

Effectiveness of a training program for community-based resource workers on cleft lip and palate and cleft speech

Subha Shunmugam, Subramaniyan B¹, Roopa Nagarajan²,
Savitha Vadakkanthara Hariharan

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ABSTRACT

Objective: This study evaluated the training module which was developed for resource workers in the community, to impart knowledge about cleft lip and/or palate (CLP) and skill to identify error patterns in speech of individuals with CLP. **Design:** This was a cross-sectional study. **Method:** This study is a part of an ongoing community based rehabilitation project conducted in a rural district of South India. A total of 47 resource workers belonging to a rural district served as participants of this study. Pre and post training measures were compared to examine the effectiveness of the training program. Knowledge about CLP and ability to identify error patterns in speech of individuals with CLP by the resource workers were measured pre and post training to examine the effectiveness of the training program. **Results:** There was a statistically significant improvement in the resource workers' knowledge about CLP. Resource workers were able to identify the abnormal productions but were inconsistent in categorizing the specific error patterns. **Conclusions:** The post training results revealed improvement in the resource worker's understanding of CLP and ability to identify speech patterns in individuals with CLP. It can be inferred that with periodic retraining, resource workers can be trained to identify speech error patterns in individuals with CLP. Trained resource workers could probably be used to provide speech services under the supervision of speech-language pathologist (SLP) in places where SLPs are not available locally to provide direct therapy.

Key words: Cleft lip and palate, cleft speech, community-based rehabilitation, perceptual assessment, resource workers

INTRODUCTION

Cleft lip and/or palate (CLP) is a congenital malformation of the orofacial region and the most common congenital disability. Individuals with CLP are at high risk for speech difficulties due to the factors such as type of cleft, timing of palate repair, middle ear disease, functioning of velopharyngeal port, and dental abnormalities.^[1] Speech difficulties exhibited by individuals with CLP include atypical consonant productions, abnormal nasal resonance and airflow, weak pressure consonants, and altered laryngeal voice quality, as well as functional errors of articulation.^[2]

With the lowered age of identification of CLP and with increasing availability of surgical care, there has been an emphasis on early speech correction for speech disorders associated with CLP. In Indian scenario, majority of the individuals seeking services belong to very low economic status and live far from centers offering team care.^[3] Nonavailability of trained professionals in or near their homes is an additional barrier for early and appropriate speech correction. Alternative models of service delivery need to be considered due to unavailable trained professionals.^[4]

According to the WHO, community-based rehabilitation (CBR) is a model of care suited for low-income countries that have scarce specialized resources.^[5] D'Antonio and Nagarajan suggested that

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Consultant-Speech Language Pathologist, ¹Department of Speech, Language and Hearing Sciences, Sri Ramachandra University,
²Department of Speech, Language and Hearing Sciences, Faculty of Allied Health Sciences, Sri Ramachandra University, Chennai, Tamil Nadu, India

Address for correspondence:

Senior Asst. Prof. Subramaniyan B,
Department of Speech, Language and Hearing Sciences,
Sri Ramachandra University, Porur, Chennai, Tamil Nadu, India.
E-mail: subramaniyanb@sriramachandra.edu.in

providing speech services using CBR workers (CBRWs) in the rural community for children with CLP in India was suggested, where the application of a CBR model of service delivery was considered a feasible option of service delivery. This model of intervention may be an effective solution to the various barriers to access in India.^[4] In South India, CBR model of service delivery for differently abled children living in rural areas is practiced by organizations such as RUCODE India as cited in WHO^[6] and CORD.^[7]

In Sri Lanka and Thailand, where resources are limited like India, attempts were made to develop a community-based model of service delivery using local health-care workers as speech therapy assistants.^[8,9] Both these programs have been reported to be successful in their efforts to train grassroot workers as speech therapy assistants for providing speech services for individuals with CLP. In a UNICEF-funded project in India, rural workers were involved in early detection and management of communication disorders.^[10]

In an effort to explore a CBR model of intervention for individuals with CLP, a community-based project supported by Transforming Faces, Canada, titled “Comprehensive care of individuals with cleft lip and palate” in a rural district in Tamil Nadu, South India, was initiated in 2005. A group of 25 CBRWs participated in a basic screening for communication disorders among individuals with CLP. The trained CBRW assessed the speech of CLP individuals as normal/abnormal and this was validated with an assessment by speech-language pathologists (SLPs). Good agreement was obtained between the SLPs and CBRWs.^[11] This study reinforced the feasibility of a community-based model.

This study suggests that CBRW/grassroot workers in the community may be trained to provide speech correction services in the community under the guidance of an SLP. It is well accepted that perceptual evaluation of speech errors is the gold standard for planning further intervention. Therefore, in order for the grassroot workers to provide speech correction services, it is pertinent that they are trained in perceptual evaluation of speech errors. It is also well recognized that there is a large variability in such evaluation even among SLPs.^[12] Differences in perceptual evaluation reported between trained and untrained listeners of cleft palate speech have been documented.^[13]

There have been some attempts to develop a community-based model of service delivery in the area of speech service development. Wirt *et al.* reported

on a project undertaken in Sri Lanka to create a cadre of speech therapy assistants who could provide therapy.^[8] They trained the local health-care workers to provide speech correction. In this study, the authors divided the process into three steps: (1) choosing the assistants, (2) development of the curriculum and training methodologies, and (3) training program. The goal of the training program was to provide a 16-week long intensive observation, as well as practical and theoretical training in speech therapy for patients with CLP. Weeks 7 and 12 were devoted to the training of assistants with no patients present. An assessment schedule was established to evaluate the assistant's progress and achievements. This study concluded that speech therapists could train assistants to provide basic speech therapy to a population of patients in a developing country.

In 2006, another community-based project was reported in Thailand. This project also originated from the need to supplement speech services as surgical services increased. Prathanee *et al.* reported that the members of Association of Plastic Reconstructive Surgeons of Thailand, Thai-American Plastic Surgery and the American Cleft Palate Associations (ACPA) were sent to the remote areas to address the surgical issues. However, most children with CLP received delayed or no speech therapy due to the lack of SLPs. The need for a community-based model was identified and a project was developed along those lines. The process of establishing a CBR model was divided into three stages: First, development of consensus of the institutional, medical, and professional approaches, second, to develop a consensus from primary health care centers and third, model implementation.^[9] Both the Sri Lankan and Thailand models of service delivery were developed keeping local resources and systems in mind. In both the studies, the community-based rehabilitation is an ongoing process. In the Indian scenario, due to barriers in accessing services, training caregivers – resource workers – might well serve as a viable and useful resource for providing speech intervention in their home/schools/community.

Speech rehabilitation for individuals with CLP requires different time commitments and models of service delivery than surgical services. One among the challenges for service delivery includes nonavailability of trained personnel. There are very few SLPs available that are specialized in CLP even in urban centers and they are almost nonexistent in rural areas. It, therefore, becomes imperative to look for models of service delivery that is designed to meet the needs of the local population and that can be sustained. In India, community-based

service delivery for health and rehabilitation has been implemented for other impairments. This model of service delivery involves grassroot-level workers identified in the local community who provide support/information to the patients and families of individuals with disability. There is a need to train nonspecialist CBRWs to provide extension services of a tertiary care hospital. This can be implemented only with the support of local community, which could be family of individuals with disability, local nongovernmental organizations, and health and rehabilitation workers. This study is a part of an ongoing project aimed at reporting the outcomes of a training program developed for providing knowledge about CLP and their ability to identify errors in speech of individuals with CLP.

Aim

The current study evaluates a training program for imparting knowledge about CLP and error identification in the speech of individuals with CLP for a community-based resource person.

METHODS

This study was approved by the Institutional Ethics Committee. Informed consent was obtained from all resource workers.

Phase 1: Development of training program

This included development of materials for training and assessment of:

1. Knowledge about CLP
2. Skill involved in identification of errors patterns in speech of individuals with CLP.

Preparation of materials on knowledge about cleft lip and/or palate

Booklet on cleft lip and/or palate

A booklet on CLP was developed by an investigator in Tamil following a detailed review of literature. The booklet comprised three chapters: (1) overview of the condition of CLP, its causes, associated problems, and habilitation; (2) normal speech production mechanism; and (3) speech characteristics in individuals with CLP. PowerPoint presentations comprising three chapters mentioned above were designed to supplement the lectures. Audio and video clips were integrated into the PowerPoint slides to explain the dynamic nature of speech production in normal and individuals with CLP. The materials presented in the booklets and PowerPoint presentations were evaluated for its content by an independent SLP from the multidisciplinary cleft team and by a linguist to evaluate the presentation of the

content and ambiguity. Modifications in the presentation order of content and use of vocabulary suggested were incorporated into the final version of the booklet.

Questionnaire to assess knowledge on cleft lip and/or palate

A questionnaire in Tamil was prepared to assess the resource workers knowledge on CLP [Appendix 1]. This was used for obtaining baseline and posttraining scores. It comprised 20 questions each with three choices: (a) agree, (b) disagree, and (c) not sure. The questionnaire was developed based on the video composed by Sri Ramachandra Cleft and Craniofacial Centre (SRCCC). The first two questions addressed the resource workers' awareness about condition CLP. The remaining 18 questions were grouped under the following areas: (1) general characteristics of CLP; (2) causes of CLP; (3) presence of associated problems such as difficulty in hearing, delayed language development, dental issues, and psychological problems; (4) specialists involved in the rehabilitation of individuals with CLP; (5) speech characteristics in individuals with CLP; and (6) treatment options for individuals with CLP. The questionnaire was evaluated for appropriateness of the content and ambiguity in the sentence structure, by a linguist and SLP working with multidisciplinary cleft team. Suggestions were provided regarding phrasing of questions. All the suggestions were incorporated into the final version of the questionnaire used for the study.

Preparation of materials for identification of speech error patterns in individuals with cleft lip and/or palate: Skill assessment

Development of word list for baseline and posttraining articulation assessment

Tamil language comprises 12 vowels and 18 consonants. Five commonly used pressure consonants/p//t//t//k//and/s// in Tamil language were chosen for the development of word list. These five consonants selected are reported as the most frequently misarticulated sounds by individuals with CLP.^[2] Corpus of commonly used words in local language was developed. Word list was verified by a linguist and SLP for ambiguity. Fifty-word (cv, vcv, cvcvv, cvcv, cvccv) combinations with ten words in each pressure consonant occurring in initial and medial positions were selected. Sentences loaded with oral pressure consonants, nasal consonants, and both oral/nasal sentences developed in the cleft clinic were used to obtain samples for resonance assessment.

Collection of speech samples for training module

Speech samples were obtained from 15 normal children and fifty children with nonsyndromic repaired CLP

between the ages of 10 and 15 years. Repetition task was used to obtain speech samples. Audio recordings were performed using a Sony IC voice recorder ICD-PX720 in the Speech Recording Laboratory at the Department of Speech, Language and Hearing Sciences. All the participants were instructed to repeat each word three times slowly. Sixty words and 15 sentences representing different error patterns were identified from the pool of speech samples by the investigator. Speech samples identified by the investigator were played to two SLPs independently for identifying/coding the error pattern. Fifty words and ten sentences which had 100% agreement in the coding of error pattern between the SLPs were taken for this study. On interrater reliability, SLPs agreed ($K = 0.8$) that the samples represented the error patterns to be assessed. A total of 50 speech samples at word level comprising 13 backing errors, 15 glottal stops, 8 fronting errors, 7 pharyngeal fricatives, and 7 normal articulation samples and 10 connected speech samples comprising 5 hypernasal, 2 hyponasal, and 3 normal resonance samples were used for the training program.

Randomization of speech samples for baseline and posttraining assessment

Speech samples collected were copied in two compact disks. Two randomized lists comprising 50 words and 10 sentences were generated and copied in two independent compact disks. Compact disk compatible to play in laptop was prepared with each speech sample played three times consecutively with equal time intervals. Speech samples were randomized to ensure that the samples did not follow the same order during baseline and posttraining assessments.

Format for coding speech samples in baseline and posttraining assessment

A format for coding speech samples was developed. Articulation and resonance error patterns were rated on separate sheets. Articulation coding sheet included options for marking the speech sample as being normal or abnormal articulation pattern. If abnormal, the articulation error pattern in the speech sample had to be identified as either (1) backing error, (2) fronting error, (3) glottal stop, or (4) pharyngeal fricative. Similarly, the resonance coding sheet included options for marking the speech sample as being normal or abnormal resonance pattern. If abnormal, resonance pattern had to be identified as either (1) hyponasal resonance or (2) hypernasal resonance. For ease of understanding, a simple description of the error patterns of CLP speech was prepared in Tamil language and provided to resource workers.

Training samples

Speech samples used for perceptual training in this study were taken from a listening training material developed as a part of Sri Ramachandra University Smile Train Speech Training Initiative. Listening training material is a compact disk comprising articulation and resonance error patterns in individuals with CLP used of training SLPs. It consisted of ten samples in each articulation error pattern (fronting, backing, glottal stops, and pharyngeal fricatives). Speech samples for resonance error pattern identification included ten sentences with hypernasal resonance and hyponasal resonance, respectively.

Phase 2: Delivery of training program

Resource workers

A total of 47 resource workers (9 males, 38 females) aged between 19 and 30 years belonging to a rural district in Tamil Nadu participated in this study. The resource workers were native Tamil speakers, pursuing their Diploma in Teacher Training. In this group, 23/47 resource workers had completed a diploma course either in hearing/visual/locomotor impairment. All the resource workers were untrained listeners and not had previous training/experience in the field of CLP. None of the resource workers reported any concerns or history of hearing-related issues during this study.

The training program was carried out in a school classroom in a rural district in Tamil Nadu. Two identical training programs were carried out each lasting for 4 h. The first program was attended by 25 resource workers, followed by 22 resource workers in the second program. In each program, participants were grouped to a maximum of five per group. The training program was conducted by an SLP and assisted by a graduate student in SLP.

Baseline assessment

A questionnaire was administered to obtain baseline knowledge. Resource workers were asked to complete the pretraining questionnaire.

Listening training assessment

Randomized List I was used to obtain baseline listening scores. The samples were played simultaneously to the groups through high-quality headphones. The resource workers were instructed to listen to the words or sentences and identify whether the production was normal or abnormal. If abnormal, they were asked to read the choices given under abnormal and choose an appropriate option.

Training program

Before the training program, all materials and training booklet were distributed to each participant.

The training program commenced with a 20-min video on CLP in Tamil developed by SRCCC. The video provided information on causes of CLP, associated problems with CLP, and need for early intervention for these individuals. Normal speech production mechanism was explained using PowerPoint presentation. Speech error patterns including articulation error patterns (backing errors, fronting errors, glottal stops, and pharyngeal fricatives) and resonance error patterns (hyper/hypo-nasal) observed in individuals with CLP explained using PowerPoint presentations and audio samples of error patterns.

Presentation was followed by the listening training session. Resource workers were involved in a listening training activity, during which both normal and speech error patterns observed in individuals with CLP were played. This session was interactive to encourage resource workers to discuss with the trainer and explain the speech token they heard. Resource workers were asked to identify the error pattern during the listening training. They were given feedback immediately whether their judgments are correct or incorrect.

Posttraining

Immediately following the training session, the questionnaire was readministered. Randomized List II was used to obtain posttraining listening scores. After posttraining assessment, the resource workers were asked to give their feedback regarding the training program.

experience with individuals with CLP. Twenty-three out of 47 (48.9%) resource workers had heard about CLP and had seen individuals with CLP.

To evaluate whether resource workers were aware that CLP can exist independently, resource workers were asked to agree/disagree to the statement “The term cleft of palate also implies that there is a cleft of lip.” Twenty-two percent (13/47) of the resource workers in the baseline and 56% (26 out of 47) of resource workers in posttraining disagreed with the statement.

For ease of analysis, the remaining 17 items in the questionnaire were grouped into five categories. The responses of each participant in each category were averaged. Table 1 shows the mean and standard deviation of percentage of correct responses across the different categories.

The mean of percentage of correct responses was higher in posttraining than baseline. Paired *t*-test was administered to compare the performance between baseline and posttraining on knowledge about CLP. There was a statistically significant difference between the baseline and posttraining performance, $t(49) = -6.73, P \leq 0.01$.

Identification of normal versus abnormal articulation patterns

The word lists containing 50 words (7 normal speech tokens and 43 tokens with error in articulation) were used in baseline and posttraining. Between the two, there was an increase in the mean percentage of identification of correct responses across the error patterns. However, the resource workers' ability to identify backing errors, fronting errors, and pharyngeal fricative did not show statistically significant difference between the baseline and posttraining. Glottal stop was the only error that showed statistically significant difference, $t(49) = -2.35, P = 0.023$.

In both baseline and posttraining, 80% of the resource workers correctly identified tokens with normal speech

RESULTS

Knowledge about cleft lip and/or palate: Effect of training

Knowledge about CLP was collected through a 20-item questionnaire. The first two items in the questionnaire were related to the resource workers previous

Table 1: Mean and standard deviation percentage of correct responses in baseline and posttraining for different categories included in the questionnaire

Categories	Number of items in each category	Mean and SD percentage of correct response in baseline	
		Baseline	Posttraining
Cause of CLP	4	42.5 (2.4)	60.5 (4.3)
Associated problems faced by individuals with CLP	4	42.5 (3.6)	74.5 (2.4)
Members involved in the rehabilitation team of CLP	2	51.0 (3.9)	71.0 (3.3)
Speech characteristics in individuals with CLP	2	66.0 (1.6)	82.0 (1.6)
Intervention for individuals with CLP	5	42.4 (1.3)	61.6 (1.7)

CLP: Cleft lip and palate, SD: Standard deviation

pattern. Of the 43 tokens that represented abnormal articulatory production, 81% of the resource workers identified the abnormal articulation patterns in baseline. Posttraining, 86.0% of the resource workers identified the abnormal articulatory patterns. In this part of the study, the difference between baseline and posttraining performance was not statistically significant, $t(49) = -1.34$, $P = 0.185$.

Identification of specific articulatory error patterns

When a speech token was identified as abnormal, the resource workers were further required to identify the specific error pattern, that is, backing, glottal stop, fronting, and pharyngeal fricative. The mean and standard deviation percentage of correct identification of error pattern by the resource workers are shown in Table 2.

Between baseline and posttraining, there was an increase in the mean percentage of identification of correct responses across the error patterns. However, the participants' ability to identify backing errors, fronting errors, and pharyngeal fricative did not

show statistically significant difference between the baseline and posttraining. Glottal stop was the only error that showed statistically significant difference, $t(49) = -2.35$, $P = 0.023$.

Comparison of baseline and posttraining performance

To understand whether there were subtle effects of training in the identification of errors, resource workers' identification of error patterns was further analyzed. Comparison between baseline and posttraining performance was undertaken to study the same and the results are shown in Table 3.

From Table 3, it can be noticed that there was no consistency in the manner in which error patterns were identified in baseline. Posttraining, the resource workers were able to identify the abnormal speech patterns. This was evident by the reduced number of tokens with abnormal speech patterns that were identified as normal. With reference to backing errors, at baseline, 22.6% of backing errors were identified as being normal. However, in posttraining, the mean of the percentage of identification of backing errors as normal, reduced to 1.0%. Further, at baseline, there was no pattern in the identification of backing errors. In the posttraining, backing errors were either identified correctly as backing errors (26%) or as glottal stops (70%).

A similar trend was seen for those tokens that contained glottal stops. Identification of the glottal stop as normal dropped from 17% to 4% at posttraining. Glottal stops were either identified correctly as glottal stops (31%) or as backing errors (28%). The mean percentage of coding fronting errors pattern as normal was 30% at

Table 2: Mean and standard deviation percentage of correct responses in coding of articulation errors in baseline and posttraining

Error pattern	Mean and SD percentage of correct responses	
	Baseline	Posttraining
Backing error	22.9 (1.6)	26.0 (2.2)
Glottal stop	23.6 (1.7)	30.9 (2.5)*
Fronting error	20.1 (1.3)	21.2 (1.2)
Pharyngeal fricative	18.0 (1.1)	21.1 (1.5)

* $P \leq 0.05$. SD: Standard deviation

Table 3: Comparison of participant's baseline and posttraining performances

Speech token presented	Response coded				
	Normal	Backing error	Glottal stop	Fronting error	Pharyngeal fricative
Normal					
Baseline	79.7 (1.7)	7.0 (0.5)	9.3 (0.7)	1.0 (0.2)	3.0 (0.3)
Posttraining	79.7 (1.6)	9.0 (0.8)	4.0 (0.5)	5.3 (0.6)	3.0 (0.3)
Backing error					
Baseline	22.6 (2.6)	22.9 (1.6)	19.4 (2.3)	19.5 (2.3)	15.6 (2.0)
Posttraining	1.0 (0.3)	26.0 (2.2)	70.0 (2.1)	2.0 (0.2)	1.0 (0.2)
Glottal stop					
Baseline	16.9 (1.2)	20.5 (1.5)	23.6 (1.7)	18.9 (1.3)	20.1 (1.5)
Posttraining	4.0 (0.5)	28.7 (2.4)	30.9 (2.5)	18.4 (1.8)	18.0 (1.9)
Fronting error					
Baseline	30.3 (2.3)	21.9 (1.9)	20.7 (2.1)	20.1 (1.3)	7.0 (1.9)
Posttraining	10.0 (0.2)	30.2 (3.1)	29.6 (3.3)	21.2 (1.2)	9.0 (2.7)
Pharyngeal fricative					
Baseline	19.0 (2.3)	20.7 (3.1)	22.0 (3.2)	20.3 (2.7)	18.0 (1.1)
Posttraining	15.3 (2.0)	15.6 (1.9)	24.8 (2.1)	23.2 (1.8)	21.1 (1.5)

baseline; however, in posttraining, the mean percentage of coding fronting errors pattern as normal reduced to 10%. Identification of fronting error patterns did not follow any pattern in baseline and posttraining.

Identification of normal versus abnormal resonance

Sentence lists containing 10 sentences (3 normal speech tokens and 7 tokens with error in resonance) were used in baseline and posttraining, and the resource workers responses are shown in Table 4.

Resource workers' ability to identify normal versus abnormal resonance did not show statistically significant difference between the baseline and posttraining coding, $t(49) = 0.42$, $P = 0.674$.

Identification of the type of resonance

If the resource workers identified a token to be abnormal resonance, they were required to mark the abnormal resonance pattern as hyper/hypo-nasal. The mean percentage of correct identification of the type of resonance by the resource workers is shown in Table 5.

Resource workers' ability to identify hyponasal resonance did not show statistically significant difference between the baseline and posttraining coding, $t(49) = 0.21$, $P = 0.830$. However, resource workers' ability to identify hypernasality showed statistically significant difference between the baseline and posttraining, $t(49) = 2.21$, $P = 0.031$.

DISCUSSION

The purpose of this study was to develop and measure the outcome of a training program for resource workers at the community. The outcome was measured in terms

Table 4: Percentage of correct responses in identification of normal versus abnormal resonance errors in baseline and posttraining

Resonance	Baseline (%)	Posttraining (%)
Normal	75.0	80.0
Abnormal	75.0	80.4

Table 5: Mean and standard deviation percentage of correct responses in coding of resonance errors in baseline and posttraining

Abnormal resonance	Mean and SD percentage of correct response	
	Baseline	Posttraining
Hyponasal resonance	18.0 (1.3)	20.0 (1.5)
Hypernasal resonance	40.0 (2.2)	55.0 (1.8)

SD: Standard deviation

of the knowledge imparted regarding CLP and skill in identifying speech errors in individuals with CLP by resource workers.

Knowledge about cleft lip and/or palate

The higher scores posttraining compared with baseline suggested that the training program was effective in providing knowledge about the condition. It is in agreement with the findings that general public had less than adequate information and awareness of cleft palate.^[14] They suggested developing resource films as a means to create awareness and understanding of cleft palate. In this study, a video developed by SRCCC to orient the public to a basic understanding of CLP shown to the resource workers was a part of the training program. It can be inferred that the film in addition to the booklet on CLP provided to the resource workers was a useful resource in educating the layperson about CLP.

Identification of normal versus abnormal articulation patterns: Effect of training

In this study, resource workers were able to identify abnormal production during the baseline assessment. The obvious speech characteristics of individuals with CLP could have facilitated the resource workers' identification of abnormal articulatory patterns even in the baseline assessment. This result is in agreement with the findings of Nagarajan *et al.*, who reported that the participants in their study were able to identify abnormal speech tokens.^[11]

Identification of specific articulatory error patterns

Although the resource workers were able to identify the speech pattern as abnormal, posttraining results highlighted the need for more training in identification of specific error patterns. Similar to the results of the present study, Gooch *et al.* reported that there was a significant difference in the agreement of error pattern between experienced and inexperienced SLPs.^[12] This implies that the reliability of listener's transcription could have been improved by different methods of training before the experimental task. Results suggest that the task of identifying specific error patterns was much more difficult than simply identifying a speech token as normal or abnormal.

Comparison of baseline and posttraining performance

It was observed that there was no consistency in the manner, in which error patterns were identified in baseline performance. This could be attributed to the

listener's first experience of listening to a speech of individuals with CLP and no prior training in coding of specific speech error patterns in individuals with CLP. Posttraining, resource workers were able to identify abnormal speech patterns. In identification of error patterns, the number of speech tokens identified as abnormal increased in posttraining when compared with baseline performance.

In the posttraining assessment, backing errors were either identified correctly as backing errors or as glottal stops. It can be hypothesized that there could be an over generalization of glottal stops as an error. These backing errors were not identified as normal, fronting, or pharyngeal fricatives as observed in the baseline assessment. It can also be inferred that the program was effective in helping participant(s) associated backing errors as a placement error, in particular as a posterior articulation. In both baseline and posttraining, there was no pattern that was observed in identification of pharyngeal fricative, indicating it as the most difficult error pattern to identify. This could be attributed to the inexperience of listeners in identifying these error patterns.

Identification of specific abnormal resonance pattern: Effect of training

Resource workers were able to identify abnormal resonance patterns before training. This could be attributed to the nasalized speech observed in individuals with CLP. In identification of type of resonance error, resource workers were able to identify hypernasality more consistently than hyponasality. In a study carried out by Brunnegård *et al.*, listeners were asked to describe the resonance in their own words. They reported that listeners did not differentiate consistently between hyper- and hypo-nasality.^[13] Individuals used descriptions such as "talking through their nose" and "have a blocked nose" interchangeably. The authors reported that the listeners' descriptions did not reliably match the resonance of CLP individual in the sample.

Starr *et al.* reported similar findings. Ratings of nasality made by SLPs, parent, and children with hypernasal speech did not differ significantly.^[15] Brunnegård *et al.* reported that untrained listeners detected hypernasality in the speech of individuals with CLP, but they were less sensitive to identify the audible nasal air emission and/or nasal turbulence.^[13] Listeners task was limited only to identify whether it was hyper/hypo-nasal and not to rate severity of nasality as it would require additional training.

CONCLUSIONS

The training module was constructed at a basic level to address this target population. In baseline and posttraining assessment, the participants were required to complete the questionnaire and coding sheets. The results of posttraining revealed that there was an improvement in the participants' understanding of CLP. The participants' ability to identify normal versus abnormal production also improved, but their ability to categorize the error pattern was found to be inadequate.

To summarize, training was effective in increasing the resource workers knowledge about CLP, identification of normal or abnormal articulatory production and in identification of hypernasal resonance in CLP speech. While 80% of the resource workers were able to identify that the error pattern was abnormal, they demonstrated difficulty in grouping the abnormal error patterns into a specific type of error. Factors that possibly affected their performance in acquiring the skill could be (a) all the speech patterns observed in individuals with CLP were covered in one single session, hence there could have been a chance of overgeneralization of a particular error pattern, (b) baseline and posttraining assessment followed a strict time schedule for completion of the activity and they were given only three repetitions for a speech sample, hence there could have been anxiety in coding the error pattern, and (c) fatigue could have been another possible factor as the listening tasks duration were longer.

The results highlight the need for focused training for resource workers (untrained listeners) in identifying specific error patterns in the speech of individuals with CLP. Sell *et al.* (2009) advocated active structure training over several training sessions for experienced SLPs. Thus, it can be hypothesized that with periodic retraining to provide knowledge on CLP and identifying speech errors in individuals with CLP, resource workers could be used as base level resource personnel in rural communities.

Several factors could have impacted the resource workers' ability to identify the error patterns. The duration of training could have had a major impact. For naive listeners, rather than having small intensive training sessions, 2–3 sessions focusing on a particular error pattern in each session, with appropriate breaks over a period, could have helped in identification of error patterns. It could also be improved using animated videos and videos of individuals with CLP producing error production along with listening training.

On completion of the training program, each participant was requested to provide feedback about the training

program. The suggestions recommended by the resource workers for improving the training program are as follows:

1. Include worksheets/exercises to practice placement of articulators during normal speech production of sounds and various speech error patterns noticed in individuals with CLP
2. Include animated videos and videos of individuals with CLP producing the error production in the PowerPoint presentations.

In addition to the feedback from the resource workers, certain modification in the training program is recommended.

1. Duration of the training program has to be increased to 2 days. This will allow more time for conduct of training sessions to identify speech patterns in individuals with CLP
2. Target stimuli can be provided in each word of the word list given to identify error
3. The number of samples for assessment can be reduced. Longer time duration in baseline and posttraining may possibly affect the performance due to fatigue
4. The number of resource workers can be reduced from 25 to 15 and form small groups which will allow group activities and also provides more time for interaction with the trainer.

The above-mentioned suggestions can be incorporated and carried out with the target population in the future training programs. It can be inferred that with changes in the module and periodic retraining, a small group of resource workers can be trained to identify speech errors in individuals with CLP. These trained resource workers could probably be used under the supervision of SLP to supplement the services of SLPs in places where resources are not available. The resource workers could also be used as an alternate to parents for carrying out home-based therapy plans that are usually given as a part of institution-based rehabilitation programs.

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Conflicts of interest

There are no conflicts of interest.

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APPENDIX- I

QUESTIONNAIRE

கேள்விகள்

1. இதற்குமுன்பு உதமட்டும்/ அல்லது அண்ணப்பிளவினைப்பற்றிக் கேள்விப்பட்டுள்ளீர்களா?

- ஆம்
- இல்லை

2. இதற்குமுன்பு உதமட்டும்/ அல்லது அண்ணப்பிளவுள்ள நபரை பார்த்துள்ளீர்களா?

- ஆம்
- இல்லை

ஏற்றுக் கொள்
வேன்

ஏற்றுக்கொ
ள்ளமாட்டேன்

சரியாக தெ
ரியவில்லை

3. முன்ஜென்மபாவங்கள் உதமட்டும்/
அல்லது அண்ணப்பிளவை ஏற்படுத்தும்.

4. கருவுற்றிருக்கும் பொழுது குறைவான ஊட்டச்சத்து காரணமாக
உதமட்டும்/ அல்லது அண்ணப்பிளவு ஏற்படலாம்.

5. உதமட்டும்/
அல்லது அண்ணப்பிளவு குழந்தை கருவில் வளரும் பொழுது
தோன்றும்.

6. உதமட்டும்/
அல்லது அண்ணப்பிளவு அனைத்து நபர்களுக்கும் ஒரே மாதிரி
யான பிரச்சினைகள் இருக்கும்.

7. உதமட்டும்/
அல்லது அண்ணப்பிளவு உள்ளவர்களுக்கு உணவு உட்கொள்வ
தில் சிரமம் இருக்கும்.

8. உதமட்டும்/
அல்லது அண்ணப்பிளவு உள்ளவர்களுக்கு நடமாடுவதில் சிரம
ங்கள் இருக்கும்.

9. உதமட்டும்/
அல்லது அண்ணப்பிளவு உள்ளவர்களுக்கான சிகிச்சையில் பேச்
சு மற்றும் மொழிநிபுணரும் ஒரே அங்கமாவார்.

10. அறுவை சிகிச்சை நிபுணரினப் பங்கு உதமட்டும்/
அல்லது அண்ணப்பிளவு சிகிச்சையில் மிகவும் குறைவானது.

11. அண்ணப்பிளவு என்பது உதப்பிளவையும் குறிக்கும்.

12. உதமட்டும்/

அல்லது அண்ணப்பிளவு உள்ளவர்களுக்கு காது கேளாமை அதிக
படியாக இருக்கவாய்ப்பு உள்ளது.

13. கருவற்றிக்கும் காலத்தின்போது போலிக் ஆசிட் உட்கொள்வதி
னால் உதமட்டும்/

அல்லது அண்ணப்பிளவு ஏற்படுதற்கான அதிகவாய்ப்பு உள்ளது.

14. உதமட்டும்/

அல்லது அண்ணப்பிளவு உள்ளவர்களுக்கு பேச்சுப்பிழைகள் இ
யல்பாக வேசரியாகிவிடும்.

15. உதமட்டும்/

அல்லது அண்ணப்பிளவு உள்ளவர்களின் பேச்சு புரிந்து கொள்
ளுதல் எளிது.

16. உதமட்டும்/

அல்லது அண்ணப்பிளவு உள்ளவர்களின் பேச்சு மூக்கால் பேசுவ
தைப் போல்தோன்றும்.

17. உதடுபிளவிற்கான அறுவைசிகிச்சை குழந்தை பிறந்து மூன்றா
வது மாதத்தில் செய்யப்படும்.

18. அறுவைசிகிச்சையினால் மட்டும் உதமட்டும்/

அல்லது அண்ணப்பிளவு உள்ளவர்களுக்கு பேச்சுத்திறனை மே
ம்படுத்த முடியும்.

19. உதமட்டும்/

அல்லது அண்ணப்பிளவு உள்ளவர்களுக்கான சிகிச்சையில் பேச்
சுபயிற்சி மூலம் பேச்சுத்திறனை மேம்படுத்துவது ஓர் முக்கிய குறி
க்கோளாகும்.

20. உதமட்டும்/

அல்லது அண்ணப்பிளவு உள்ளவர்களுக்கு பேச்சுப்பயிற்சி வயது
முதிர்ந்த காலத்தில் அளித்தால் பேச்சு நன்றாகும்.

