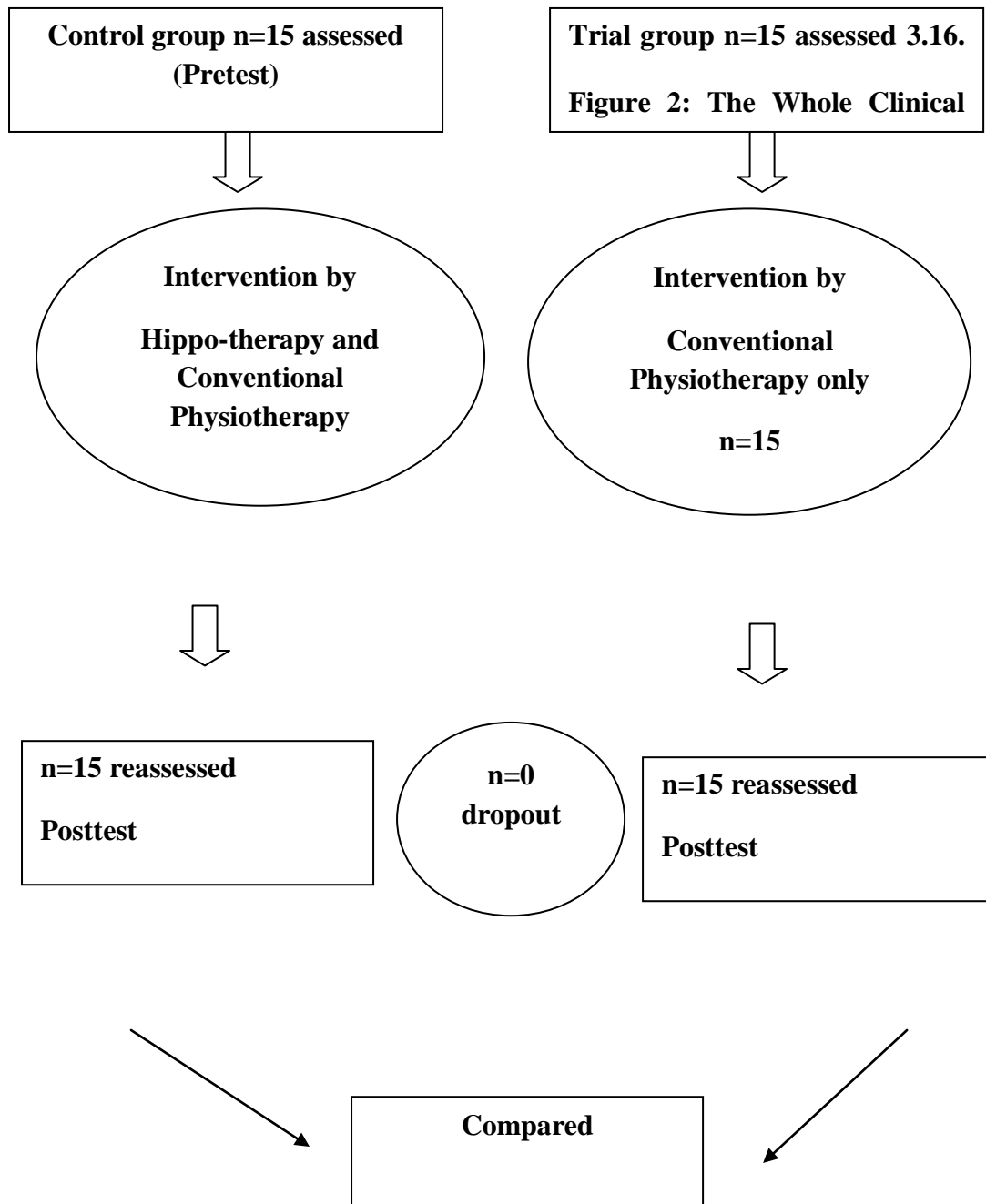


Fig 2: Flow chart of phases of clinical trial.

The thesis project was conducted to compare the Effectiveness of hippo therapy and conventional physiotherapy with conventional physiotherapy on Gross motor function and Balance in the children with Cerebral palsy. To conduct this thesis work in-patients of pediatric department of CRP (Savar and Mirpur) were selected as participants and were given intervention. For this study 30 Cerebral palsy participants were assessed two times: pre intervention and post intervention and compared the outcome within and between group immediate after the 8 sessions of treatment in 2 weeks period of time. The researcher was also able to find out the socio-economic status and base line characteristics and those were presented by tables, chart, Column in order to give readers at a glance idea in the following section. Both Descriptive and inferential statistical analysis were carried out accordingly to find out the p value. P value that is equals or less than .05 was considered as significant.

4.1. Table V: Comparison of baseline characteristic of participants

Variable(s)	Trial group (n=15)	Control group (n=15)	p
Age (months)- Mean(SD)	68.53 ± 31.665	64.47 ± 30.4	0.67
Gender	Male 10 (67%) Female 5 (33%)	Male 9 (60%) Female 6 (40%)	0.47
Height (cm), mean, SD	96.87±30.32	104.80 ± 16.71	0.27
Weight (KG), mean, SD	19.60±6.854	18.73 ±6.508	0.46
GMFS level- II, III, IV, percentage	II=7(47%) III=5 (33%) IV=3 (20%)	II=6 (40%) III=6 (40%) IV=3 (20%)	0.63
Type of CP	Spastic Quadriplegic=5 (33%) Spastic Diplegic=5 (33%) Spastic Hemiplegic=4 (27%) Ataxic=0 Dyskinetic =1 (7%)	Spastic Quadriplegic=5(33%) Spastic Diplegic=5(33%) Spastic Hemiplegic=4(27%) Ataxic=1 (7%) Dyskinetic =0	0.98

4.2. Socio-demographic Information

4.2. 1. Occupation of Parents

4. 2. 1. a. Occupation of Father

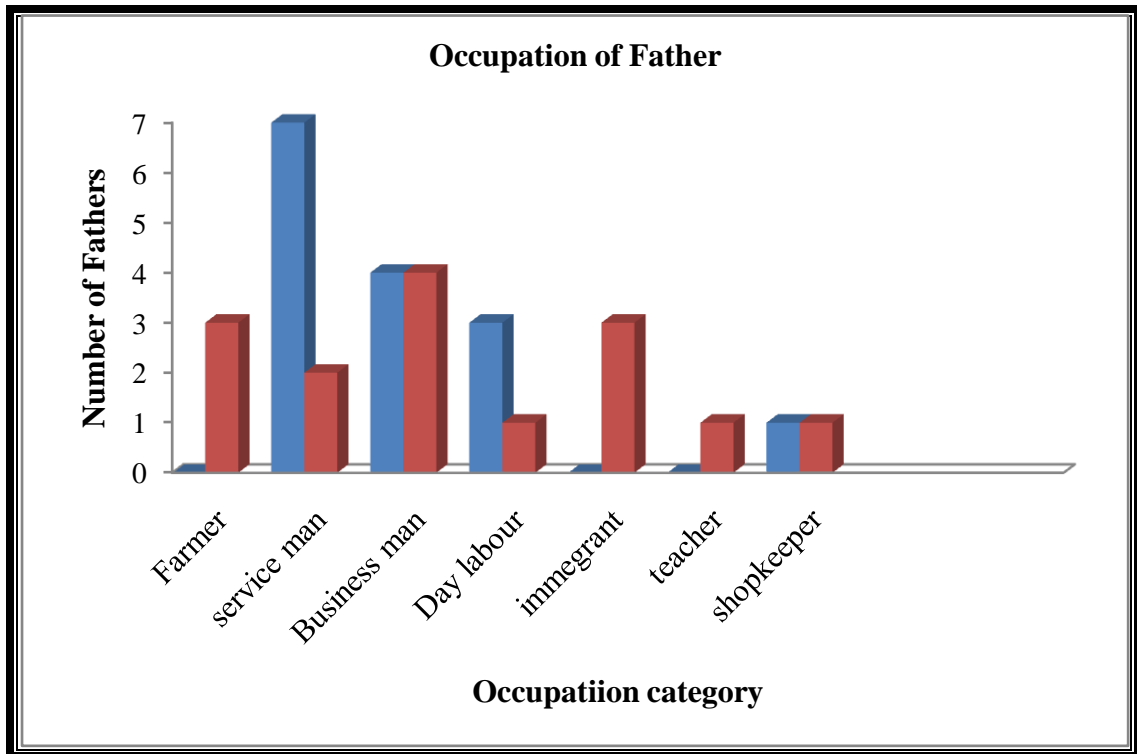


Figure 3: Occupations of Father

Figure 3 showed the number of different occupation of fathers divided into trial and control group. Among 30 participants farmer was 0 in trial group and 3 were in control group. Service holders in trial group were 7 and in control group were 2, Business men in trial group were 4 and in control group were 4, Day labors in trial group were 3 and in control group were 1, Immigrant in trial group was 0 and in control group were 3. Teacher in trial group was 0 and in control group was 1. Shopkeeper in trial group was 1 and in control group was 1.

4.2.1. b. Occupation of Mother

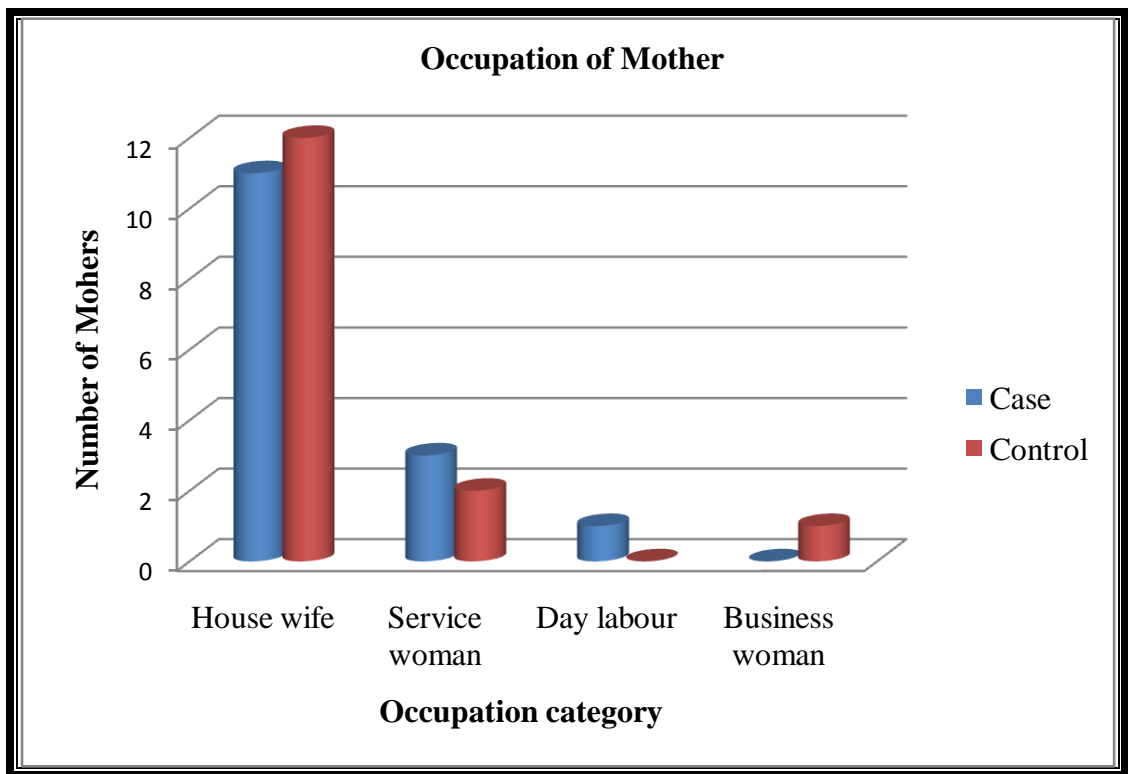


Figure 4: Occupation of Mother

Figure 4 showed the comparison of occupation of mother between case and control group. Among 30 mothers in case group House wife was 11, in control group house wife was 12. Service holder in case group was 3 and control group 2. Day labor in case group was 1 and in control group was 0. Business woman in case group was 0 and in control group was 1.

4.2.2. Level of Education

4.2.2. a.: Father Education

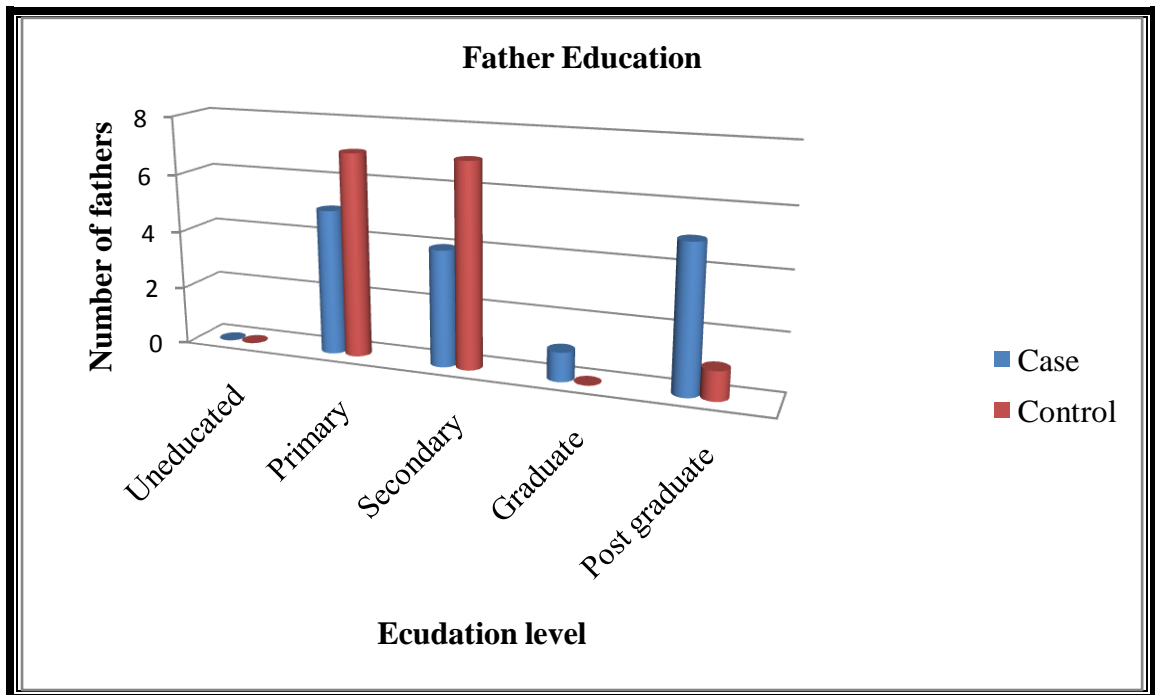


Figure: 5: Father Education level

Figure 5 displayed the different education status and their frequency of fathers of participants separately. In case group uneducated 0 and in control group uneducated 0. The number of Primary completed father was found in case group 5, and in control group 7. Secondary completed father in case group was 4 and in control group was, In case group the number of graduate father was 1 and in control group was 0. Number of postgraduate father was found in case group was 5 and in control group was 1.

4.2.2. b. Mother Education

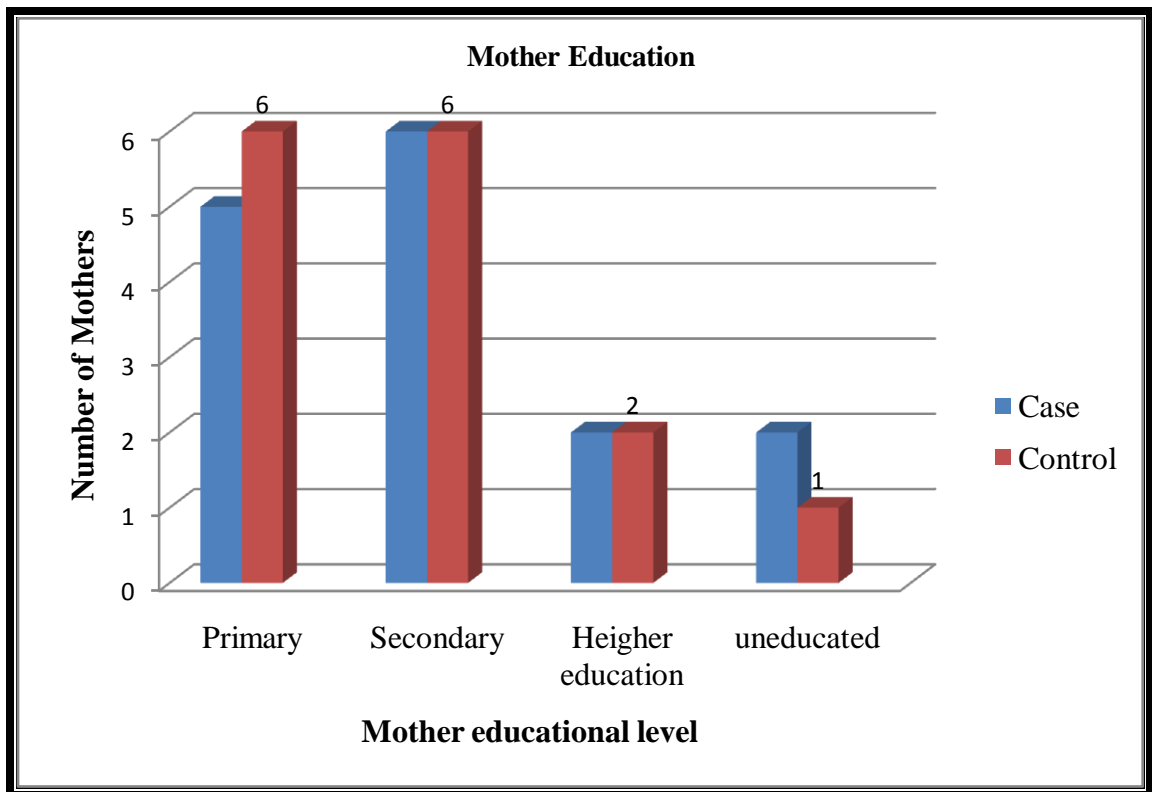


Figure 6: Mother Educational level

Figure 6 displayed the educational level of mother and the frequency of the mothers of participants holding the educational level separate into case and control group. In case group primary educated was found 5 and in control group primary educated was 6. Secondary educated in case group was found to be 6 where in control group it was 6. Higher educated mother was found in case group 2 and in control group was 2 as well. The number of uneducated mother in case group was 2 and in control group was 1.

4. 2. 3. Residence area

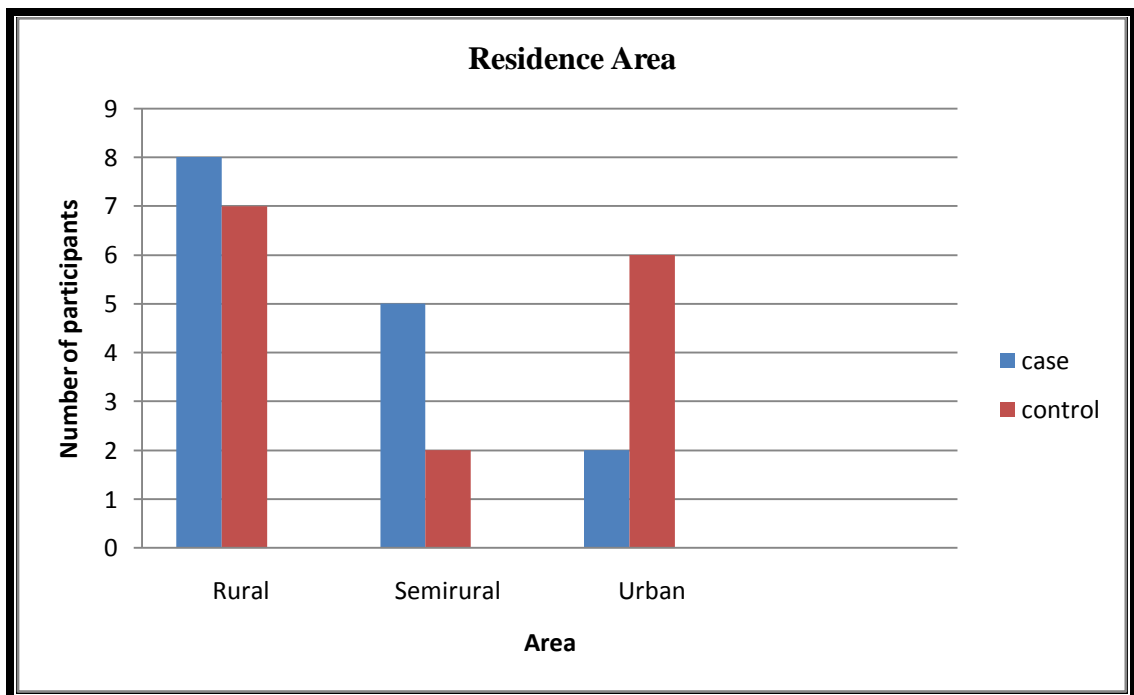


Figure- 7: Residence area of participants

Fig 7 demonstrates the residence area of participants in case and control group. In case group 8 participants came from rural where in control group 7 came from rural area. 5 participants in case group came from semirural and 2 participants in control group from semirural area. From Urban area 2 participant of case group came and 6 participants in control group came from urban area.

4.2.4. Social status of participants

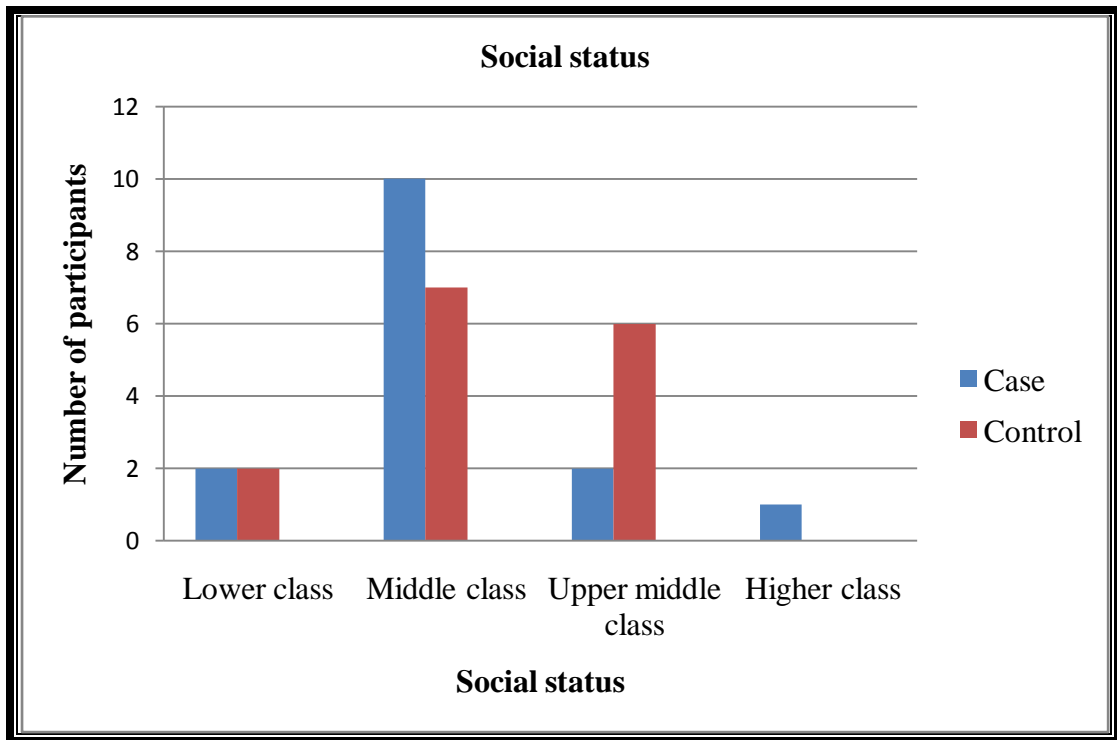


Figure 8: Social status of participants

Figure 8 explored the social status of participants in case and control group. Among 30 participants in case group 2 belong to lower class and in control group 2 from lower class. In case group 10 from middle class where 7 participants of control group from middle class. 2 participants from case group came from upper middle class and 6 participants from control group came from upper middle class. In case group 1 participant came from higher class and in control group 0 participants from higher class.

4.2.5. Family type

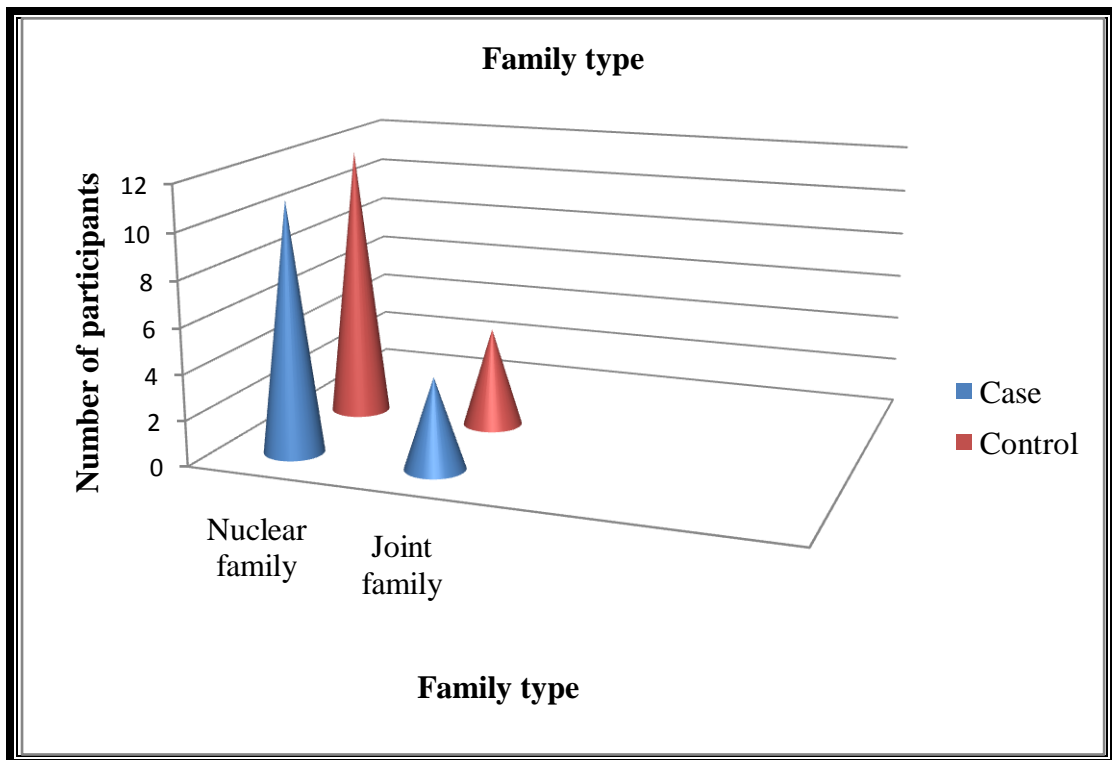


Figure 9: Family type of participants

Figure 9 showed the type of family that the case and control participants belong to. Among 30 participants in case group 11 participants from Nuclear family and in control group 12 is from nuclear family. The number of participants from joint family in case group is 4 and the number of participants from joint family in control group 3.

4. 2. 6. Parents Monthly Income

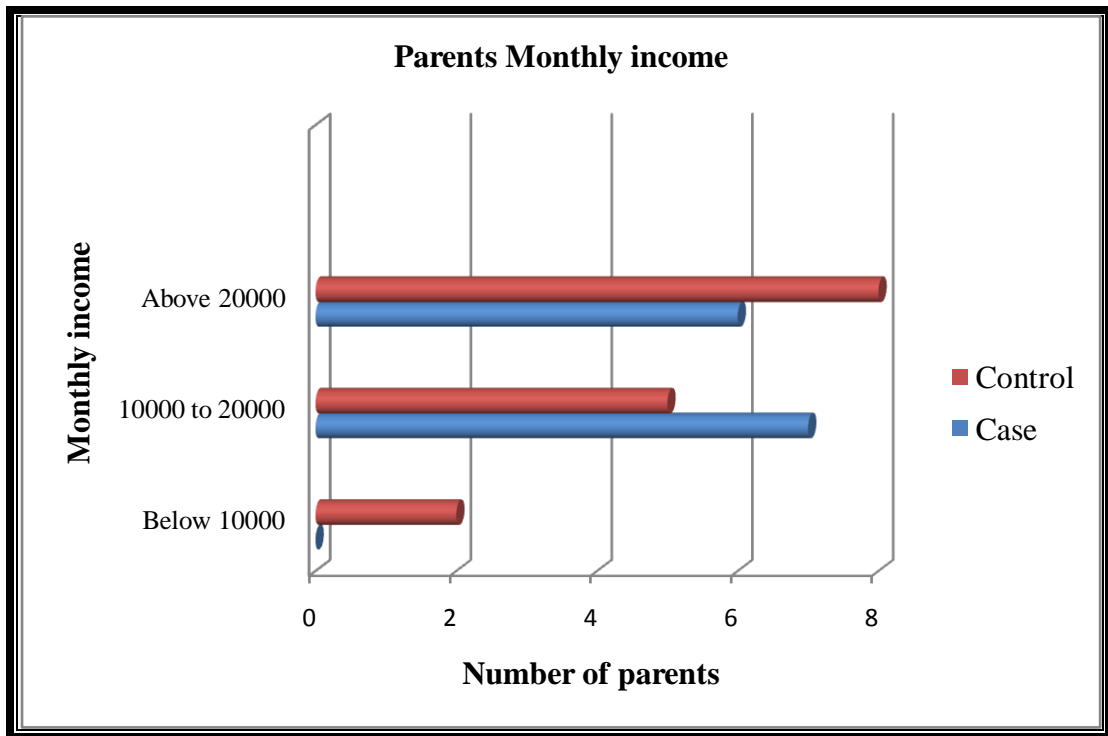


Figure 10: Parents Monthly income

Fig 10 displayed in case group among 15 parents 2parent has monthly income below 10000 BDT, 7have income 10000 to 20000 BDT, and 6have above 20000 BDT. In Control group among 15 parents 2 parent has monthly income below 20000 BDT, 5 have income 10000 to 20000 BDT, and 8have above 20000 BDT.

4.2.7: Mode of Delivery.

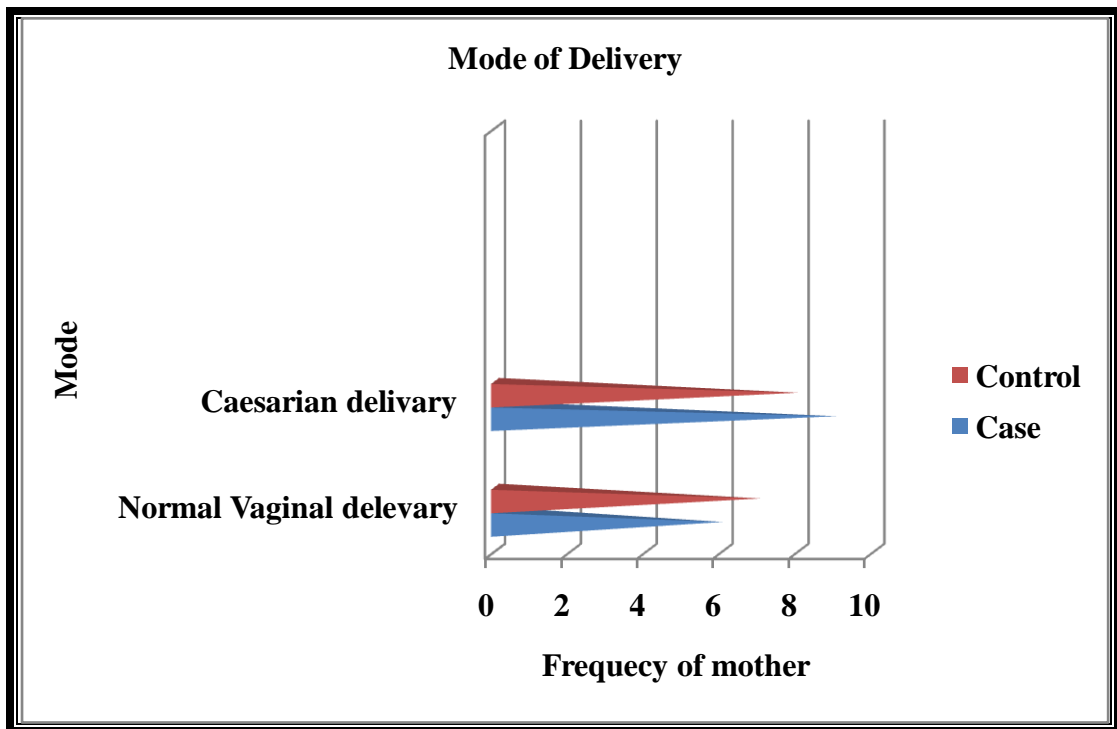


Figure 11: Mode of Delivery.

Figure 11 demonstrates the mode of delivery in case and control group. In case group 6(40%) mothers had normal vaginal delivery and 9(60%) mothers had caesarian delivery. On the other hand control group 7(47%) mothers had normal vaginal delivery and 8 (53%) mothers had caesarian delivery.

4.2.8. Place of Delivery

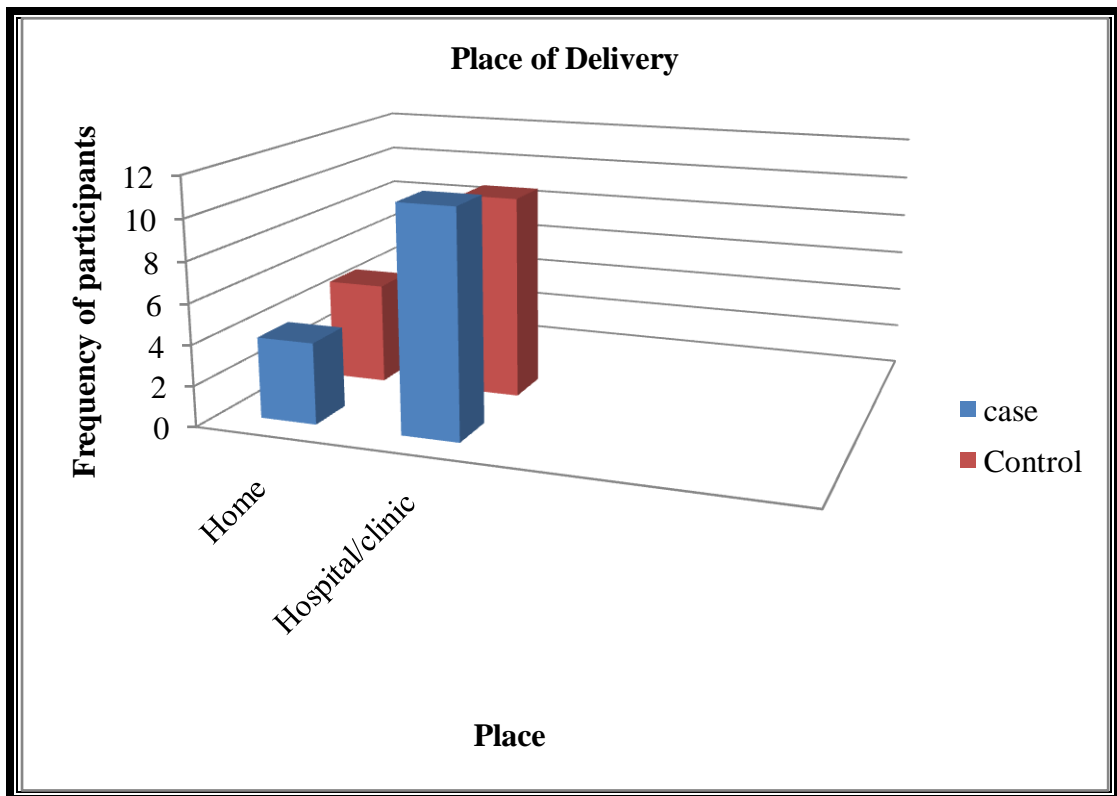


Figure 12: Place of Delivery.

In figure 12 the place of delivery has been displayed. It was found that in case group 4(27%) participant was delivered at home and 11(73%) delivered at hospital or clinic. In control group 5(33%) delivered at home and 10(67%) delivered at hospital or clinic.

4.2.9. Birth History (Possible cause of Brain damage)

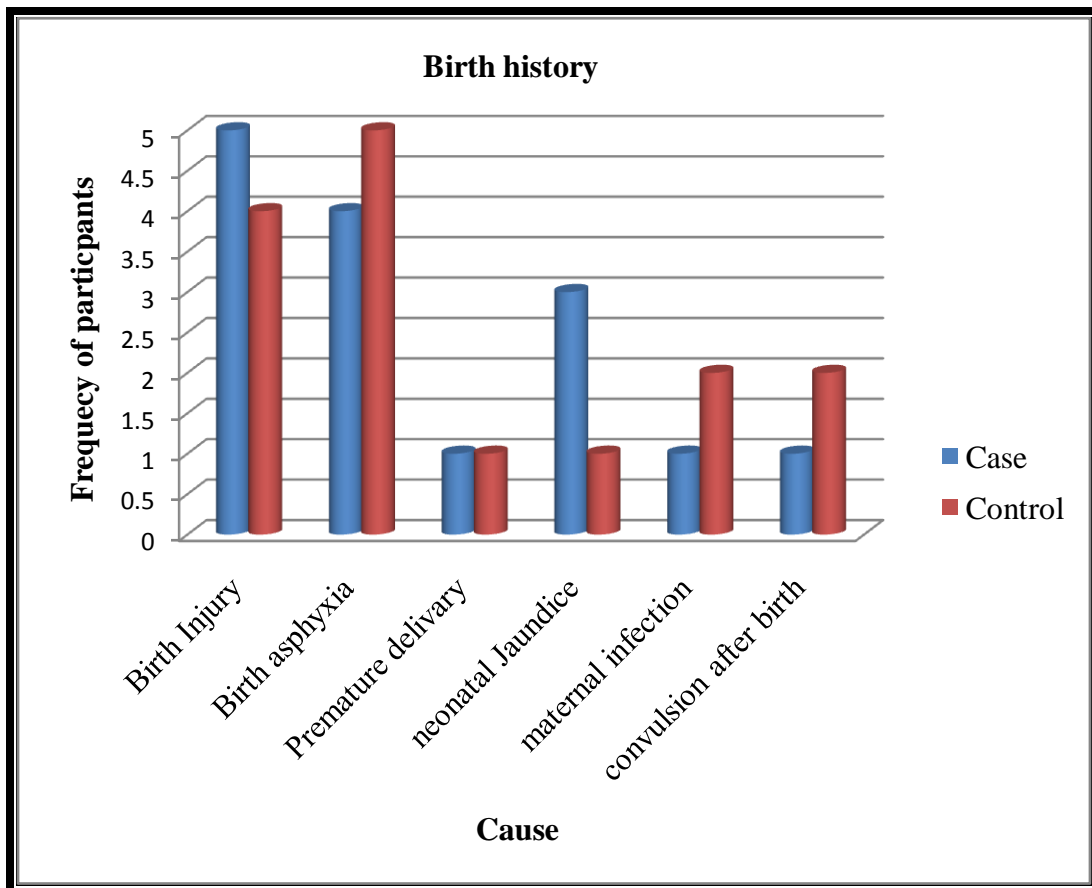


Figure 13: Birth History (cause).

Figure 13 displayed the different causes they the mother mentioned in birth history section. The chart is showing the comparison between case and control group. In case group 5(33.3%) had birth injury during delivery, 4(26.7%) had birth asphyxia, 1(6.7%) had premature delivery, 3(20%) had prolong labor, 1(6.7%) had maternal infection, 1(6.7%) had convulsion disorder after birth. In control group 4(26.7%) had birth injury during delivery, 5(33.3%) had birth asphyxia, 1(6.7%) had premature delivery, 1(6.7%) had neonatal Jaundice, 2 (13.3%) had maternal infection, 2(13.3%) had convulsion disorder after birth.

4.2.10. Siblings with disability

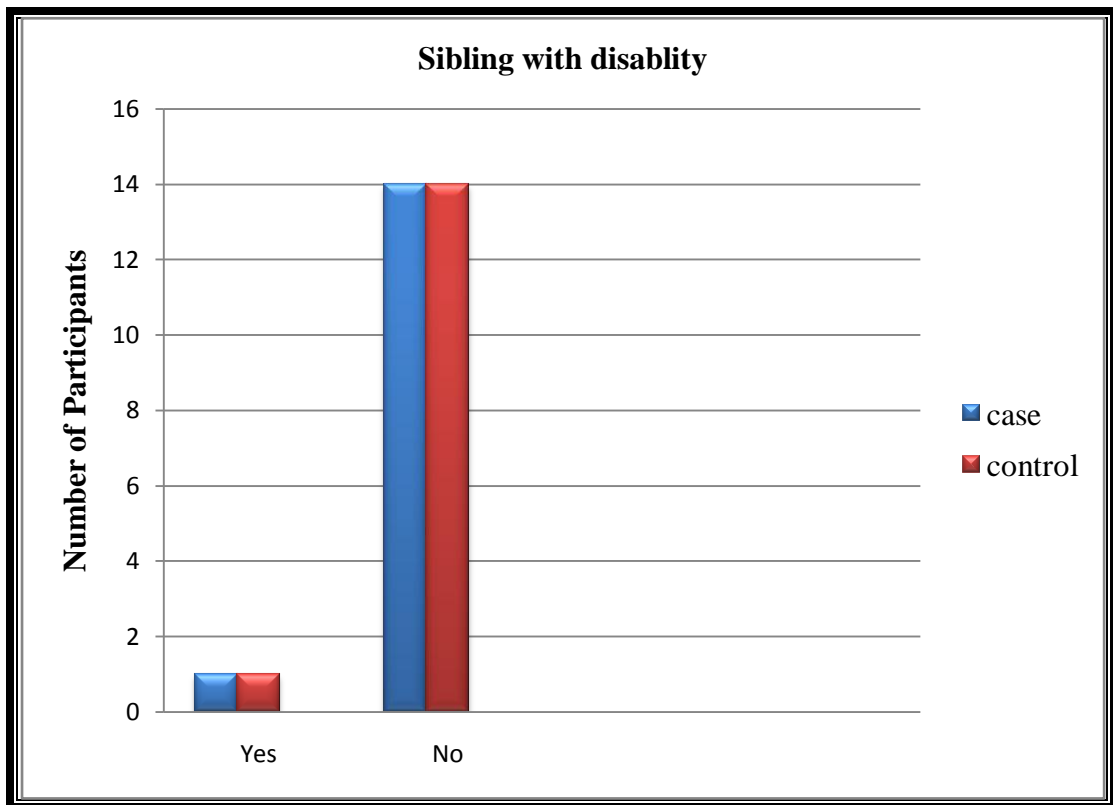


Figure 14: Sibling with disability.

Figure 14 has showed the presence of disable sibling of the participants. In case group 1(6.7%) child had disable sibling and in control group also had 1(6.7%) sibling with disability.

4.3. Gross Motor Function Measure (GMFM-88)

4.3.1. Table VI: Gross Motor Function Measure (GMFM-88) Dimension A

(Lying and Rolling)-Paired sample t test

		Trial Group				Control group		
D	Variable	Mean SD	t	Sig(2tailed)	df	Mean SD	t	Sig (2 tail)
D=	Lying	10.400	8.510	.000*	14	3.33	4.122	.001*
A	and Rolling	4.733				3.132		

D=Dimension, SD=Standard deviation, df=degree of freedom, Significant.*= result is

Significant

Table IV is showing the calculated t value of trial group is (8.510) which has a corresponding probability value or p value which is (.000). In base line pretest mean score for trial group is 35.87 and posttest mean score is 46.27 with mean difference 10.4. 5% level of significance at 14 degrees of freedom standard t value was 2.145. As the calculate t value is greater than standard t value and p= .000 which is less than 0.05 the result is significant and the null hypothesis (no difference within group) is rejected and the alternative hypothesis (there is difference within group) is accepted. Therefore it can be concluded that 2 weeks, 8 sessions hippo therapy combined with conventional physiotherapy is significantly effective to improve lying and rolling function in the children with cerebral palsy. Second part of the table is showing the calculated t value of control group is (4.122) which also has a corresponding probability value or p value that is .001. The mean pretest score of control group is 34.67, posttest mean 38 with mean difference 3.33.5% level of significance at 14

degrees of freedom standard t value was 2.145. As the calculate t value is greater than standard t value and $p=.001$ is less than 0.05, the result is considered as significant and the null hypothesis is rejected and at the same time alternative hypothesis is accepted. This section concludes that conventional physiotherapy also effective in improving lying and rolling function in the children with cerebral palsy.

4.3.2. Table VII: Gross Motor Function Measure (GMFM-88) Dimension A

(Lying and Rolling). Independent sample t test

D	Variable	Mean difference	t	df	Sig. (2-tailed)
D-A	Lying and Rolling Pretest	1.200	352	28	.728
	Lying and Rolling posttest	8.267	3.345	28	.002*

D=Dimension, df=degree of freedom, * Significant.

The table is showing lying and rolling between group analyses. Here lying and rolling pretest between group mean difference is 1.200, calculated $t=352$ and corresponding $p=.728$. The findings showing that there was no base line pretest statistical difference but after 2weeks/8 sessions of hippo therapy posttest findings of mean difference is 8.267, $t=3.345$ and $p=.0025\%$ level of significance at 28 degrees of freedom standard t value was 2.048. Here the calculated t value is greater than standard t value therefore the null hypothesis (no difference) is rejected and alternative hypothesis (difference exists between groups) is accepted. More over the trial group mean difference is more than control group mean difference. Therefore it is proven that 2 weeks/8sessions hippo therapy with conventional physiotherapy is more effective than conventional physiotherapy alone to improve the lying and rolling function in the children with cerebral palsy.

4.3.3. Table VIII: Gross Motor Function Measure (GMFM-88) Dimension B

(Sitting) paired sample t test.

D	Variable	Trial Group					Control group				
		Mean	SD	t	Sig (2tail)	df	Mean	SD	t	Sig (2 tail)	
D=B	Sitting	-10.600	5.026	8.169	.000*	14	2.600	1.404	7.172	.000*	

D=Dimension, SD=Standard deviation, df=degree of freedom, *Sig

In this section the calculated $t = 8.169$, $p = .000$ in trial group and at base line mean value of trial group is 42.53, posttest mean 53.13 with mean difference 10.65% level of significance at 14 degrees of freedom standard t value was 2.145. As the calculate t value is greater than standard t value and $p = .000$ which is less than 0.05 the null hypothesis (There is no difference within group) can be rejected and the alternative hypothesis (there is difference within group) is accepted. Therefore it can be concluded that 2 weeks, 8 sessions hippo therapy combined with conventional physiotherapy is significantly effective to improve sitting function in the children with cerebral palsy. In Control group calculated $t = 7.172$, $p = .000$ and at base line mean pretest value 41.20, posttest value 43.80 with mean difference of 2.6. As $P < .05$, null hypothesis (There is no difference within group) can be rejected and the alternative hypothesis (there is difference within group) is accepted. Therefore it can be concluded that 2 weeks conventional physiotherapy is significantly effective to improve sitting function in the children with cerebral palsy.

4.3.4. Table IX: Gross Motor Function Measure (GMFM-88) Dimension B

(Sitting) Independent sample t test.

Dimension	Variable	Mean difference	t	df	Sig. (2-tailed)
Dimension B	Sitting Pretest	1.333	.365	28	.718
	Sitting posttest	9.333	3.012	28	.005*

df=degree of freedom, *significant.

The table is showing sitting between group analyses. Here sitting pretest between group mean difference is 1.333, calculated $t=.365$ and corresponding $p=.718$.5% level of significance at 28 degrees of freedom standard t value was 2.048 where the calculated t value is less than standard t value. So the findings showing that there was no base line pretest statistical difference but after 2 weeks of intervention post test findings of mean difference is 9.333, $t=3.012$ and $p=.005$.5% level of significance at 28 degrees of freedom standard t value was 2.048. Here the calculated t value is greater than standard t value therefore the null hypothesis (no difference) is rejected and alternative hypothesis (difference exists between groups) is accepted. More over the trial group mean difference is more than control group mean difference. Therefore it is proven that 2 weeks/8sessions hippo therapy with conventional physiotherapy is more effective than conventional physiotherapy alone in improving sitting function in the children with cerebral palsy

4.3.5. Table X: Gross Motor Function Measure (GMFM-88) Dimension D (Standing) paired sample t test.

D	Variable	<u>Trial Group</u>				Control group				
		Mean	SD	t	Sig(2 tail)	df	Mean	SD	t	Sig (2 tail)
D=D	Standing	3.200	3.234	3.833	.002*	14	4.267	3.674	4.498	.001*

D=Dimension, SD=Standard deviation, df=degree of freedom, *Sig.

In this table trial and control group standing scoring statistics were shown. In trial group the calculated $t=3.833$, $p=.002$, $mean=3.200$. 5% level of significance at 14 degrees of freedom standard t value was 2.145. The observed value here is greater than the standard t value and also $p<0.05$ so the null-hypothesis is rejected and alternative hypothesis is accepted. This section concluded that Hippo therapy combined with conventional therapy is effective in improving standing ability in the children with cerebral palsy. In control group on the other hand has $t=4.498$, $p=.001$ and $mean=4.267$. 5% level of significance at 14 degrees of freedom standard t value was 2.145. The observed value here is greater than the standard t value and also $p<0.05$ so the null-hypothesis is rejected and alternative hypothesis is accepted. This section concluded that conventional physiotherapy is effective in the improvement of standing function in the children with cerebral palsy.

4.3.6. Table XI: Gross Motor Function Measure (GMFM-88) Dimension D

(Standing) Independent sample t test.

Dimension	Variable	Mean difference	t	df	Sig. (2-tailed)
Dimension	Standing Pretest	1.867	.709	28	.484
D	Standing Posttest	2.933	1.112	28	.276

df=degree of freedom, *significant.

This table is demonstrating standing between group analyses. Here standing pretest between group mean difference is 1.867, calculated $t=.709$ and corresponding $p=.484$. 5% level of significance at 28 degrees of freedom standard t value was 2.048 where the calculated t value is less than standard t value. In this case the null hypothesis is accepted and alternative hypothesis is rejected. So the findings showing that there was no base line pretest statistical difference and after 2weeks of intervention post test findings of mean difference is 2.933, $t=1.112$ and $p=.276$. 5% level of significance at 28 degrees of freedom standard t value was 2.048. Here the calculated t value is also smaller than standard t value therefore the null hypothesis is accepted and alternative hypothesis is rejected. So we can conclude that there is no difference in the effectiveness of hippo therapy combined with conventional physiotherapy and conventional physiotherapy alone in the improvement of standing function in the children with cerebral palsy.

4.3.7. Table XII: Gross Motor Function Measure (GMFM-88) Dimension E

(Walking and Running) paired sample t test.

D	Variable	<u>Trial Group</u>		Control group						
		Mean	SD	t	Sig(2tailed)	df	Mean	SD	t	Sig(2tail)
D=E	Walking And Running	.800	.676	4.583	.000*	14	.933	.704	5.137	.000*

D=Dimension, SD=Standard deviation, df=degree of freedom, *Sig

In this section the in trial group calculated $t = 4.583$, $p = .000$ mean is .800.5% level of significance at 14 degrees of freedom standard t value was 2.145. As the calculate t value is greater than standard t value and $p = .000$ which is less than 0.05 the null hypothesis (There is no difference within group) can be rejected and the alternative hypothesis (there is difference within group) is accepted. Therefore it can be concluded that 2 weeks, 8 sessions hippo therapy combined with conventional physiotherapy is significantly effective to improve walking and running function in the children with cerebral palsy. In control group calculated $t = 5.137$, $p = .000$, mean .933.5% level of significance at 14 degrees of freedom standard t value was 2.145. Here also the observed t value is greater than the standard t value additionally $P < .05$. Therefore null hypothesis (There is no difference within group) can be rejected and the alternative hypothesis (there is difference within group) is accepted. Finally it can be concluded that 2 weeks of conventional physiotherapy is effective in the improvement of walking and running function in the children with cerebral palsy.

4.3.8. Table XIII-Gross Motor Function Measure (GMFM-88) Dimension E

(Walking and Running) Independent sample t test.

Dimension	Variable	Mean difference	t	df	Sig. (2-tailed)
Dimension E	Walking and Running Pretest	1.333	.352	28	.728
	Walking and Running posttest	1.200	.319	28	.752

D=Dimension, SD=Standard deviation, df=degree of freedom, *significant.

This section is showing walking and running between group analyses. Here pretest between group mean difference is 1.333, calculated $t=.352$ and corresponding $p=.728$. 5% level of significance at 28 degrees of freedom standard t value was 2.048 where the calculated t value is less than standard t value. In this case the null hypothesis is accepted and alternative hypothesis is rejected. So the findings showing that there was no base line pretest statistical difference and after 2 weeks of intervention post test findings of mean difference is 1.200, $t=.319$ and $p=.752$. 5% level of significance at 28 degrees of freedom standard t value was 2.048. Here the calculated t value is also smaller than standard t value therefore the null hypothesis is accepted and alternative hypothesis is rejected. So we can conclude that there is no difference in the effectiveness of hippo therapy combined with conventional physiotherapy and conventional physiotherapy alone in the improvement of walking and running ability in the children with cerebral palsy.

4.3.9. Table XIV-Summary table of GMFS (paired and independent t test result)

Variable	Paired t test		Independent t test
	Trial group	Control group	
Dimension A- Lying and rolling	Significant difference*	Significant difference*	Significant difference.* Trial>control
Dimension B -Sitting	Significant Difference*	Significant difference*	Significant difference.* Trial >Control*
Dimension D- Standing	Significant difference*	Significant difference *	No difference
Dimension E- waling and running.	Significant difference*	Significant difference*	No difference

In this table the paired sample t test showing there are significant changes in the pretest and posttest statistical values in every dimension where the Independent sample t test found there are significant difference in between groups and the trial group has more improvement than the control group after 2 weeks of Hippo therapy with conventional Physiotherapy and conventional therapy.

4.4. Pediatric Balance Scale (PBS)

4.4.1. Table-XVI- Pediatric Balance Scale (PBS)-Sit to stand- paired t test

Variable Group	Mean		SD		t		df	Sig. (2-tailed)	
	Trial	Control	Trial	Control	Trial	Control		B/ G	Trial
1. Sit to stand	.800	.467	.561	.516	5.527	3.500	14	.000*	.004*

SD=standard deviation. B/G-both group. Significant *

The table is showing mean PBS scoring of trial group .800 and calculated t value is 5.527. 5% level of significance at 14 degrees of freedom standard t value was 2.145 so the calculated t value is greater than standard t value. Moreover the observed $p < .05$. Here the null hypothesis (no difference within group) is rejected and the alternative hypothesis (there is difference within group) is accepted. The result concludes that 2 weeks 8sessions, 30 minutes of hippo therapy is effective to improve sit to standing balance in the children with Cerebral palsy. The control group PBS mean in same variable is .467 and t score is 3.500. It is also greater the standard $t = 2.145$ and $p < .05$ in which the null hypothesis is rejected and alternative hypothesis is accepted. Therefore the 2 weeks conventional physiotherapy is also effective to improve sit to stand balance ability in the children with cerebral palsy.

4.4.2. Table XVII- Pediatric Balance Scale (PBS)-Sit to stand- Independent sample t test

Variable		Mean difference	t	df	Sig. (2-tailed)
Sit to stand	Pretest	.067	.292	28	.772
	Posttest	.400	2.223	28	.034*

df=degrees of freedom. Significant *

This is showing the comparison between groups where pretest mean difference is .067, at 28 degree of freedom in 5% level of significance the standard $t = 2.048$ and he observed $t = .292$ which is smaller than the standard $t =$ and additionally $p > .05$. Here the null hypothesis cannot be rejected so this section means that there was no statistical significant pretest scoring difference between groups but after 2 week intervention the posttest score is showing mean difference of .400, $t = 2.223$ which is bigger than the standard $t = 2.048$ value. Here $p < .05$. So the null hypothesis can be rejected. The trial group mean is greater than the control group mean therefore it is also concluded that hippo therapy combined with conventional therapy is more effective than only conventional physiotherapy.

4.4.3. Table: XVIII-Pediatric Balance Scale (PBS)- stand to sit- paired t test

Variable	Mean		SD		t		df	Sig. (2-tailed)	
	Trial	Control	Trial	Control	Trial	Control		Trial	Control
2. Stand to sit	.733	.200	.458	.414	6.205	1.871	14	.000*	.082*

SD=standard deviation. df=degrees of freedom, Significant *

In this table the trial group and control group mean .733 and .200 respectively. The calculated t values were 6.205 and 1.871. Both the t values are greater than the standard t value at 5% level of significance and 14 degrees of freedom which was 2.145. Moreover both group $p < .05$. Here in both group the null hypothesis is rejected and alternative hypothesis was established. Therefore the section concluded that both hippo therapy with conventional physiotherapy and conventional therapy only significantly improves the stand to sit balance in the children with cerebral palsy.

4.4.4. Table-XIX-Pediatric Balance Scale (PBS)-Stand to sit- Independent sample t test

Variable		Mean difference	t	df	Sig. (2-tailed)
Sit to stand	Pretest	.000	.000	28	1.000
	Posttest	.533	2.296	28	.029*

Df= degrees of freedom, Significant *

Sit to stand balance ability pretest is showing .000 mean differences, t-.000 which is much smaller than the standard t value and $p > .05$, therefore the null hypothesis is accepted. It means that the baseline PBS scoring was identical in both groups. But after 2 weeks of intervention the mean difference was .533 and the trial group mean was greater than the control group. The observed $t = 2.296$ is greater than standard $t = 2.048$, $p < .05$. Here the null hypothesis is accepted. This section concluded that 2 weeks Hippo therapy combined with conventional therapy is more effective than conventional therapy to improve sit to stand balance in the children with cerebral palsy.

4.4.5. Table-XX-Pediatric Balance Scale (PBS)-Transfer- paired sample t test

Variable	Mean		SD		t	df	Sig. (2-tailed)		
	Trial	Control	Trial	Control	Trial	Control	both	Trial	Control
3. Transfer	.667	.400	.488	.507	5.292	3.055	14	.000*	.009*

SD=standard deviation. df=degrees of freedom. Significant *

The table is showing a comparative feature of case and control group findings. Trial group mean .667 and control .400, both group has calculated t scoring is greater than the standard t value therefore null hypothesis is rejected. It concluded that both hippo therapy with conventional therapy and conventional therapy is effective to improve transfer balance ability in the children with cerebral palsy.

4.4.6. Table-XXI- Pediatric Balance Scale (PBS)-Transfer- Independent sample t test

Variable	Mean difference	t	df	Sig. (2-tailed)
Transfer pretest	.133	.642	28	.526
Transfer posttest	.400	2.683	28	.012*

df=degrees of freedom. Significant *

This table is showing the between group pretest mean difference, $t=.642$ which is less than the standard $t=2.048$ at 5% significance level with 28 degrees of freedom. It means that there was no difference between groups in pretest score but after 2 weeks of intervention the mean difference is .400, $t=2.683$ which is greater than the standard t value and $p<.05$, trial group mean was more than control group. Here the null hypothesis

can be rejected and this portion conclusion was the hippo therapy combined with conventional therapy is more effective than only conventional therapy.

4.4.7. Table-XXII. Pediatric Balance Scale (PBS)-Standing unsupported- Paired t test

Variable	Mean		SD		t		df	Sig. (2-tailed)	
	Trial	Cont	Trial	Cont	Trial	Cont		both	Trial
4.Standing unsupported	.733	.467	.458	.516	6.205	3.500	14	.000*	.004*

Cont=Control group, SD=standard deviation. df=degrees of freedom. Significant *

This table is showing standing unsupported trial and control group mean .733, .467. $t=6.205$ and 3.500 respectively which are bigger than the standard $t=2.145$ at 5% significance, $p<.05$. Therefore in both cases the null hypothesis is rejected. This part concluded that hippo therapy with conventional therapy and conventional therapy is effective in standing unsupported balance activity in the children with cerebral palsy.

4.4.8. Table-XXIII. Pediatric Balance Scale (PBS)-Standing unsupported- Independent sample t test.

Variable	Mean difference	t	df	Sig. (2-tailed)
standing unsupported pretest	.133	.656	28	.517
Standing unsupported posttest	.400	2.103	28	.045*

df=degrees of freedom. Significant *

Here pretest and posttest between group comparison showings mean difference .133, .400. Where $t=.656$, 2.103 respectively. The pretest t is less than standard $t=2.048$ at 5% significance level with 28 degrees of freedom, $p<.05$ and the posttest t score is greater than standard t , $p<.05$. Therefore this section concluded there was no significant difference in baseline score but after having 2 weeks of treatment there is significant

difference and as the trial group mean is greater the trial group improved more than control group.

4.4.9. Table-XXIV- Pediatric Balance Scale (PBS)-Sitting unsupported- Paired t test.

Variable	Mean		SD		t	df	Sig. (2-tailed)		
	Trial	Control	Trial	Control	Trial	Control	both	Trial	Control
5. Sitting unsupported	.867	.400	.352	.507	9.539	3.055	14	.000*	.009*

SD=standard deviation. df=degrees of freedom. Significant *

This table is showing sitting unsupported trial and control group mean .867, .400. $t=9.539$ and 3.055 respectively which are bigger than the standard $t=2.145$ at 5% significance $<.05$ in both cases. Therefore in both cases the null hypothesis is rejected. This part concluded that hippo therapy with conventional therapy and conventional therapy is effective in sitting unsupported balance activity in the children with cerebral palsy.

**4.4.10. Table-XXV- Pediatric Balance Scale (PBS)-Sitting unsupported-
Independent sample t test**

SL no	Variable	Mean difference	t	df	Sig. (2-tailed)
5(a)	Sitting unsupported pretest	.067	.354	28	.726
5(b)	Sitting unsupported posttest	.400	2.316	28	.028*

df=degrees of freedom. Significant *

Here pretest and posttest between group comparison showings mean difference .067, .400. Where $t=.354, 2.316$ respectively. The pretest t is less than standard $t=2.048$ at 5% significance level with 28 degrees of freedom, $p<.05$ and the posttest t score is greater than standard t , $p<.05$. Therefore this section concluded there was no significant difference in baseline score but after having 2 weeks of treatment there is significant difference and as the trial group mean is greater the trial group improved more than control group.

**4.4.11. Table-XXVI- Pediatric Balance Scale (PBS) - Standing with eye closed -
paired t test**

Variable	Mean		SD		t	df	Sig. (2-tailed)		
	Trial	Control	Trial	Control	Trial	Control	both	Trial	Control
6. Standing eye closed	.333	.267	.488	.458	2.646	2.256	14	.019*	.041*

SD=standard deviation. df=degrees of freedom. Significant *

This table is showing “standing eye closed” trial and control group mean .333,.267. $t=2.646$ and 2.256 respectively which are bigger than the standard $t=2.145$ at 5% significance $<.05$ in both cases. Therefore in both cases the null hypothesis is rejected. This part concluded that hippo therapy with conventional therapy and conventional therapy is effective in “standing eye closed” balance ability in the children with cerebral palsy.

**4.4.12. Table-XXVII-Pediatric Balance Scale (PBS)- Standing eye closed -
Independent sample t test**

Variable	Mean difference	t	df	Sig. (2-tailed)
Standing with eye closed pretest	.000	.000	28	1.000
Standing with eye closed posttest	.067	.323	28	.749

df=degrees of freedom. Significant *

Here pretest and posttest between group comparison showings mean difference .000, .067. Where $t=.000$, $.323$ respectively. The pretest and posttest t is less than standard $t=2.048$ at 5% significance level with 28 degrees of freedom, $p>.05$ in both case. Therefore this section concluded there was no significant difference in baseline score. After having 2 weeks of treatment there was also no significant difference in post test

score therefore in both cases the null hypothesis cannot be rejected. So 2 weeks of hippo therapy with conventional physiotherapy and conventional physiotherapy has no different effect on standing with eye closed balance ability in the children with cerebral palsy.

4.4.13. Table-XXVIII- Pediatric Balance Scale (PBS) - Standing with feet together - paired t test

Variable	Mean		SD		t	df	Sig. (2-tailed)		
	Trial	Control	Trial	Control	Trial	Control	both	Trial	Control
7. Standing with feet together	.400	.333	.507	.488	3.055	2.646	14	.009*	.019*

SD=standard deviation. df=degrees of freedom. Significant *

This table is showing “Standing with feet together” trial and control group mean .400,.333. $t=3.055$ and 2.646 respectively which are bigger than the standard $t=2.145$ at 5% significance. $P<.05$ in both cases. Therefore in both cases the null hypothesis is rejected. This part concluded that hippo therapy with conventional therapy and conventional physiotherapy is effective in “Standing with feet together” balance ability in the children with cerebral palsy.

**4.4.14. Table-XXIX-Pediatric Balance Scale (PBS)-Standing with feet together -
Independent sample t test**

Variable	Mean difference	t	df	Sig. (2-tailed)
Standing with feet together pretest	.200	1.197	28	.242
Standing with feet together posttest	.267	1.169	28	.252

df=degrees of freedom. Significant *

Here pretest and posttest between group comparison showings mean difference .200, .267. Where $t=1.197, 1.169$ respectively. The pretest and posttest t is less than standard $t=2.048$ at 5% significance level with 28 degrees of freedom, $p>.05$ in both cases. Therefore this section concluded there was no significant difference in baseline score. After having 2 weeks of treatment there was also no significant difference in post test score therefore in both cases the null hypothesis cannot be rejected. So 2 weeks of hippo therapy with conventional physiotherapy and conventional physiotherapy has no different effect on “Standing with feet together” balance ability in the children with cerebral palsy.

**4.4.15. Table-XXX-Pediatric Balance Scale (PBS) - Standing one foot in front -
paired t test**

Variable	Mean		SD		t	df	Sig. (2-tailed)		
	Trial	Control	Trial	Control	Trial	Control	both	Trial	Control
8. Standing one foot in front	.267	.133	.458	.352	2.256	1.468	14	.041*	.164

SD=standard deviation. df=degrees of freedom. Significant *

This table is showing “Standing one foot in front” trial and control group mean .267, .133. $t=2.256$ and 1.468 respectively. The trial group t is bigger and the control group t is smaller than the standard $t=2.145$ at 5% significance $p<.05$ and $p>.05$ respectively. Therefore trial group the null hypothesis is rejected and in control group the null hypothesis cannot be rejected. This part concluded that hippo therapy with conventional therapy is effective but only conventional physiotherapy is not effective in “Standing one foot in front” balance ability in the children with cerebral palsy.

**4.4.16. Table-XXXI- Pediatric Balance Scale (PBS)-Standing one foot in front -
Independent sample t test**

Variable	Mean difference	t	df	Sig. (2-tailed)
Standing one foot in front pretest	.000	.000	28	1.000
Standing one foot in front posttest	.413	.714	28	.481

df=degrees of freedom. Significant *

Here pretest and posttest between group comparison showings mean difference .000, .413. Where $t=.000$, $.714$ respectively. The pretest and posttest t is less than standard $t=2.048$ at 5% significance level with 28 degrees of freedom, $p>.05$ in both cases.

Therefore this section concluded there was no significant difference in baseline score. After having 2 weeks of treatment there was also no significant difference in post test score therefore in both cases the null hypothesis cannot be rejected. So 2 weeks of hippo therapy with conventional physiotherapy and conventional physiotherapy has no different effect on “Standing one foot in front” balance ability in the children with cerebral palsy.

4.4.17. Table-XXXII-Pediatric Balance Scale (PBS) - Standing on one foot - paired t test

Variable	Mean		SD		t		df	Sig. (2-tailed)	
	Trial	Control	Trial	Control	Trial	Control		Trial	Control
9. Standing on one foot	.267	.067	.458	.258	2.256	1.000	14	.041*	.334

SD=standard deviation. df=degrees of freedom. Significant *

This table is showing “Standing on one foot” trial and control group mean .267, .067. $t=2.256$ and 1.000 respectively. The trial group t is bigger and the control group t is smaller than the standard $t=2.145$ at 5% significance. $p<.05$ and $p>.05$ respectively. Therefore trial group the null hypothesis is rejected and in control group the null hypothesis cannot be rejected. This part concluded that hippo therapy with conventional therapy is effective but only conventional physiotherapy is not effective in “Standing on one foot” balance ability in the children with cerebral palsy.

4.4.18. Table-XXXIII- Pediatric Balance Scale (PBS) - Standing on one foot - Independent sample t test

Variable	Mean difference	t	df	Sig. (2-tailed)
Standing on one foot pretest	.067	.354	28	.726
Standing on one foot posttest	.133	.756	28	.456

df=degrees of freedom. Significant *

Here pretest and posttest between group comparison showings mean difference .067, .133. Where $t=.354$, $.756$ respectively. The pretest and posttest t is less than standard $t=2.048$ at 5% significance level with 28 degrees of freedom, $p>.05$ in both cases. Therefore this section concluded there was no significant difference in baseline score. After having 2 weeks of treatment there was also no significant difference in post test score therefore in both cases the null hypothesis cannot be rejected. So 2 weeks of hippo therapy with conventional physiotherapy and conventional physiotherapy has no different effect on “Standing on one foot” balance ability in the children with cerebral palsy.

4.4.19. Table-XXXIV Pediatric Balance Scale (PBS) - Turning 360 degree - paired t test

Variable	Mean		SD		t	df	Sig. (2-tailed)		
	Trial	Control	Trial	Control				Trial	Control
10. Turning 360 degree	.533	.267	.516	.458	4.000	2.256	14	.001*	.041*

SD=standard deviation. df=degrees of freedom. Significant *

This table is showing “Turning 360 degree” trial and control group mean .533,.267. $t=4.000$ and 2.256 respectively which are bigger than the standard $t=2.145$ at 5% significance. $P<.05$ in both cases. Therefore in both cases the null hypothesis is rejected. This part concluded that hippo therapy with conventional therapy and conventional

physiotherapy is effective in “Turning 360 degree” balance ability in the children with cerebral palsy.

4.4.20. Table- XXXV-Pediatric Balance Scale (PBS) - Turning 360 degree - Independent sample t test

Variable	Mean difference	t	df	Sig. (2-tailed)
Turning 360 degree pretest	.067	.386	28	.702
Turning 360 degree posttest	.333	1.538	28	.135

SD=standard deviation. df=degrees of freedom. Significant *

Here pretest and posttest between group comparison showings mean difference .067, .333. Where t=.386, 1.538 respectively. The pretest and posttest t is less than standard t=2.048 at 5% significance level with 28 degrees of freedom, $p > .05$ in both cases. Therefore this section concluded there was no significant difference in baseline score. After having 2 weeks of treatment there was also no significant difference in post test score therefore in both cases the null hypothesis cannot be rejected. So 2 weeks of hippo therapy with conventional physiotherapy and conventional physiotherapy has no different effect on “Turning 360 degree “balance ability in the children with cerebral palsy.

4.4.21. Table-XXXVI-Pediatric Balance Scale (PBS) - Turning to look behind - paired t test

Variable	Mean		SD		t	df	Sig. (2-tailed)	
	Trial	Control	Trial	Control			Trial	Control
11.Turning to look behind	.533	.333	.516	.488	4.000	2.646	14	.001* .019*

SD=standard deviation. df=degrees of freedom. Significant *

This table is showing “Turning to look behind” trial and control group mean .533,.333. $t=4.000$ and 2.646 respectively which are bigger than the standard $t=2.145$ at 5% significance. $P<.05$ in both cases. Therefore in both cases the null hypothesis is rejected. This part concluded that hippo therapy with conventional therapy and conventional physiotherapy is effective in “Turning to look behind” balance ability in the children with cerebral palsy.

4.4.22. Table-XXXVII-Pediatric Balance Scale (PBS) - Turning to look behind - Independent sample t test

Variable	Mean difference	t	df	Sig. (2-tailed)
Turning to look behind pretest	.067	.357	28	.724
Turning to look behind posttest	.133	1.058	28	.299

df=degrees of freedom. Significant *

Here pretest and posttest between group comparison showings mean difference .067, .133. Where $t=.357$, 1.058 respectively. The pretest and posttest t is less than standard $t=2.048$ at 5% significance level with 28 degrees of freedom, $p>.05$ in both cases. Therefore this section concluded there was no significant difference in baseline score. After having 2 weeks of treatment there was also no significant difference in post test score therefore in both cases the null hypothesis cannot be rejected. So 2 weeks of hippo

therapy with conventional physiotherapy and conventional physiotherapy has no different effect on “Turning to look behind” balance ability in the children with cerebral palsy.

4.4.23. Table- XXXVIII- Pediatric Balance Scale (PBS) - Retrieving object from floor - paired t test

Variable	Mean		SD		t		df	Sig. (2-tailed)	
	Trial	Control	Trial	Control	Trial	Control		Trial	Control
12.Retrieving object from floor	.133	.067	.352	.258	1.468	1.000	14	.164	.334

SD=standard deviation. df=degrees of freedom. Significant *

This table is showing “Retrieving object from floor” trial and control group mean .133, .067. $t=1.468$ and 1.000 respectively. The trial and control group t is bigger than the standard $t=2.145$ at 5% significance. $p<.05$ and $p>.05$ respectively. Therefore both groups the null hypothesis is cannot be rejected. This part concluded that hippo therapy with conventional therapy and only conventional physiotherapy is not effective in “Retrieving object from floor” balance ability in the children with cerebral palsy.

4.4.24. Table- XXXIX-Pediatric Balance Scale (PBS) -Retrieving object from floor - Independent sample

Variable	Mean difference	t	df	Sig. (2-tailed)
Retrieving object from floor pretest	.067	.386	28	.702
Retrieving object from floor posttest	.133	.727	28	.473

df=degrees of freedom. Significant *

Here both pretest and posttest $t = .386, .727$ is smaller than standard $t=2.048$ at 5% significance level with 28 degrees of freedom, $p > .05$ in both cases. Therefore this section concluded there was no significant difference in baseline score. After having 2 weeks of treatment there was also no significant difference in post test score therefore in both cases the null hypothesis cannot be rejected. So 2 weeks of hippo therapy with conventional physiotherapy and conventional physiotherapy has no different effect on “Retrieving object from floor “balance ability in the children with cerebral palsy.

4.4.25.Table- XXXX- Pediatric Balance Scale (PBS) -Placing alternate foot on a stool - paired t test

Variable	Mean		SD		t	df	Sig. (2-tailed)		
	Trial	Control	Trial	Control			Trial	Control	
13. Placing alternate foot on a stool	.067	.067	.258	.594	1.000	.435	14	.334	.670

SD=standard deviation. df=degrees of freedom. Significant *

This table is showing “Placing alternate foot on a stool” trial and control group mean .067, .067. t=1.000 and .435 respectively. The trial and control group t is smaller than the standard t=2.145 at 5% significance. $p < .05$ and $p > .05$ respectively. Therefore both groups the null hypothesis cannot be rejected. This part concluded that hippo therapy with conventional therapy and only conventional physiotherapy is not effective in “Placing alternate foot on a stool” balance ability in the children with cerebral palsy.

4.4.26. Table- XXXXI-Pediatric Balance Scale (PBS) Placing alternate foot on a stool - Independent sample

Variable	Mean difference	t	df	Sig. (2-tailed)
Placing alternate foot on a stool pretest	.133	.807	28	.426
Placing alternate foot on a stool posttest	.133	.756	28	.456

df=degrees of freedom. Significant *

Here both pretest and posttest $t = .807, .756$ is smaller than standard $t=2.048$ at 5% significance level with 28 degrees of freedom, $p > .05$ in both cases. Therefore this section concluded there was no significant difference in baseline score. After having 2 weeks of treatment there was also no significant difference in post test score therefore in both cases the null hypothesis cannot be rejected. So 2 weeks of hippo therapy with conventional physiotherapy and conventional physiotherapy has no different effect on “Placing alternate foot on a stool” balance ability in the children with cerebral palsy.

4.4.27. Table- XXXXII- Pediatric Balance Scale (PBS) -Reaching forward with outstretched arm - paired t test

Variable	Mean		SD		t		df	Sig. (2-tailed)	
	Trial	Control	Trial	Control	Trial	Control		Trial	Control
14. Reaching forward with outstretched arm	.467	.267	.743	.458	2.432	2.256	14	.029*	.041*

D=Dimension, SD=Standard deviation, df=degree of freedom, *significant.

The trial and control group mean .467, .267. $t=2.432$ and 2.256 respectively which are bigger than the standard $t=2.145$ at 5% significance and 14 degrees of freedom. $P<.05$ in both cases. Therefore in both cases the null hypothesis is rejected. This part concluded that hippo therapy with conventional therapy and conventional physiotherapy is effective in “Reaching forward with outstretched arm” balance ability in the children with cerebral palsy

4.4.28. Table- XXXXIII-Pediatric Balance Scale (PBS) reaching forward with outstretched arm - Independent sample

Variable	Mean difference	t	df	Sig. (2-tailed)
Reaching forward with outstretched arm pretest	.067	.367	28	.716
Reaching forward with outstretched arm posttest	.267	1.673	28	.105

df=degrees of freedom. Significant *

Here both pretest and posttest $t =.367, 1.673$ are smaller than standard $t=2.048$ at 5% significance level with 28 degrees of freedom, $p>.05$ in both cases. Therefore this section concluded there was no significant difference in baseline score. After having 2 weeks of treatment there was also no significant difference in post test score therefore in both cases the null hypothesis cannot be rejected. So 2 weeks of hippo therapy with conventional physiotherapy and conventional physiotherapy has no different effect on “Reaching forward with outstretched arm” balance ability in the children with cerebral palsy.

4.4.29. Table XXXXIV-Summary table of PBS (paired and independent t test result)

Variable	Paired t test		Independent t test
	Trial group	Control group	Between group
1. Sit to stand	Significant*	Significant*	Significant* Trial>Control
2. Stand to sit	Significant*	Significant*	Significant* Trial>Control
3. Transfer	Significant*	. Significant*	Significant* Trial>Control
4. Standing unsupported	Significant*	Significant*	Significant* Trial>Control
5. Sitting unsupported	.Significant*	Significant*	Significant* Trial>Control
6. Standing eye closed	Significant*	Significant*	Not significant
7. Standing with feet together	Significant*	Significant*	Not significant
8. Standing one foot in front	Significant*	Not significant	Not significant
9. Standing on one foot	Significant*	Not significant	Not significant
10. Turning 360 degree	Significant*	Significant*	Not significant
11. Turning to look behind	Significant*	Significant*	Not significant
12 Retrieving object from floor	Significant*	Not significant	Not significant
13. Placing alternate foot on a stool	Not significant	Not significant	Not significant
14. Reaching forward with outstretched arm	Significant*	Significant*	Not significant

CHAPTER-V DISCUSSION

The study was conducted aiming to find out the effect of hippo therapy with conventional physiotherapy and the conventional physiotherapy and to compare which one is more effective to improve Gross Motor Function and Balance in the children with Cerebral palsy. Two different therapist rated outcome measurement tools were used along with a Semi-structured Questionnaire in order to find out the basic physical, socio-demographic features, baseline condition and the condition modified after intervention. The base line data demonstrates that there was no significant difference between the group overall characteristics therefore both the groups were homogenous which is a very important component of any clinical trial. Though it looks very simple but it provides many important features to the reader to judge the validity of any research work (Burgess, Gebiski & Keech, 2003). At the end of data analysis researcher found significant improvement by both the interventions and hippo therapy with combined physiotherapy in some areas had greater impact compare to the conventional physiotherapy group. In the Descriptive part of the result showed that the mean age (in months) of trial group (51.60 ± 13.741) and control group (50.27 ± 15.215). According to Khandaker et al. (2015) found in one study the age group from 3 to 16 years old cerebral palsy is frequency come to take intervention. Male and female participant frequency was Male 19 (63%) and female was 11 (37%) and literature found that the rate of CP is significantly higher in boys than girls as a ratio of 1.3: 1 (Murphy, Yeargin-Allsopp, Cecoufle & Drews, 1993). Mean height (cm) of trial and control participants were 96.87 ± 30.32 and 104.80 ± 16.71 and weight (kg) 19.60 ± 6.854 and 18.73 ± 6.508 respectively which is approximately within normal limit of growth and development according to age

(Hellmann, 1983). The functional baseline leveling was done by GMFS level and only level- II, III; IV participants were selected because this group (mild to moderate) Cerebral palsy group was the group of interest of the researcher. In trial group II=7(47%), III=5 (33%), IV=3 (20%) and in control group II=7(47%), III=5 (33%), IV=3 (20%). Different types of cerebral palsy were included in this study. In trial group Spastic Quadriplegic=5 (33%), Spastic Diplegic=5 (33%), Spastic, Hemiplegic=4 (27%), Ataxic=0, Dyskinesia =1 (7%) and in control group Spastic Quadriplegic=5(33%), Spastic, Diplegic=5(33%), Spastic Hemiplegic=4(27%), Ataxic=1 (7%), Dyskinetic =0 . here the spastic type of cerebral palsy is more and the number of ataxic and dyskinesia is very less. The proportion of diplegic cerebral palsy now a days decreasing and the hemiplegic is increasing and it is unchanged in spastic Quadriplegic which supposed to be the most prevalent type (Odding, Roebroek & Stam, 2006). The various birth histories were given by mothers which were assumed to be the possible cause of the condition. In case group 5(33.3%) had birth injury during delivery, 4(26.7%) had birth asphyxia, 1(6.7%) had premature delivery, 3(20%) had prolong labor, 1(6.7%) had maternal infection, 1(6.7%) had convulsion disorder after birth. In control group 4(26.7%) had birth injury during delivery, 5(33.3%) had birth asphyxia, 1(6.7%) had premature delivery, 1(6.7%) had neonatal Jaundice² (13.3%) had maternal infection, 2(13.3%) had convulsion disorder after birth. Spastic Quadriplegia usually is associated with intrapartum asphyxia, several cystic or polycystic degeneration and some developmental abnormality. Spastic diplegic cerebral palsy is usually associated with premature birth and low birth weight where most of them are revealed to have periventricular leukomalacia in MRI (Sankar & Mundkur, 2005). In the Socio-demographical part it was found that the father and mother had

different occupation such as among 30 participants farmer was 0 in trial group and 3 were in control group. Service holders in trial group were 7 and in control group were 2, Business men in trial group were 4 and in control group were 4, Day labors in trial group were 3 and in control group was 1, Immigrant in trial group was 0 and in control group were 3. Teacher in trial group was 0 and in control group was 1. Shopkeeper in trial group was 1 and in control group was 1. On the other hand in case group House wife was 11, in control group was 12. Service holder in case group was 3 and control group 2. Day labor in case group was 1 and in control group was 0. Business woman in case group was 0 and in control group was 1. It is clear from this feature that cerebral palsy can affect each and every level of society. Among 30 participants 15 came from rural area, 7 from semirural and 8 from urban area. In case group 8 participants came from rural where in control group 7 came from rural area. 5 participants in case group came from semirural and 2 participants in control group from semirural area. From Urban area 2 participant of case group came and 6 participants in control group came from urban area. According to Khan, Ferdous, Munir, Huq & McConachie (1998) the prevalence and mortality rate is higher in Bangladeshi rural area as the rural areas have lack of accessibility in the primary and other essential health service. Among 30 participants in case group 2 belong to lower class and in control group 2 from lower class. In case group 10 from middle class where 7 participants of control group from middle class. 2 participants from case group came from upper middle class and 6 participants from control group came from upper middle class. In case group 1 participant came from higher class and in control group 0 participants from higher class. It was found that every class of society are susceptible to have cerebral palsy child. Though here it is shown that the urban and rural

participation is similar but the prevalence at rural areas might be higher as a study by McConachie et al. (2001) found that the rural mother face many difficulties to come the health care centre due to poverty, lack of transport facilities and social stigma. Most of the participants belong to nuclear family 23 (77%) and 7 (23%) from joint family. The urbanization has broken many joint families into nuclear family where now days the number of nuclear families are also increasing in rural areas. This social changing process is imposing a great burden to the special need members of the family as they have lack of assistance or helping family members (Amin, 1998). The family income is very important factor to know as a family having a cerebral palsy child might face a great burden to bear the treatment cost. It was found that about 4 participants family income below 10000 per months, 12 has 10000-20000 and 14 have above 20000. The vaginal mode of delivery was found to be 13(43%) and caesarian delivery was 17(57%). The common indication for cesarean section is the abnormality of fetal heart rate but a study by Nelson, Dambrosia, Ting and Grether (1996) found no strong association between decreasing fetal heart rate and development of cerebral palsy therefore cesarean section might have no benefit and harmful for mother. Among 30 mothers 9 mothers had home delivery and 21 mothers had hospital delivery. Neonatal health service become a priority now a day in Bangladesh and was able to reduce the neonatal and below 5 years children mortality rate significantly (Talukder, 2011). Therefore those who born at hospital setting tend to be survive more than home delivery. Among 30 participants 2 had other disable sibling and 28 didn't have any. A family with more than 1 disabled child is a great burden in family especially the mother. Often many of the mothers with disable children in Bangladesh develop stress, behavioral and other psychological disorders (Mobarak, Khan, Munir,

Zaman & McConachie, 2000). In this study the participants were provided total 8 sessions of Hippo therapy for 30 minutes in each sessions in 2 week time. There is a study by Shurtleff, Standeven, & Engsborg, (2009) where hippo therapy was provided in 45 minutes, once a week and for 12 weeks which means total 12 sessions of treatment the participants got. The treatment was provided by the certified hippo practitioners which included Occupational therapist, physiotherapist and trained horse riding person. The following study also provided the treatment to the participants with experienced therapist in this field for long time (Occupational and physiotherapists) although they are not certified and with a very well trained horse man. In the following study 2 weeks were the maximum time that could be given and after 2 weeks the patients usually discharged. The study tried to reach as much as possible to the standard without interfering the actual schedule. After 2 weeks of Hippo therapy and conventional therapy both the groups had the different posttest findings where almost all participants had improve and most of them improved significantly. In between group comparison many of them didn't show significant difference between them but still had clinical significance. As this study result found in most of areas conventional physiotherapy was as effective as hippo therapy except some areas, therapists should provide equal concentration to the conventional management. In conventional therapy the neuro developmental therapy was mainly focused. The conventional therapy had the evidence to have significant effect on balance, coordination, posture, movements, gross motor function and the overall quality of life. A study by LABAF, SHAMSODDINI, HOLLIXAZ, SOBHANI AND Shakibae (2015) was conducted to find out the effect of Neuro-developmental therapy on gross motor functions. It was Quasi-experimental study where 28 cerebral palsy children were

randomly divided in to two groups. GMFM was used to measure the outcome. 1hour per sessions per week for 3 months the treatment were given and at the end the researchers found that Neuro developmental therapy has significant effects on lying and rolling, Sitting, crawling and kneeling and standing abilities of the children with cerebral palsy. It was not effective to improve the walking, running and jumping function. The study used two outcome measures. The first one was the Gross motor Function measure (GMFM)-88. It was an 88 point of observational tool further divided in to five dimensions. Dimension A –Lying and rolling, Dimension B-Sitting, Dimension C=crawling and kneeling, D=standing and E was walking, running, Jumping function. Here only 4 dimensions were assessed. The crawling and kneeling dimension was skipped. In this study it was shown (Table-VI and VII) a significant change in Dimension A which is lying and rolling abilities within and between groups after the completion of the intervention. The trial group ($p=.000$) and control group ($p=.001$) and the between group posttest ($p=.002$). Here the trial group was more significant than control group. This result is showing both the hippo therapy and conventional therapy is effective in the improvement of the lying and rolling abilities of CP children but hippo therapy has additional effect on this specific parameter. The rolling abilities are associated with pelvic rotational movement which is often lacking in the children with cerebral palsy due to abnormal postural tone, compromise in ROM and lack of postural stability. A study by Quint and Toomey (1998) found movement of the horse facilitates Childs pelvic motion, improves soft tissue length, and facilitates the normal tonicity around trunk and pelvis. It was done by a mechanical saddle called BABS which has similar movement while the horse walks. They have found a significant improvement of antero-posterio pelvic tilt in

the children. They also mentioned that hippo therapy is a valuable treatment tool for cerebral palsy clients. Sitting is a fundamental function which has enormous functional benefits. A children who has at least sitting ability can perform many task better than who doesn't have the ability. Sitting is a combination of trunk, head, and pelvic static and dynamic control and additionally it requires the normal tonicity around the proximal muscles. This study it was found (table-VIII and IX) that there is significant improvement both in trial ($p=.000$) and control ($p=.000$) in Dimension B which is Sitting after 2 weeks of intervention. It means that both the hippo therapy and the conventional physiotherapy were highly effective in the improvement of sitting ability. The between group comparison, it was found a significant difference ($p=.005$) and as the trial group mean was greater it concluded that hippo therapy combined with conventional therapy was more effective than the hippo therapy alone. A study by Shurtleff et al. (2009) has found a significant benefit of hippo therapy on head and trunk stability. Another study by Hamill, Washington and White (2007) found a very positive parental perception regarding Range of Motion and Head control. Standing is a function which requires similar criteria of sitting additionally it requires a good coordinated action of antigravity muscles. The weight bearing surface, foot biomechanics and anatomical structures also play important roles. In this study it was found (Table X and XI) in Dimension D which is standing that both the groups, the trial ($p=.002$) and control group ($p=.001$) had significant improvement after 2 weeks of intervention. Here the control group posttest mean was slightly more than trial group posttest mean. When the groups were compared there was no significant difference evident. Therefore the section concluded that hippo therapy and conventional physiotherapy and only conventional physiotherapy are

effective means of treatment in order to improve standing function but none of them is superior to each other. A similar finding was achieved by Chang, Kwon, Lee and Kim (2012). His research found about 30 minutes of hippo therapy in 16 sessions significantly improve the standing ability (Dimension D and E as well) without any adverse effect in the children with cerebral palsy above 4 years old. Another study by Champagne, Corriveau and Dugas (2017) found after 10 weeks of hippo therapy both Dimension D and E posttest score changed significantly in the favor of hippo therapy. This study could provide more success in favor of hippo therapy if the treatment sessions could be extended at least 2 more weeks which was the limitation of this study. Walking and running is a higher level of motor function that is often challenging to achieve in the children with cerebral palsy. However proper way facilitation, reduction of muscle spasm especially of lower limb and by improving the dynamic balance can cause a significant change. In this study in Dimension E (Walking and running) both group had significant positive change (Table XII and XIII) in posttest scoring followed by 2 weeks of intervention. The trial ($p=.000$) and the control ($p=.000$) which means that both the hippo therapy with conventional physiotherapy and conventional physiotherapy alone can improve the standing and walking ability in the children with cerebral palsy. The between group comparison couldn't reveal any significant difference ($p=.752$). Therefore it was said that hippo therapy with conventional therapy and conventional therapy have similar effect on walking and running function in the children with cerebral palsy. A similar presentation was found in a study conducted by Kwon et al. (2011). They found that 16 sessions of hippo therapy for 30 minutes significantly improved the waking speed, stride length and pelvic motion. Moreover the study found significant improvement in

Dimension E of GMFS-66. Another study by Benda et al. (2003) found that 8 minutes of hippo therapy was able to provide symmetry of muscular activity in spastic cerebral palsy. Pediatric Balance Scale (PBS) is the modified version of Berg Balance scale (BBS) used to measure the balance ability in the school going aged children. A study by Liao and Hwang (2003) found balance or postural stability in eye closed and sway situation one leg standing were strongly correlated with gross motor function. Another study by Yi, Hwang, Kim and Kwon (2012) found that PBS scores have high correlation with GMFS Dimension D and E. It has 14 different components. In this study it was found (Table-XVI and XVII) Sit to stand trial ($p=0.000$) and control ($p=.004$) and between group posttest ($p =.034$) which demonstrates the sit to stand balance ability improved significantly by both the intervention and hippo therapy is more effective than the conventional therapy in this section. In (Table- XVIII and XIX) it was found that stand to sit balance ability trial ($p=.000$) and control ($p=.082$) and between group posttest ($p=.029$). This result demonstrated that both interventions were effective to improve that ability but hippo therapy is more effective than conventional physiotherapy. (Table-XX and XXI) showed transfer balance trial ($p=.000$) and control ($p=.009$) and between group ($p=.012$). Therefore it can be said that both the hippo therapy with conventional therapy and conventional therapy is effective to improve transferring balance and hippo therapy is more effective than conventional therapy. (Table-XXII and XXIII) found trial ($p=.000$) and control ($p=.004$) in standing unsupported balance and between group ($p=.045$). So standing balance responds to both the therapy but to Hippo therapy more than conventional therapy. (Table XXIV an XXV) showed sitting unsupported trial ($p=.000$) and control ($p=.009$). Between group ($p=.028$) this is also representing that hippo therapy

and conventional both are effective but hippo therapy is more effective. In (table XXVI, XXVII, XXVIII, XXIX) showed similar scenario that hippo therapy and conventional therapy both are effective to improve standing eye closed and standing feet together and no treatment is superior to each other. In (table-XXX, XXXI, XXXII, XXXIII) showed similar finding that only hippo therapy was effective ($p=.041$ and $.041$) on Standing one foot in front and Standing on one foot respectively. In (table XXXIV, XXXV, XXXVI and XXXVII) showed also similar findings such as both the hippo therapy and conventional therapy is effective, trial ($p=.001$, $.001$) and control group ($p=.041$, $.019$) respectively on Turning 360 degree and Turning to look behind balance ability but none of them showed superior effect to each other ($p=.135$, $p=.299$). (Table- XXXVIII, XXXIX, XXXX, XXXXI) showed neither hippo therapy and nor conventional therapy was effective on Retrieving object from floor and Placing alternate foot on a stool balance ability trial ($p=.164$, $.334$) and control ($p=.334$, $.670$). (Table- XXXXII and XXXXIII) demonstrated -Reaching forward with outstretched arm showed significant improvement both group, trial ($p.029$) and control ($p=.041$) but no significant difference in between groups ($p=.105$). This result is similar to the study findings of Shurtleff et al. (2009) that Hippo therapy improves trunk and head stability as well as upper limb functional reaching.

1. The sample size was relatively small due to the unavailability of the proper participants within the data collection period.
2. Hippo therapy sessions were only 2 weeks due to the limited hippo therapy facilities. CRP has only one horse which is not enough to provide optimal service. Moreover the inpatient services provided for maximum 2 weeks. In outpatient service Hippo therapy has not included yet.
3. In CRP indoor pediatric settings (Mirpur and Savar) the number of participants were too low and as two different settings were used it was not possible to random group allocation.
4. The indoor service consists of too many group activities which took maximum time therefore it was very difficult to allocate time more than 30 minutes for hippo therapy.
5. The therapist Interests towards hippo therapy was not also good enough as they have lack of knowledge regarding the effectiveness and a monotonous treatment protocol. They were experienced but not were certified for hippo therapy.
6. The hot and cold climate often troubled some sessions.

This study was conducted to find out the effectiveness of hippo therapy on gross motor function and balance in the children with cerebral palsy. 2 weeks 30 minutes and total 8 sessions of hippo therapy along with conventional physiotherapy were given to the trial group and at the same time control group got only the conventional physiotherapy. The result showed (GMFS-88) in Dimensions A, B, D, E lying and rolling, Sitting, standing, walking and running both the hippo therapy and conventional physiotherapy had statistical significant effectiveness but only in dimension A (lying and Rolling) and Dimension B (Sitting) the hippo therapy with conventional therapy was more effective than conventional physiotherapy. Other two dimensions did not reveal any superior effect to each other. In PBS among 14 variables 10 variables had significant improvement both in trial and control group but in 5 variables -Sit to stand. Stand to sit, Transfer, Standing unsupported and Sitting unsupported hippo therapy combined with conventional physiotherapy had superior effect than only conventional therapy. The outcome clearly demonstrated that hippo therapy with conventional therapy is very much effective in most of the parameters of Gross motor function and Balance in the children with cerebral palsy.

It would be more virtuous if further research will concentrate to include more samples with more timing and frequency of treatment. Random allocation will be possible if future study provide more time in data collection and within same setting. Though blinding of the data collector not easy this small setting, future steps can be taken to blind

the assessors as well. If outpatient service of CRP include Hippo therapy in the outpatient service, research work will be easier.

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Appendix-5: The Treatment Protocol

The protocol was developed on the basis of Personal communication with foreign expert Dr. Dorine van Ravensberg and Angsupaisal et al. (2015), Shurtleff, Standeven & Engsborg (2009)

Age group-3 to 6 years

Target group: Cerebral palsy

Contraindication: Hippo-Phobia, uncontrolled epilepsy, unwillingness.

GMFS Level: II, III, IV

Time: 30 minutes for each child. 4 times a week, for 2 weeks

Progression: Every exercise has a progression (from easy to difficult)

Aim: To improve balance, head control, arm and leg control, spasticity as well as improve self-confidence, pride, and joy.

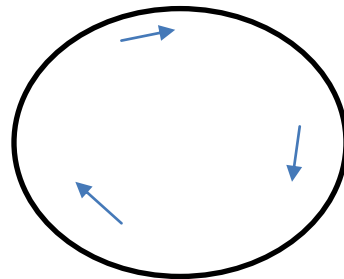
Phases:

I First all movements while the horse is standing still,

II Then all movements when the horse is **stepping slow speed forward**.

III Later phase: when the horse is **walking on a big round** stepping first to the left, then to the right

So, in the figure horse is stepping to the right.



Exercises:

1. Explain the plan to the entire team including the children and mothers.

2: Riding over horse and try to sit upright as much as possible. (Image-1)



Image 1

3: Making head movements: rotating head to left, then to right, 'looking' down, 'looking' up. Arms up (Image-2).



Image-2

4: Feeling the horse's head, between the horse's ears: first one hand, then the other hand, then both hands. (Image-3)



Image: 3

5. Feeling the horse's back, as far as possible to its tail: first one hand, then the other hand

6. a. Make trunk rotations with arms close to body

b. make trunk rotations with arms widespread left-right.(Image-4)



Image-4

7. a. Putting knee high up, then down with one leg at a time

b. If the balance has been improved: putting both knees high up and down.

8. Reaching practice for interesting object forward and sideways. (Image 5 and 6)



Image -5



Image -6

9. a. lying prone onto the neck of the horse

b. lying backwards onto the trunk of the horse. (Image-7)



Image-7

10. Singing together with children children's song: "head, shoulders, knee and toe, knee and toe" and so on while sitting on the horse and at the same time touching of those body parts. (Image-8)



Image-8

3.10.2: Conventional therapy (Gross motor function and balance)

1. Stretching exercise.
2. Passive ROM exercise.
3. Free active and resisted exercise.
2. Normal movement and function facilitation exercise-rolling, crawling, sitting, standing etc.
3. Sitting, standing balance practice using different tool such as physio ball, mini-trampoline, balance board.
4. Gait training.
5. Group therapy
6. Mother education