

Speech Correction for Children with Cleft Lip and Palate in Community: Kantharawichai Networking

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Objective: To compare number of pre- and post-articulation errors of children with cleft lip and palate who enrolled in Khon Kaen University Community-Based Speech Therapy Model (KKUCSM): Kantharawichai Networking, Maha Sarakham Province.

Material and Method: Seven children with cleft lip and palate (CLP) who lived in or near Kantharawichai, Maha Sarakham, were enrolled using purposive samplings in three phases. Phase I, II, and III recruited four, one and two children with CLP, respectively. The children were assessed for speech and language skills, including language, understand ability, accept ability, articulation, resonance, and voice by two qualified speech and language pathologists (SLPs) before and after each phase. Three to four of 30- to 45-minute speech therapy sessions with teaching on services for a speech assistant (SA) and caregivers were provided for each child by SLPs in intensive speech camp and each 1-day follow-up speech camp. Then, SA and caregivers gave speech corrections (SC) at networking health care unit, Kantharawichai Hospital, and at home. Each phase took approximately one year. Data were analyzed using comparisons of mean and standard deviation between numbers of pre- and post-articulation errors.

Results: There was a statistically significant decrease in articulation errors after KKUCSM. Six of seven children with CLP (85.7%) had significant improvement in articulation.

Conclusion: Kantharawichai Networking of KKUCSM was one of the effective ways for providing speech correction in children with CLP, particularly for those who have difficulties accessing speech services.

Keywords: Cleft lip and cleft palate, Speech therapy, Community based-speech model

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Cleft lip and palate (CLP) are some of the most common neonatal birth defects with a birth prevalence of 0.99 to 2.69 for every 1,000 live births^(1,2). The incidence greatly varies across the world depending on ethnicity, location of the study and genetic factors. United States of America registers one cleft in every 500-700 live births⁽³⁾ while in Thailand it is 1.01 to 2.49 every 1,000 live births⁽⁴⁾. Interestingly, the northern and northeastern regions of Thailand have high prevalence of CLP birth defects than the other regions, i.e., 700-800 children per year⁽⁵⁾ and the incidence is 1.6 and 2.49 1,000 live births^(6,7).

Almost every CLP child requires a coordinated care by multidisciplinary team with specialties who face many challenges in caring for CLP, including feeding

difficulty, delayed speech and language development, speech disorders, dental carries and malocclusion, psychological and economic concerns. A long-term commitment from both parents and medical team is pivotal for quality outcomes. Treatment of orofacial cleft anomalies requires years of specialized care, accounting for \$US 5,510 and 50,634 per person⁽⁸⁾. An average lifetime medical cost of treatment for one individual affected with CLP is \$US 100,000 in the United State⁽⁹⁾ and \$US 2,286-2,857 in Thailand⁽¹⁰⁾. This amount included treatments for dentistry, along with that of providing in speech pathology, audiology, genetics, nursing, mental health, and social medicine that was spent across 20 years⁽¹⁰⁾.

Speech is one of the most functional outcomes in the treatment of CLP. After surgery, which is the first medical care for CLP, children with CLP had difficulties in speech⁽¹¹⁻¹³⁾, particularly compensatory articulation disorders (CAD). They need continuing and long term speech therapy for correction in CAD.

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Delay in providing speech remedy greatly increases the difficulty of eventual correction. However, logistical and financial issues prevent these children accessing to speech services, particularly in developing and under developing countries⁽¹⁴⁻¹⁶⁾ where lacks or limitations of speech services. Many alternative models have been established in these countries (Table 1).

Thailand is one of developing countries with limited speech services⁽²⁸⁾ where Community-Based Speech Therapy Model has been developed and applied to many areas^(24-26,29-31). These include both intensive speech camps and networking of Khon Kaen University Community-Based Speech Therapy Model which combining cooperation of speech correction (SC) for children with CLP by community local health care providers or speech assistants (SAs) and speech and language pathologists (SLPs) in tertiary or institute health care units. SC by SAs and mentoring by SLP have been the effective ways in decreasing the number of articulation errors^(24,29,32,33).

This present study aimed to determine the effectiveness of networking of Khon Kaen University Community-Based Speech Therapy Model (KKUCSM): Kantharawichai Hospital, Kantharawichai, Maha Sarakham on the improvement of articulations errors for children with CLP.

This study was approved by the Khon Kaen University Ethic Committee based on the Helsinki Declaration (The project number for the 1st year: HE531358; the 2nd year: HE55116; and the 3rd year: HE561402).

Material and Method

Study design

A prospective community-based study which was a part of the Khon Kaen University community-based speech therapy model for clefts⁽²⁹⁾.

Participants

Children with CLP aged 3-15 years who lived in Kantharawichai Hospital, Kantharawichai, Maha Sarakham, and were already repaired cleft lip and palate and had medical history in Srinagarind Hospital. A total of four, one, and two children with CLP were recruited in the 1st, 2nd, and 3rd year projects, respectively.

A comprehensive meeting for health care providers at the beginning of each year project was conducted. Children were formally assessed by qualified SLPs for baseline parameters and post treatment, including:

- Oral examination and facial grimace

- Speech abnormality with perceptual assessment of speech for cleft using the Thai Universal Parameters of Speech Outcomes for People with Cleft Palate⁽³⁴⁾. Outcomes were summarized by consensus between two qualified SLPs; a researcher and an external evaluator. Speech characteristics were assessed by articulation, resonance, intelligibility, and nasal emission/turbulence.

- Language screening test (adapted from Thai Early Language Milestone)⁽³⁵⁾.

SCs by SA, a physiotherapist who worked in Kantharawichai Hospital, was monitored via

Table 1. Alternative models for speech services in developing countries

Countries	Program name
Sri Lanka	- Training counterparts in cleft palate speech therapy in the less developed world ⁽¹⁷⁾ - Training assistants in cleft palate speech therapy in the developing world ⁽¹⁸⁾
Vietnam	- Training of a paraprofessional in speech pathology: a pilot project in South Vietnam ⁽¹⁹⁾
Indonesia	- Cleft palate rehabilitation: interim strategies in Indonesia ⁽²⁰⁾
Mexico	- Speech summer camp for treating articulation disorders in cleft palate patients ⁽²¹⁾ - A comparative trial of two modalities of speech intervention for compensatory articulation in cleft palate children, phonologic approach versus articulatory approach ⁽²²⁾
India	- Use of a consensus building approach to plan speech services for children with cleft palate in India ⁽²³⁾
Thailand	- Speech camp for children with cleft lip and/or palate in Thailand ⁽²⁴⁾ - Development of community-based speech therapy model: for children with cleft lip/palate in northeast Thailand ⁽²⁵⁾ - Speech camp: community-based speech therapy model for Thai children with cleft lip/palate in Amnatchareon Province ⁽²⁶⁾
Lao PDR	- Satisfaction of speech and treatment for children with cleft lip/palate in Lao People's Democratic Republic ⁽²⁷⁾

observation on the practice by SLP as follows:

1) The 1st year project: teachings of services (speech therapy with teaching SAs and caregivers for articulation correction) were conducted by SLPs on a three-day speech camp, following by a one-day follow-up speech camp at Maha Sarakham Hospital every two months. SCs were performed by SA at the patient's home, every week for a period of nine months.

2) The 2nd year project: teachings of services were conducted by SLPs in a one-day speech camp at Maha Sarakham Hospital. One-day follow-up activities and site visit were established at Kantharawichai Hospital. SCs by SA were conducted at local hospitals, twice a month for a period of nine months. Counseling between SLP and SA could be arranged any time.

3) The 3rd year project: teachings on services were conducted by SLPs in a 1-day speech camp at Srinagarind Hospital. Six one-day follow-up activities and a site visit were established at Kantharawichai Hospital, Non Thong, Kosum, Phisai and Maha Sarakham Hospitals. SCs by SA were conducted at local hospitals twice a month for a period of nine months. Counseling between SLPs and SA could be arranged any time.

Assessment and demonstration were also simultaneously conducted in each speech camp and follow-up. SLPs assigned individual home programs for SA and caregivers. Children were provided speech therapy approximately three to four 45-minute-sessions by SLPs in each speech camp and follow-up activities. SA provided SCs approximately two 30-minute sessions a month. Caregivers also carried on home program for children approximately three or four 20- to 30-minute sessions a week. Manuals of Speech Correction for Children with Cleft Palate: Paraprofessionals and Caregivers⁽³⁶⁾ and Exercises for Articulation Correction⁽³⁷⁾ were used as references. Daily Home Record of Speech Correction⁽³⁸⁾ was reviewed by SLPs and then provided as a checklist for SA and caregivers in follow-up camp.

Formal assessment of post-perceptual speech abnormality using the Thai Universal Parameters of Speech Outcomes for People with Cleft Palate⁽³⁴⁾ was performed for quantity the number of articulation errors in post treatment.

Analysis

The main outcome was the number of articulation defects calculated from pre- and post-speech camps. Perceptual assessments were also scored: resonance as normal (0), hyponasality (-1), mild

hypernasality (+1), moderate hypernasality (+2), severe hypernasality (+3); nasal emission/turbulence as none and appear; voice as normal and abnormal; language was scored as pass and delay.

Descriptive analysis was performed for general children's characteristics and satisfaction assessment. Paired t-test was used to demonstrate the effectiveness of "Networking of KKKU Community-Based Speech Therapy Model: sites of Kantharawichai Hospital" by comparing the number of pre- and post-articulation errors in children with CLP. These data were parts of 44 children in total with clefts, who enrolled in the main project that were tested by Shapiro-Wilk, and indicated they were able to use the Student's t-test^(39,40).

Results

General characteristics of participating children with CLP are displayed in Table 2. The majority of the participating children with CLP (n = 5, 71.43%) were diagnosed left cleft lip and cleft palate whilst the remainders were cleft palate.

Pre- and post- speech and language assessment for the children with CLP are summarized in Table 3.

SC by SA under supervision and monitored by SLPs in the networking of Kantharawichai for the children with CLP showed a significant decrease in the number of post-articulation errors in each year project.

Discussion

Children with CLP with delayed speech and language development were enrolled in Khon Kaen University Community-Based Speech therapy Model for clefts, networking of Kantharawichai, had improvement of language and were in normal language skill level (3C30, 3C21) (Table 3). For speech correction, SA was trained to use communication media

Table 2. General characteristics of the participating children

Code	Age years; months	Gender	Diagnosis
1C01	5.1	Female	Left cleft lip and cleft palate
1C02	4.6	Female	Cleft palate
1C05	5.3	Male	Left cleft lip and cleft palate
1C03	4.1	Female	Left cleft lip and cleft palate
3C30	6.0	Male	Cleft palate
3C21	5.3	Male	Left cleft lip and cleft palate
2C01	6.2	Female	Left cleft lip and cleft palate

Table 3. Pre- and post- speech and language assessment for the children with CLP

Code	Language		Resonance		Understandability		Acceptability		Voice		Number of articulation			
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Word		Sentence	
											Pre	Post	Pre	Post
1C01	Pass	Pass	0	0	N/A	Normal	N/A	Normal	Normal	Normal	16	2	11	1
1C02	Pass	Pass	0	0	N/A	Normal	N/A	Normal	Normal	Normal	16	0	11	0
1C05	Delayed	Delayed	+1	+1	N/A	Mild	N/A	Mild	Normal	Normal	18	5	15	4
1C03	Pass	Pass	0	0	N/A	Normal	N/A	Normal	Normal	Normal	23	3	16	2
3C30	Delayed	Pass	+2	0	Normal	Normal	Mild	Normal	Normal	Normal	6	1	3	1
3C21	Delayed	Pass	+2	+2	Moderate	Normal	Moderate	Moderate	Normal	Normal	10	3	6	2
2C01	Pass	Pass	0	0	Normal	Normal	Normal	Normal	Normal	Normal	2	2	1	1

* Understandability included: Normal = within normal limits; Speech is always easy to understand; Mild = Speech is occasionally hard to understand; Moderate = Speech is often hard to understand; and Severe = Speech is hard to understand most or all of the time.

** Acceptability included: Normal = within normal limits; Speech is always easy to understand; Mild = Speech deviates from normal degree; Moderate = Speech deviates from normal to a moderate degree; and Severe = Speech deviates from normal to a severe degree.

and materials that composed of meaningful pictures from phoneme level to conversation level for articulation drills. Therefore, the children received language stimulation at the same time as articulation correction. Otherwise, they had opportunity to gain speech, language and social interaction during treatment which conveys language skills via SCs activities.

Results of this present study showed that six out of seven children (85.71%) had significant decrease of articulation errors (Table 3). Those six children had significant reduction of articulation errors; however, the child had the same number of articulation defects after the one-year program. This child had rarely got SCs either at the hospital by SA or at home by caregiver due to financial hardship. Caregivers had no time to bring their child to the health care unit for speech services and found no time and space for speech practice at home. The staff of the speech therapy program recognized this problem and tried to support financially such as transportation and living expenses; however, they still have to cope with other difficulties (e.g., caregivers needed to work to compensate expenses and no one took care of other siblings) that were out of their control for SC.

Comparisons mean differences between pre and post perceptual articulation tests revealed that the Community-Based Speech Therapy Model in Kantharawichai Hospital under SLPs' supervision had significant improvement in articulation skills both word (mean difference = 10.5; 95% confidence interval = 8,13) and sentence levels (mean difference = 7.25; 95% confidence interval = 0.5-12) (Table 4). These were supported by previous studies which were networks of Community-Based Speech Model in Kosumphisai Hospital, Maha Sarakham Hospital, and Non Thong primary care unit^(41,42). These studies revealed similar positive results for speech correction by SAs and showed that networking of Community-Based Speech Model was one of the effective ways to provide speech services for children with CLP.

One of the children with CLP and hypernasality had normal resonance after finished networking of KCU community-based speech therapy program for a year (the child No. 3C21). This hypernasality resulted from compensatory articulation defects, therefore, after articulation drills, it gave new placement of articulation and the child was trained to use oral acoustic energy in place of a nasal sound. Resonance disorder in this case disappeared after SCs in both perceptual and objective measurements. Another child (No. 3C30) had moderate

Table 4. Mean differences between pre- and post-articulation errors

Level	Pre-test	Post-test	Mean difference (95% CI)	p-value
Word	16 (2-23)	2 (2-6)	10.50 (8, 13)	0.02
Sentence	11 (1-16)	1 (1-4)	7.25 (0.5, 12)	0.02

hypersnasality that disappeared after enrolling in the program for a year. He lived with grandparents who were “Tribal York Times” or “a native of Yorkshire” in Tambol Srisuk near Tha Khon Yang, Kantharawichai, where the original settlers of York have discovered and speak “York” language; the local northeastern language. Natural Yorkshire accent deviates slightly from the Northeast language, particularly hypernasality and then received speech correction via central Thai or Thai official language. After speech correction, he was familiar to speak official Thai language and resonance then changed to normal. In addition, he started attending school with central Thai or Thai official language. This evidence-based support brought about a reduction hypernasality or corrected functional resonance disorders.

There were still two children with CLP and hypernasality which needed further investigation and management. Even though, there were insufficient children’s data of understandability available, study revealed that a child with CLP and moderate deviation level or speech is often hard to understand (the child No. 3C21). He had significant improvement to be normal understandability but still moderate deviation in acceptability. He could articulate correct sounds seven out of ten articulation errors at word level and presented improvement in understandability (Table 3) after networking of KKU community-based speech therapy program: Kantharawichai. This showed that SCs could solve not only articulation errors, but also understandability.

A girl had CLP and selective mutism (case 1C03) did not cooperate to SC by SA in the early program. SLP and team visited and gave SC modification techniques via imitation of her mother’s speaking both at home and at one-day follow-up speech camp. This implied that social interaction concerning during SCs (both individual and group speech therapy) encourage her to adapt to interact with other people (two-way communication) and she could finally had personal communication with peers, SA and SLPs. She was reassessed by pediatric psychiatrist and

found that she recovered from selective mutism. She had significant reduction of articulation errors after of the KKU community-based speech therapy program.

There were a few obstacles in SCs by SA including: 1) sometimes difficulty to schedule appointments for caregivers and SA; 2) distance between home and the health care unit took 1/2-1 hour, and each SCs session normally took 30-45 minutes, therefore, it took approximately one-day speech therapy session. Caregiver needed to leave one working day and lose income. Even though, there was partial compensatory for transportation from the project, it was still not enough for their living expense. Caregivers needed time for SCs at home that consumed their time for routine activities and living earn. These factors were similar to studies in other developing countries^(26,29,33) and need to be addressed for future research.

This present study was a networking of Community-Based Speech Model in Maha Sarakham province that community services by local health care providers showed the effective mean in providing speech services in area where limitations in speech services or SLPs. The results were promising, however, there was a limitation caused by the size of participants because we needed to select purposive participants or children with CLP who lived in area near or around specific site. Further large scale study is needed.

Conclusion

Kantharawichai Networking of KKUCSM was one of the valid and effective ways in providing speech correction for the children with cleft palate.

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What is already known on this topic?

Children with CLP are at risk for speech and language abnormalities. They should be assessed early and provided speech therapy as soon as possible for the prevention of long lasting compensatory articulation. Most children with CLP cannot access speech intervention because of limitations or lack of speech services in some developing countries.

What this study adds?

Kantharawichai Networking of KKUCSM for children with CLP was the effective site in providing speech correction under SLP's supervision for the reduction of articulation errors in Thailand, where there are limited speech services.

Potential conflicts of interest

None.

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การฝึกพูดเด็กปากแหว่งเพดานโหว่ในชุมชน: เครื่องช่วยกันทรวิชัย จังหวัดมหาสารคาม

พิชญ์ลีณี ศรีเตชะ, ทวีตรี ภูมิน่า, เบญจมาศ พระธานี

วัตถุประสงค์: เพื่อศึกษาผลการเปรียบเทียบจำนวนเสียงพูดไม่ชัดของเด็กปากแหว่งเพดานโหว่ก่อนและหลังเข้าโครงการการฝึกพูดตามรูปแบบในชุมชนของมหาวิทยาลัยขอนแก่น: เครื่องช่วยกันทรวิชัย จังหวัดมหาสารคาม

วัสดุและวิธีการ: เด็กปากแหว่งเพดานโหว่ที่อาศัยอยู่ในหรือใกล้กับอำเภอกันทรวิชัย จังหวัดมหาสารคาม จำนวน 7 คน โดยการเลือกแบบเฉพาะเจาะจงเป็นกลุ่มเป้าหมายในการศึกษา 3 ระยะ โดยระยะที่ 1, 2, และ 3 มีเด็กปากแหว่งเพดานโหว่ที่เข้าร่วมโครงการจำนวน 4, 1, และ 2 คนตามลำดับ เด็กได้รับการประเมินทักษะภาษาและการพูด ประกอบด้วย ภาษา ความเข้าใจของการพูด การยอมรับการพูด การแปรเสียง การสั่นพ้องของเสียง และคุณภาพของเสียงโดยนักแก้ไขการพูดที่มีความเชี่ยวชาญ 2 คนก่อนและหลังเข้าแต่ละระยะของโครงการฯ การฝึกพูดครั้งละ 30-45 นาที พร้อมกับการสอนการแก้ไขการพูดให้กับผู้ช่วยฝึกพูดและผู้เลี้ยงดูหลักตามปัญหาของเด็กแต่ละคนในการเข้าค่ายฝึกพูดแบบเข้มข้น 3 วัน และการเข้าค่ายติดตามการฝึกพูด 1 วัน ผู้ช่วยฝึกพูดและผู้เลี้ยงดูหลักฝึกพูดต่อที่สถานพยาบาลในเครือช่วย คือโรงพยาบาลกันทรวิชัยและที่บ้าน แต่ละระยะใช้เวลาประมาณ 1 ปี นำข้อมูลที่ได้มาเปรียบเทียบระหว่างค่าเฉลี่ยของจำนวนเสียงเด็กที่พูดไม่ชัดก่อนและหลังเข้าโครงการฯ

ผลการศึกษา: จำนวนเสียงที่พูดไม่ชัดหลังเข้าโครงการฯลดลงอย่างมีนัยสำคัญทางสถิติ เด็กปากแหว่งเพดานโหว่ 6 ใน 7 คน (85.7%) มีการพูดชัดขึ้นอย่างชัดเจน

สรุป: เครื่องช่วยกันทรวิชัยของรูปแบบการฝึกพูดแบบชุมชนของมหาวิทยาลัยขอนแก่นเป็นวิธีหนึ่งที่มีประสิทธิภาพในการแก้ไขการพูดไม่ชัดในเด็กปากแหว่งเพดานโหว่ โดยเฉพาะพื้นที่ที่มีความจำกัดหรือขาดแคลนการบริการด้านแก้ไขการพูด
