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Expressive Language and Vocabulary Development of Tamil Speaking Children with Repaired Cleft Lip and Palate

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Abstract

The aim of the study was to explore the development of expressive language and expressive vocabulary in children with repaired cleft lip and palate at 30 months of age. A case control study design with longitudinal follow up of the subjects from 10 to 12 months of age till 30 months was employed for this purpose. For the purpose of this paper, the data on expressive language measures at 30 months of age have been analysed and reported. Fourteen children with non-syndromic repaired cleft lip and palate (both lip and palate operated before one year of age) and seven typically developing children along with their mothers participated in this study. All the children aged around 30 months had normal hearing sensitivity (pure tone average below 20dBHL) and intellectual development (based on Developmental Screening Test, Bharatraj, 1983). Size of expressive vocabulary was obtained using Tamil translation of MacArthur Bates Communication Inventory (Sethuraman, in progress). The expressive language age was obtained using the 3-Dimensional Language Acquisition Test (Herlekar & Karanth, 1995). Both the measures were compared between the two groups. Mann-Whitney test revealed significant differences between the two groups of children on expressive language age (p=0.000), with children with cleft showing lower scores than typically developing children. Though expressive language age differed significantly between the two groups, no significant differences were obtained in the size of expressive vocabulary (p=0.412). Children with repaired cleft lip and palate have deficits in development of expressive language. However, their vocabulary development appears to be in par with that of typically developing children.

Key Words: Expressive language age, expressive vocabulary, repaired cleft lip and palate
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Introduction

The development of language in children is facilitated by a variety of innate characteristics and environmental factors (Chomsky, 1957; Skinner, 1957). Any deviations in the biological foundations or major deprivations in the environment could result in compromised development of language (Mogford & Bishop, 1993). One such condition is cleft lip and palate, a congenital problem that occurs due to lack of fusion of the embryonic processes during the first trimester. According to the Health Ministry of India, cleft lip and palate occurs approximately in 1.4 per 1000 live births (Azad, 2010).The anatomical and physiological deviations in cleft lip and palate present right from birth have a significant effect on the development of speech and language skills (Atkinson & Howard, 2011; Peterson-Falzone, Hardin-Jones, & Karnell, 2010; McWilliams, Morris, & Shelton, 1990).

When the biological foundations for speech and language development are compromised, there are qualitative and quantitative differences in speech and language development observed right from the stage of babbling. Children with unrepaired cleft of palate reveal delayed onset of canonical babbling compared to the age matched peers. Studies on early vocalizations in children with cleft conclude that those with unrepaired cleft of lip and palate show deficits in the nature of vocalizations without significant differences in the frequency of vocalizations (Sreedhanya, Hariharan, & Nagarajan, 2015; Jones, Chapman, & Hardin-Jones, 2003; Chapman, Hardin-Jones, Schulte, & Halter, 2001; O'Gara, & Logemann, 1988). Children with cleft palate exhibit smaller consonant inventories, with a tendency to use more nasal and glottal consonants in comparison with typically developing children who use a wide variety of anterior consonants during babbling (Scherer, Williams, & Proctor-Williams, 2008; Willadsen & Albrechtsen, 2006). The vocalization deficits noticed during prelinguistic period continue to persist even after surgical correction of the palate (Chapman, Hardin-Jones, & Halter, 2003; Hardin-Jones, Chapman, & Schulte, 2003; Jones, Chapman & Hardin-Jones, 2003). These limitations during early speech production influence the phonological and lexical development of children with cleft (Hardin-Jones & Chapman, 2014; Harding-Bell & Howard, 2011; Willadsen, 2007). Higher occurrence of expressive language delays have been reported among children with cleft lip and palate (Jocelyn, Penko,

& Rode, 1996; Scherer & D'Antonio, 1995; Fox, Lynch, & Brookshire, 1978; Philips & Harrison, 1969).

Over the years, research has focused on tracing the prelinguistic and early linguistic development in individuals with cleft lip and palate. Morris and Bardach (1989) reported analysing patterns of speech and language development as one of the priority issues in cleft palate research. Physical factors due to clefting and other social factors such as impaired/poor parent child interaction can lead to variations in patterns of early speech and language development among individuals with cleft (Russell & Harding, 2001). It is widely accepted that children with cleft tend to have delayed language development, especially in the domain of expression (Scherer, Williams, & Proctor-Williams, 2008; Konst, Rietveld, Peters, & Prahl-Andersen, 2003; Scherer, & D'Antonio, 1995; Chapman, & Hardin, 1992). However, there are several variations in the aspects of language investigated, tools used for analysis and variables taken into consideration. Owing to the influence of social factors in language acquisition and differences of phonological and word structures of languages, it would be inappropriate to consider the same patterns of language acquisition across languages (Stoel-Gammon, 2011). Literature on typically developing population has also revealed that the rate of vocabulary acquisition varies across languages (Bleses et al., 2008). This finding also instigated/ encouraged the need to probe into early language development of children with cleft lip and palate speaking Tamil language. In Tamil language, phonetic repertoire in children with unrepaired clefts and the phonological processes in children with repaired cleft lip and palate have been described (Sreedhanya, Hariharan, & Nagarajan, 2015; Santhanam, Perumal, & Savitha, 2009). However, there are no published studies on language and vocabulary development in children with cleft lip and palate acquiring Tamil language. This study is part of a prospective, longitudinal study analysing aspects of speech sound and language development in individuals with cleft between 10 to 30 months of age. The objectives of this paper has been restricted to analysing expressive language development and expressive vocabulary of children with repaired cleft lip and palate at 30 months of age and compare them with typically developing children.

Method

This study was carried out after obtaining approval from the Institutional Ethics Committee of Sri Ramachandra University. The reference number is IEC-N1/10/AUG/18/25.

Participants

Fourteen children with repaired cleft lip and palate (clinical group) and seven typically developing children (control group), along with their primary caretakers participated in this study. These children were recruited as part of an ongoing longitudinal study that focussed on analysing the development of speech sounds and language development in children with CLP. All the participants were residing in and around Chennai city in Tamilnadu, India. The children in the clinical group had non-syndromic complete cleft lip and palate (unilateral or bilateral) that was surgically corrected using two-stage palatoplasty at or before 12 months of age. The surgeries (both lip and palate repair) were performed by the same surgeon, experienced in repair of CLP for all the children. The typically developing children were selected from amongst the well babies who reported to the immunisation clinic of a reputed hospital in Chennai. All the children were screened by a paediatrician to rule out the presence of any syndrome or any associated neurological impairments. Children with any high risk indicators associated with permanent congenital, delayed-onset, or progressive hearing loss in childhood specified by the American Academy of Pediatrics' Joint Committee on Infant Hearing (2007) were also excluded from the study. All children demonstrated age appropriate developmental levels, as indicated through Developmental Screening Test (Bharatraj, 1983), at the time of enrolment in the longitudinal study (between 10 – 12 months of age). All of them were exposed to Tamil as the primary language for communication; however those who had any minimal exposure to other languages (based on parental reports) were still included. All the participants passed the hearing screening procedure conducted using Visual Reinforcement Audiometry at two years of age. The data for this study was collected from all the participants when the children were 30 months of age.

Informed consent to participate in the study was obtained from parents/caretakers of all children at the time of enrolment. Kuppuswamy's socioeconomic status scale - Urban (Parashar, 2009), administered on all families indicated that all participants (both clinical and

control group) belonged to families of upper middle class status. A questionnaire was used to collect details regarding socioeconomic status, family structure, and developmental history of the child.

Procedure

All children were assessed for their language levels using the 3-Dimensional Language Assessment Test (Herlekar & Karanth, 1995). The expressive language age was arrived at using the expressive language subtest of 3-Dimensional Language Assessment Test (3DLAT). The investigator observed the child interacting with his/her mother in a free play session to observe the child's communication. If an item of the subtest could not be observed, the mother was questioned regarding it. The child's expressive language age was arrived at based on these two methods.

Mothers of children completed the Tamil translation of MacArthur Bates Communication Inventory (Sethuraman, in progress), a parent report inventory for analysing expressive vocabulary in children. This inventory has a list of 641 words arranged in twenty semantic categories and is being developed based on MacArthur-Bates Communication Development Inventory: Words and sentence (Fenson et al., 1993). The twenty semantic categories and their corresponding meanings are enclosed in Appendix 1. Mothers were instructed to mark the words from the inventory that was used by the child. The investigator was available to clarify any doubts the mothers had while filling up the inventory. The number of words marked by the mother represented the size of expressive vocabulary of the child.

Analysis

The data obtained on the two tests were tabulated and analysed using version 17 of Statistical Package for Social Sciences. Since the data was not distributed normally, non-parametric statistics was employed. Median was used as the measure of central tendency and interquartile range (IQR) was used as the measure of dispersion. The non-parametric Mann-Whitney U-test was used to analyse significance of differences on measures between the clinical and control groups (independent samples).

Results

Table 1 summarises the demographic and socioeconomic parameters, family structures of children in the two groups. This data was gathered through the questionnaire administered to the mothers at the beginning of the study.

Table 1

Summary of demographic and socioeconomic parameters, family structure of children in the two groups

Parameters	**Clinical group**	**Control group**
N	14	7
Number of males	11	3
Number of females	3	4
Maternal age at conception (n)		
Mean	22.64 years	27.29 years
SD	3.91	5.82
Mother's occupation (n)		
Unemployed	13	6
Semi – profession	1	1
Mother's education (n)		
High school	12	3
Diploma	2	2
Professional Degree	0	2
Paternal age at conception		
Mean	30.36 years	33.43 years
SD	5.38	6.13
Father's occupation (n)		

Semi-skilled	3	0
Semi profession	2	1
Clerical	4	0
Skilled worker	3	3
Professional	2	3
Father's education (n)		
High school	6	0
Diploma	2	2
Graduate	4	3
Post graduate	2	2
Birth order (n)		
1st	9	2
2nd	5	5
Family structure (n)		
Joint family	10	4
Nuclear	4	3
Kuppuswamy's socioeconomic class (n)		
Class II	14	7

Table 2 summarises the findings of expressive language age and size of expressive vocabulary of the two groups of children. Children with cleft lip and palate demonstrated significantly decreased scores on expressive language domain of 3DLAT, compared to the typically developing children. Children with cleft lip and palate, lagged behind by almost six months on the expressive language age, compared to their typically developing children. In spite of differences in the expressive language age, there was no significant difference in the size of expressive vocabulary reported by the mothers on the communication inventory.

Table 2

Summary of findings of expressive language age and vocabulary size

	Expressive Language Age (ELA)	**Total Vocabulary Size**
Clinical group		
Median	23.50	401.50
IQR	21.00-25.25	374.50-433.25
Control group		
Median	30.00	433.00
IQR	29.00-31.00	368.00-447.00
Mann-Whitney *U*	1.5	38
Significance, *p*	0.000*	0.412

*$p \leq 0.01$

Figure 1 depicts the expressive language age of all participants of the study. The yellow line depicts the median age of children in the control group. It is evident from the plot that all children with cleft lip and palate scored below the median expressive language age of those in the control group. With the exception of one child with repaired cleft lip and palate, all others lagged behind by more than two months from the median expressive language age of the control group.

The semantic categories of the Tamil translation of MacArthur Bates Communication Inventory were combined into four groups – Onomatopoeic words, nouns, verbs, and function words (grammatical categories other than nouns and verbs). Figure 2 depicts the size of vocabulary of the participants across word classes. The distribution of vocabulary across groups was found to be similar in both the groups of children.

Figure 1

Expressive language age of all the participants

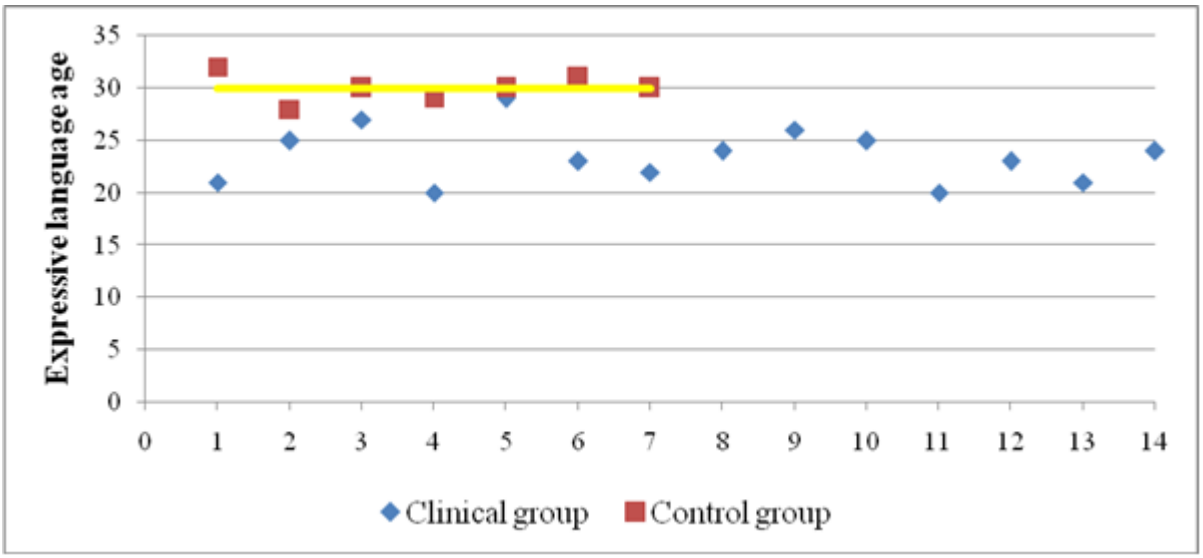
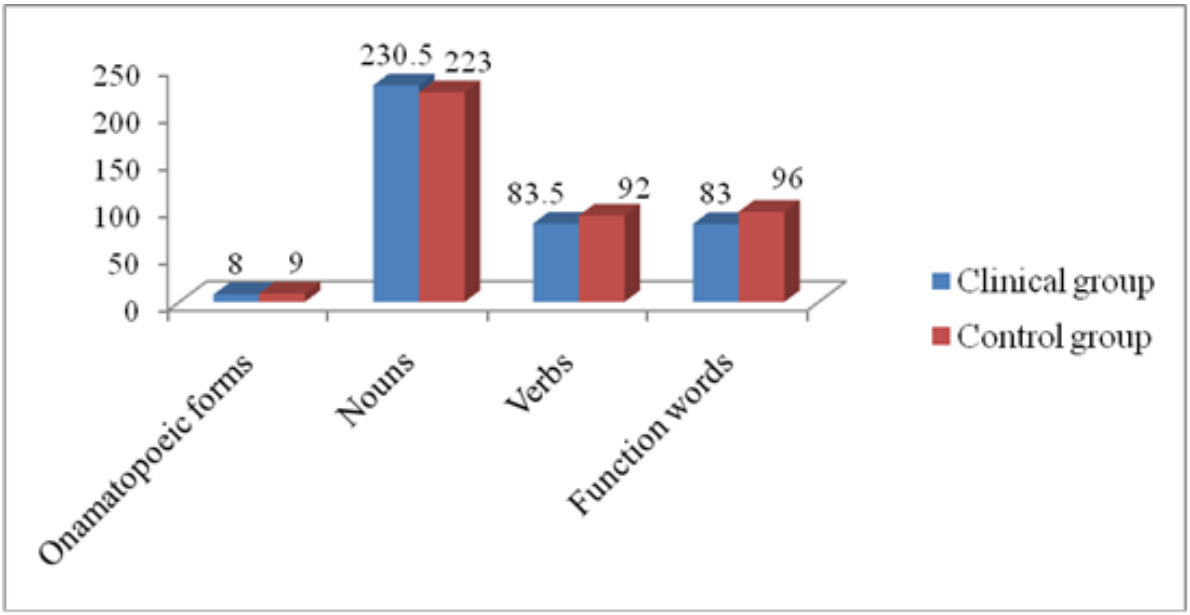


Figure 2

Size of vocabulary of children in both the groups



Discussion

The early structural deficits noticed in children with cleft lip and palate impacts the development of expressive language. This is evident from the findings of this study that children with repaired cleft lip and palate have decreased expressive language age compared to typically developing children at the age of 30 months. Studies in literature also report of expressive language delays in children with cleft lip and palate (Jocelyn, Penko, & Rode, 1996; Scherer & D'Antonio, 1995). In the past, studies on older children with cleft (in the age range of 36 to 72 months) have also reported of deficits in expressive language development in children with cleft (Philips & Harrison, 1969; Smith & McWilliams, 1968; Morris, 1962; Spriestersbach, Darley, & Morris, 1958). Reduced performance on the expressive domain in children with cleft have been attributed to their inadequate prespeech vocalisations, especially during the period of babbling (Scherer, Williams, & Proctor-Williams, 2008; Chapman, Hardin-Jones, & Halter, 2003). Children with cleft exhibit lesser variety and complexity of speech sounds during babbling (Stout, Hardin-Jones, & Chapman, 2011; Chapman, Hardin-Jones, Schulte, & Halter, 2001; Chapman, 1991).

Deficits in prespeech vocalisations have been noticed in children with cleft learning Tamil language too. Sreedhanya, Hariharan, and Nagarajan (2015) reported the presence of smaller consonant inventories, with more number of glottal (among place of articulation) and nasal (among manner of articulation) productions in children with cleft, learning Tamil language. These deficits continue to persist following surgical correction and impact the development of words and expressive language. Factors such as problems in middle ear functioning, hearing sensitivity, duration of hospitalisation, extent of cleft, and timing of palate repair have also been attributed to expressive language delays in children with cleft (Klinto, Svensson, Elander, & Lohmander 2014; Willadsen, 2012; Willadsen, & Enemark, 2000; Fox, Lynch, & Brookshire, 1978; Lamb, Wilson, & Leeper, 1972; Nation, 1970).

In spite of deficits in expressive language development, there was no significant difference in the size of expressive vocabulary reported by mothers of children with cleft in this study. This could imply that children with cleft do have the words in their vocabulary, but experience difficulty with respect to usage of words. Reduced phonetic inventory and

compromised understandability impact how the vocabulary is effectively used during communication, thereby affecting the overall expressive language. Expressive language is also dependent on aspects such as grammar. It is possible that children with cleft lip and palate might have difficulty in applying the syntactic rules, which along with their inability to articulate correctly, leads to deficits in expressive language. Analysing parameters such as mean length of utterance in morphemes could shed some light on the grammatical status of these children and their expressive competence. Scherer and D'Antonio (1995) reported of reduction in the mean length of utterance and use of bound morphemes in children with cleft.

Reports in literature on size of expressive vocabulary reveal mixed findings. Chapman, Hardin-Jones, and Halter (2003) observed no significant differences in size of expressive vocabulary reported by mothers of children with cleft compared to their peers. However, the number of different words used in a 10-minute conversation sample was significantly reduced in children with cleft compared to their peers. Several studies in literature have also reported of reduced size of vocabulary in children with cleft (Hardin-Jones, & Chapman, 2014; Lu, Ma, Luo, & Fletcher, 2010; Broen, Devers, Doyle, Prouty, & Moller, 1998; Scherer, & D'Antonio, 1995). These studies have included children from the early ages of 12 to 16 months itself indicating that size of expressive vocabulary could be impacted in the early stages of development (beyond 15 months of age). In the current study, size of vocabulary development has been analysed only at the age of 30 months using parent reported inventory. Parent reported measures of language development are a valid and effective tool for early language screening in children with cleft (Scherer, & D'Antonio, 1995). Analysing vocabulary development using longitudinal designs would throw more light on the development of vocabulary.

Conclusion

Children with cleft lip and palate are at risk for early language delays in expressive language that continues to persist till the age of 30 months. In spite of delay in expressive language development, children with repaired cleft speaking Tamil language reveal development of expressive vocabulary in par with that of typically developing children at 30 months of age. Further research considering other aspects of language such as mean

morphemic length of utterance, syntax, etc. could throw more light on understanding language development in children with cleft. The assessment protocol for children with cleft should include periodic monitoring of language development in the early stages. Speech language pathologists should consider early intervention modules focussing on language development too beyond articulation and speech intelligibility.

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Appendix 1

Semantic categories in the inventory used and their corresponding meaning

S.No	Semantic category	Corresponding meaning	Grammatical constituents
1.	sa:da:ɾaɳasaptaŋgaɭ / miɾugaŋgaɭinsaptaŋgaɭ	Environmental sounds	Onomatopeic words
2.	miɾugaŋgaɭaikuɾikumʋa:ɾttaigaɭ	Animals	Nouns
3.	ʋanɖiʋise:ʃaŋgaɭaikuɾikumʋa:ɾttaigaɭ	Vehicals	
4.	ʋiɭaija:ʈʈisa:ma:ngal	Toys	
5.	sa:ppa:ɖi	Food and Drink	
6.	tuɳiʋagaigaɭ	Clothing	
7.	uɖambiɨba:gaŋgaɭ	Body parts	
8.	ʋi:ʈisa:ma:ngal	Household items	
9.	ʋi:ʈiliɾuppaʋai		
10.	ʋeɭiʧʧa:ma:ngal	Nature	
11.	poɻutɨpo:kkumiɖaŋgaɭ	Recreational places	
12.	ɖʒanaŋgaɭ	People	
13.	ʋiɭaija:ʈʈi/ vaɻakkaŋgaɭ	Games	Verbs
14.	ʋiɭaija:ʈʈive:laigaɭ	Action words	
15.	ʋiɭakkamtaɾumʋa:ɾttaigaɭ	Descriptive words	Other grammatical
17.	ne:ɾamka:ʈʈumʋa:ɾttaigaɭ	Time	constituents

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18.	ʤanaŋgaɭaikuɾikkumʋa:ɾttaigaɭ	Pronouns
19.	ke:ɭʋiʋa:ɾttaigaɭ	Questions
20.	iɖamkuɾikkumʋa:ɾttaigaɭ	Preposition
21.	aɭaʋɨka:ʈʈumʋa:ɾttaigaɭ	Demonstratives

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