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ORIGINAL ARTICLE

Language Development in 2-to-4-year-old Children with Cerebral Palsy

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ABSTRACT

One of the frequently occurring disabilities of early age is Cerebral Palsy. Impairments in speech, language and communication usually co-occur with CP. These arise from the auditory, sensory and visual disorders that accompany CP. Delay or impairments in the development of language in cerebral palsy can lead to different speech and language disorders.

Objectives: Evaluating the development of language in children with cerebral palsy between 2-4 years of age.

Methods: A cross-sectional study design was utilized. Data was collected from different healthcare centers, clinics and hospitals. Convenient-based sampling technique was used. Children with co-morbid conditions with CP were not included in the study sample. The assessment tool used for evaluation of language development was 'PORTAGE – early education program.' The language related questions of PEEP were included as the tool for data collection. The data for 108 patients of cerebral palsy between 2-4 years of age was compiled. The results have been divided into demographics and the levels of portage i.e., 0-1 years, 1-2 years, 2-3 years and 3-4 years. The receptive as well as expressive language has been evaluated for these children. Total 70 questions have been added from the portage guide for up to 4 years of age.

Results: It is observed that a little more than half of the patients included in the study experience varying degrees of language difficulties. These difficulties are an accumulation of receptive as well as expressive impairments. On the contrary, a little under half of the patients (46.38%) have language abilities developed according to their age. Early identification of language impairment in children with Cerebral Palsy can lead to early intervention. This study evaluates the language development in young patients with CP. The results reveal the percentage of patients with language impairments. Hence, the study encourages early evaluation and treatment of language disorders in this population.

Conclusion: The most vital period of language development ranges till 5 years of age. So, 2-4 years is an important period of time for language development in an individual. An in-depth assessment of speech, language, cognitive and motor skills should be conducted during this time for CP children.

Keywords: Cerebral Palsy, Portage Early Education Program, Language Development, Language Impairment.

INTRODUCTION

Cerebral Palsy is a neurological disorder that occurs as result of atypical development of the brain or any damage or trauma which affects the brain of an individual during the growth or developmental period. It is the most prevalent motor disorder affecting individuals in childhood. (1) This causes problems and impairments in children affecting their posture as well as maintenance of balance. It causes mental as well as physical impairments in the individuals. The prevalence rate of Cerebral Palsy is observed to be about two to two point five per one thousand live births.(2) The causes of this disorder may include intrauterine infection, coagulation disorders or inflammation. Massive abruption of placenta, or umbilical cord herniation, or the bursting of uterus can cause poor response and breathing difficulties in the born infant. Low birth rate (about less than five pounds) is also observed to be a risk factor for the disorder. The most typical cause of CP is noticed to be asphyxia. (3) It occurs when the individual is deprived of oxygen that causes unconsciousness, suffocation or death. Asphyxia while birth is rarely calculated directly, rather it is identified based on signs and symptoms in the newborn that do not have a specific diagnosis.(4)

Following severe intellectual disability, CP stands on the 2nd most common disability occurring in early childhood. About sixty percent of serious motor disabilities occur as a result of Cerebral Palsy. (5) Disorders of spinal cord, neuromuscular disorders or other skeletal and tissue diseases are other causes of motor impairments. One of the major symptoms in the description of cerebral palsy includes spasticity. In order to divide cerebral palsy with spasticity, a system is used which classifies according to the region of loss of motor control and function, these terms include hemiplegia, double hemiplegia, diplegia, tetraplegia and quadriplegia.(6)

Recent studies have described the value of other impairments rather than only motor impairments which are seen in patients suffering from cerebral palsy. One in every three children suffering from cerebral palsy suffers from severe intellectual disability. One tenth of every child with CP suffers from blindness or close to blindness. (7) One of the infrequent conditions associated with CP is hearing impairment. One in every three children of CP suffers from epilepsy as well. Other impairments include problems in feeding speech and communication. On the basis of the type of cerebral palsy and the weight at birth, half to one third of the patients do not suffer from any severe associated impairment.(8)

Language is a system that makes use of meaningful symbols in order to communicate and exchange ideas as well as information. (9) Nonverbal and verbal are two types of language. Verbal language includes written and oral language, while nonverbal language involves gestures and body language. The process of acquisition of language explains how human beings are able to comprehend as well as make use of a certain language system. Different scientists and linguists have proposed different theories with the goal to explain how the process of language acquisition begins and how it continues.(10) (11)

Language and speech are primarily controlled by the left hemisphere of the brain. Damage to this region can lead to difficulties in language as well as speech. Aphasia is a term that describes the difficulty in understanding and making use of language as well as associated impairments in reading as well as writing.(12) The language difficulties that patients of CP suffer from might be expressive or receptive. If the patient has difficulty in using and producing language then it is termed as expressive disorder. (13) If the patient faces difficulties in understanding and reception of language then it is termed as a receptive disorder. (14) If the patient faces difficulties in skills of communicating that make use of organizing, problem-solving, memory skills as well as perception then it is termed as cognitive communication disorder.(15) (16) For help with these disorders and problems, the patient should be referred to a speech language pathologist who

works in order to improve their vocabulary, conversation, fluency, pronunciation, listening, word formation, conversation and stimulating their oral and neck muscles.[17] [18]

This study aims to describe the development patterns of language in young children aged 2-4 years, suffering from cerebral palsy. This can enable us to identify language and speech problems and impairments in young children as early as possible. This can enable early intervention and can benefit the patient at early age. To ensure the developmental milestones of the children at appropriate time this can be a beneficial study.

A study was conducted by Pennington and Dave in the United Kingdom, in the year 2019. The publication was revised again in the year 2020. The study aimed to assess the prevalence of communication disorders in children with CP. They also aimed to identify the severity of communication disorders in children aged two to five years suffering from the disease. It was a cohort method of research that included fifty-two male children as participants and twenty-five female children as participants. Through medical history details of their conditions including vision, hearing, fine motor skills, cognition, gross motor skills, seizures and motor impairments were collected. The FCCS known as the functional communication classification system as well as the CFCS (communication function classification system) were used by the researchers. The researchers concluded that the characteristics of speech and communication at the age of 24 months should be able to predict and inform about problems in the future at the age of about five years and according to the problems the patient should be referred to an SLP.[19] [20]

Research was conducted by Hustad and Sakash in 2018, in the United States of America. The goal of the research was to evaluate the development of receptive language in children with cerebral palsy between the ages of eighteen months to fifty-four months. The study involved three groups of children: a group of children without the action of motor speech, group of children with the action of motor speech and a group with the children with anarthria. A prospective study was used in this research. Forty-two male participants and forty-three female participants were included in the study. Chemical profile groups were made in order to assort the participants. Age-appropriate scoring of language comprehension was the main area of interest. It was observed that language delay was common in children who suffered from anarthria. Receptive language delays at low level were found to occur in children who had difficulties in motor speech skills. Whereas the children who did not have marked difficulties in their motor speech skills developed their receptive language according to their age.[21]

A study was conducted by Fluss and Lidzba in the year 2020, in Switzerland. The research was conducted with the objective of assessing academic as well as cognitive profiles in children suffering from cerebral palsy. The research made use of online articles and studies available for cerebral palsy, scholastic skills and cognition. Irrespective of the type of the article, all the articles related to the topic were extracted. The results of the research concluded that speech and language problems accompany all types of CP and cause problems in the social lives as well as the everyday lives of the patients. The level or degree at which this problem affects the patient depends upon the level of their motor impairments and difficulties. Because of these problems their performance in school as well as their participation in social situations is affected.[22]

A study was conducted by Sakash and Broman in 2018, in the United States of America. The study states that children with CP have high chances of developing a language or speech disorder. 47 children who were school-going; suffering from CP were included as participants in the study. Out of a total of eighty-seven data points, the participants were divided into language and speech profiles at each point. The relationship between executive functioning and speech and language was observed in the research. The behavior rating inventory of executive function questionnaire was utilized. The researchers concluded that CP patients who did not have difficulties in language and speech might develop likelihood for executive functioning difficulties. This will have a negative impact on their performance academically as well as socially.[23]

Objective: To find out language development in children aged 2-4 years with cerebral palsy.

MATERIALS AND METHODS

Cross-sectional study design and analytical survey was utilized in the research. The duration of the research was 4 months. Data was collected from various hospitals and clinics in Lahore and Sheikhupura, Pakistan. These include University of Lahore Teaching Hospital, Sehat Medical Complex, King Edward Medical Institute, Children's Hospital, Services Hospital, Bases Gulberg, Mayo Hospital, Sheikh Zayed Hospital, and Social Media Platforms.

Convenient-based sampling technique was used. A total of 108 participants were included in the study sample. The inclusion criteria for selection of sample were children between two to four years of age with cerebral palsy. The children who had co-morbid conditions with CP were not included in the study sample.

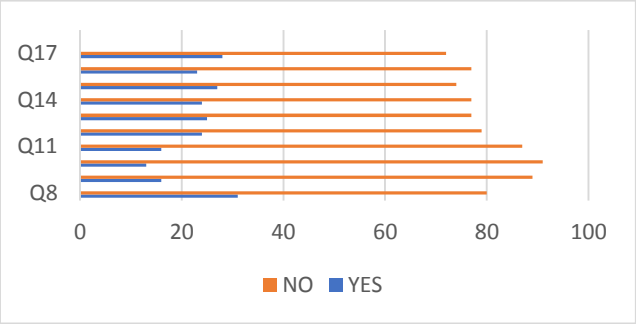
The tool used for assessment of language in these children was 'PORTAGE – early education program.' Total 70 questions have been added from the portage guide for up to 4 years of age. The responses to these questions were noted. The data for 108 patients of cerebral palsy between 2-4 years of age was compiled. The results have been divided into demographics and the levels of portage i.e., 0-1 years, 1-2 years, 2-3 years and 3-4 years. The receptive as well as expressive language has been evaluated for these children. The analysis of obtained data was done via SPSS-21.

RESULTS

The formal assessment tool for receptive and expressive language i.e., PORTAGE was used for children between 2-4 years of age. The results have been divided into demographics and the PORTAGE questions for 0-4 years were applied on all participants of the research.

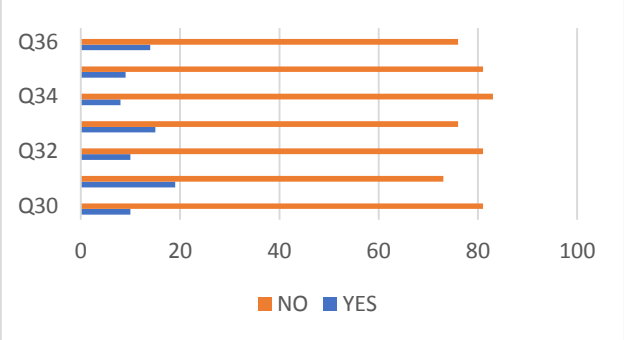
Question no.	Question	No (f/%)	Yes (f/%)
1	Repeat sounds made by others	64, 53%	47, 39.3%
2	Repeats same syllable 2-3 times (ma, ma, ma)	58, 49.6%	51, 42.7%
3	Responds to gestures with gestures	66, 54.7%	45, 37.6%
4	Carries out simple direction when accompanied by gestures	58, 47.9%	53, 44.4%
5	Stops activity at least momentarily when told "no" 75% of the time	67, 55.6%	44, 36.8%
6	Answer simple questions with non-verbal response	82, 68.4%	29, 23.9%
7	Combines two different syllables in vocal play	70, 58.1%	41, 34.2%

The graph below highlights the answer responses for PEEP questions 8-17. It is evident that the response for 'no' is more prominent. Hence it can be concluded that majority of CP patients face language difficulties.



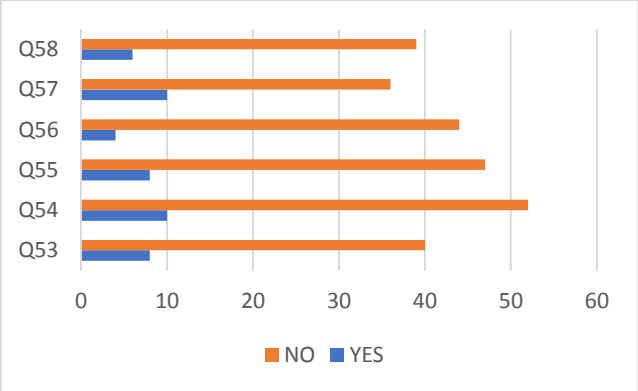
9	Uses single word meaningfully to label object or person	89, 74.4%	16, 13.7%
10	Vocalizes in response to speech of other person	91, 76.1%	13, 11.1%
11	Says five different words (may use the same word to refer to different objects	87, 72.6%	16, 13.7%
12	Asks for “more”	79, 65.8%	24, 19.7%
13	Says "all gone"	77, 64.1%	25, 20.5%
14	Follows 3 different one step directions without gestures	77, 64.1%	24, 19.7%
15	Can “give me” or “show me” upon request	74, 61.5%	27, 22.2%
16	Points to 12 familiar objects when named	77, 64.1%	23, 18.8%
17	Points to 3-5 pictures in a book when named	72, 59.8%	28, 23.1%
18	Points to 3 body parts on self	64, 53%	35, 29.1%
19	Says his/her own name or nick name upon request	64, 53%	35, 29.1%
20	Answers question “what’s this?” with object name	72, 59.8%	27, 22.2%
21	Combines use of words and gestures to make wants known	76, 63.2%	23, 18.8%
22	Name 5 other family members including pets	72, 59.8%	27, 22.2%
23	Name 4 toys	73, 60.7%	26, 21.4%
24	Produces animal sounds or uses sounds for animal’s name (cow is "moo-moo")	64, 57.3%	30, 24.8%
25	Asks for some common food items by name when shown (milk, cookie, cracker)	69, 57.3%	29, 23.9%
26	Asks questions by arising intonation at end of word or phrase	67, 55.6%	31, 25.6%
27	Name 3 body parts on a doll or other person	71, 59%	27, 22.2%
28	Answers yes/no question with affirmative or negative reply	75, 62.4%	19, 16.2%
29	Combines noun or adjective and noun in two-word phrase (ball chair) (my ball)	78, 65%	14, 12%

The graph below depicts the results for questions 30 to 36 of PEEP. The bar of ‘No’ response shows that majority of the responses from the study population reveals language difficulties.



37	Names familiar environmental sounds	67, 55.6%	22, 17.9%
38	Gives more than one object when asked using plurals form (blocks)	68, 56.4%	19, 15.4%
39	Refers to sell by own name in speech	69, 57.3%	17, 14.5%
40	Points to picture of common object described by its use (10)	66, 54.7%	19, 16.2%
41	Holds up fingers to tell age	63, 52.1%	21, 17.1%
42	Tells sex when asked	65, 53.8%	16, 13.7%
43	Carries out a series of two related commands	67, 55.6%	12, 10.3%
44	Uses “ing” verb form (running)	63, 52.1%	16, 13.7%
45	Uses regular plural forms (book, books)	69, 57.3%	10, 8.5%
46	Uses some irregular past tense forms consistently (went, did, was)	66, 54.7%	15, 12.8%
47	Asks questions, “what’s this (that)?"	67, 55.6%	13, 11.1%
48	Controls voice volume 90% of the time	69, 57.3%	8, 6.8%
49	Uses “this” and “that” in speech	68, 56.4%	7, 6%
50	Uses “is” instatements (this is ball)	64, 53%	10, 8.5%
51	Says “I ,me, mine” rather than own name	68, 56.4%	5, 4.3%
52	Points to object that “is not----------” (is not a ball)	63, 52.1%	8, 6.8%

The graph drawn below is a representation of Question 53 to 58 of Portage – early education program. Majority of responses show that language difficulties are common in CP patients at this age.



59	Says “is” at beginning of questions when appropriate	37, 30.8%	8, 6.8%
60	Will attend for 5 minutes while story is read	39, 32.5%	6, 5.1%
61	Carries out series of 2 unrelated commands	34, 28.2%	9, 7.7%
62	Tells full name when requested	27, 22.2%	13, 11.1%
63	Answers simple “how” question	34, 28.2%	3, 2.6%
64	Uses regular Past tense forms (jumped)	33, 27.4%	3, 2.6%
65	Tells about immediate experiences	31, 25.6%	4, 3.4%
66	Tells how common objects are used	28, 23.1%	7, 6%
67	Expresses future occurrences with “going to" "have to" "want to"	32, 26.5%	3, 2.6%
68	Changes word order appropriately to ask questions (can I, does he)	31, 25.6%	4, 3.4%
69	Uses some common irregular plurals (men, feet)	30, 24.8%	4, 3.4%
70	Tells two events in order of occurrences	33, 27.4%	2, 0.9%
Pool Prevalence		53.62	46.38

The data in the above table shows the percentage and frequency for the children who scored a response of “yes” in the questions of PORTAGE as well as the response for “no”. The pool prevalence for each set of questions is calculated. In view of the calculated pool prevalence, it can be seen that a little more than half of the patients included in the study experience varying degrees of language difficulties. These difficulties are an accumulation of receptive as well as expressive impairments. On the contrary, a little under half of the patients (46.38%) have language abilities developed according to their age.

DISCUSSION

This study aims to evaluate the development of language in 2- to 4-year-old children with cerebral palsy. For this purpose, we used PORTAGE with these children to evaluate their expressive as well as receptive language. Outcomes of the research will be discussed next.

A study conducted in 2013, in the United States of America evaluated the development of speech and language in children with cerebral palsy. Their expressive as well receptive language was examined along with their speech intelligibility. Studies show that around sixty percent of cerebral palsy children around school age face varying degrees of speech and language problems. In the data gathered in the study, about 75% patients had clinically reported problems with speech, language and communication. Cluster analysis was used in the research to interpret the results. The participants were divided into three groups: Group 1: not yet talking. Group 2: with emerging talking abilities. Group 3: established talkers. The three main areas addressed in the study were mean length of utterance (MLU), Communicative Development Inventories (CDI) and number of different words (NDW). [24]

In the reference study mentioned above, it was observed that eight five percent of the children included in the study had language delays. This showed that the development of language in cerebral palsy children is slower as compared to the rate of normal development.

In our current research it is noted that for each question of PORTAGE, the percentage of children for whom the answer was 'no' is greater than the percentage of children for whom the answer was 'yes'. This revealed that more than half of the children included in the study, face some level of language deficits. A formal assessment tool, i.e., PORTAGE was used in this study rather than assessing individual characteristics of speech and language. This provided us information about the receptive as well as expressive language skills in these participants of the study. A notable number of participants showed language deficits. From the study it is observed that expressive language impairments and delays are more common in two- to four-year-old children with cerebral palsy than receptive impairments or delays. The main reason behind this is that CP patients have muscular impairments. Their oral motor musculature might be spastic or dysarthric. In both cases, the production of speech and language is impaired. Impaired coordination and control over these muscles leads to difficulties in expressing language. Receptive language delays and impairments also accompany cerebral palsy. Cerebral Palsy patients can face difficulties understanding and producing language. In a study conducted in Turkey, it was noted that around 46% of the research participants had receptive language below their age. Cerebral Palsy patients can face difficulties understanding and producing language. This can include difficulties in understanding and expressing facial expressions. gestures, and voice.[25]

CONCLUSION

The most vital period of language development ranges till 5 years of age. So, 2-4 years is an important period of time for language development in an individual. The results of this study have shown that over 50% of children with cerebral palsy in ages between 2-4 years face varying degrees of language difficulties. Keeping this in view, thorough assessment should be conducted for these children in their early years to ensure proper language development.

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