The outline of this chapter is as follows:

2.1 Cleft Lip and Palate: (CLP)
   2.1.1 Cleft palate speech
   2.1.2 Speech therapy in individuals with CLP

2.2 Addressing challenges in providing speech intervention services
   2.2.1 SLP monitored indirect intervention programs in communication disorders
   2.2.2 Caregiver involvement in the child’s intervention
   2.2.3 Need for alternate models of service delivery

2.3 Alternate models of service delivery in cleft in South Asian Region
   2.3.1 Parent implemented model
   2.3.2 Volunteer /Grass root level worker implemented model
   2.3.2 Community based model

2.4 Community Based Rehabilitation
2.1 Cleft Lip and Palate: (CLP)

The management of children with CLP presents many challenges. Their problems are unique and complex in nature and hence require effective management provided by a wide range of specialists. Multidisciplinary cleft team is the accepted model for delivery across the globe. Primary role of speech-language pathologist is to work with the cleft palate team, make an accurate diagnosis and formulate an appropriate treatment plan. A speech-language pathologist who specializes in the evaluation and treatment of children with oral clefts could monitor articulation, voice, resonance, expressive, and receptive language development and skills of an individual (Sharp, et al., 2003).

2.1.1 Cleft Palate Speech

The effect of structural anomalies on speech function is complex and often multifaceted, placing individuals with this condition at risk for communication disorders. (Broen, Devers, Doyle, Prouty, & Moller, 1998) compared the acquisition of language in children with CLP (n=28) with that of non-cleft children (n=29). They reported a delay in early language development and slow vocabulary development in children with CLP than non-cleft children. Scherer and D’Antonio (1995) reported delay in early language skills, however they disappeared by school age (Chapman, Graham, Gooch, & Visconti, 1998).

Individuals with CLP exhibit atypical speech characteristics called ‘cleft speech’. It is characterized by abnormal speech production difficulties such as atypical consonant productions, nasal emission, abnormal resonance such as hypernasality, hyponasality, mixed nasality (Peterson-Falzone, et al.,2009). Sell, Harding, and Grunwell (1999) defined cleft speech as being characterized by abnormal consonant productions, nasal resonance and nasal airflow, altered laryngeal voice quality, and nasal or facial grimaces. The cleft type error patterns can be either obligatory or compensatory. Obligatory errors are produced because of structural abnormality, resulting mostly in changes in manner of articulation and compensatory errors are produced due to maladaptive articulatory placements during the developmental period, resulting in changes in place of articulation (Kummer, 2008). Pressure consonants are more
affected than other speech sounds (Nagarajan, Savitha, & Subramaniyan, 2009). Speech errors in individuals with CLP, especially when not intervened, impact overall communication and therefore can have considerable impact on an individual. According to National Sample Survey Organization (NSSO, 2003), in India there are 17 per thousand persons with speech disability due to cleft lip and palate.

Prevalence of compensatory articulation in CLP speech has been reported by several authors (Dalston, 1992; Hardin-Jones & Jones, 2005). Hardin-Jones and Jones (2005) assessed the prevalence of compensatory articulation in 212 preschool children with repaired cleft of palate. They reported that 25% of children exhibited glottal/pharyngeal substitutions, 13% produced nasal substitutions, 7% exhibited mid-dorsum palatal stop and less than 3% exhibited other compensatory error types. Peterson-Falzone, et al., (2009) reported that glottal stop was the most frequently (57%) occurring compensatory articulation, followed by mid-dorsum palatal stop (39%), pharyngeal fricatives (15%), velar stops (14%), pharyngeal affricates (12.5%), palatal fricatives (10%), pharyngeal stops (8%), and velar fricatives (4.5%). Chapman and Hardin (1992) reported the production of compensatory articulation in ten, two year old toddlers with repaired cleft palate. Results revealed that nine out of ten children exhibited compensatory articulation but the overall frequency of occurrence of these errors were reported to be low. Eight of the nine toddlers produced glottal stops, mid-dorsum palatal stop, or a combination of both.

Research studies have primarily focused on profiling articulation errors such as type and frequency of occurrence of error pattern and comparing treatment outcomes. Bzoch (1965) compared the articulation proficiency of 60 children with CLP in the age range between 3 and 7 years with 120 age matched normal children. He reported that the articulation proficiency of 5 year old children with CLP was lesser than 3 year old normal children.

Riski and DeLong (1984) analysed articulation development in 108 children with cleft lip and/or palate between the ages of 3 and 8 years using Templin-Darley Test of Articulation. Test results showed significantly higher articulation scores in children with CL or cleft lip and alveolus (CLA) than in children with cleft lip and/or palate at
every age tested. They also found better scores in children with CL than children with CLA. Authors observed that children with isolated cleft lip developed articulatory skills that followed a normal developmental schedule.

Hardin-Jones and Jones (2005) conducted a retrospective study to examine the early speech results associated with primary palatal surgery. Objectives of their study were to report the prevalence of preschoolers requiring speech therapy and who demonstrated significant nasalization of speech and compensatory articulations. 212 preschoolers with repaired cleft palate aged 2 years 10 months to 5 years 6 months participated in the study. Findings from the study revealed, about 68% of the children were enrolled/received speech therapy, 37% demonstrated moderate-severe hypernasality or had received secondary surgery for management of velopharyngeal dysfunction. Authors concluded that despite advances in intervention, majority of participants demonstrated atypical speech production that required direct speech therapy.

Articulation errors patterns are learnt when the speech mechanism was defective and noticed even after surgical intervention. During the early years developmental errors may also be observed in these individuals. In such instances treatment planning is very important in the articulation therapy and may determine the prognosis of the patient.

Karling, Larson, Leanderson, and Henningsson (1993) analysed speech of 84 patients with complete unilateral CLP and 19 patients with complete bilateral CLP. All speech samples were evaluated by trained listeners. The speech of the patients and 40 noncleft subjects was tape recorded and randomly mixed and used for listening tasks. The results indicated that bilateral cleft patients had poorer speech and needed more speech therapy than unilateral cleft patients. All individuals with cleft palate were found to have poorer speech than non cleft subjects even when considerable speech therapy and complementary surgical treatment was provided.

A retrospective study conducted by (Prathanee, Seepuaham, & Pumnum, 2014) reported errors in speech exhibited by children with cleft palate alone. Records of 42
children with cleft palate enrolled in the project “Smart Smile and Good Speech” were reviewed. Results indicated, 12% were normal, 12% had functional articulation disorder, 9% had compensatory articulation disorder and 67% had both functional and compensatory articulation disorder. Hypernasality with varying degree was observed in 50% of children with cleft palate. Voice abnormality was noted in 19% of the group. The patterns of errors in articulation observed were backing of oral consonants, mainly glottal substitution (40%), followed by velar substitution (36%) and substitution of nasal consonants for oral pressure consonants (21%). Authors reported that prevalence of speech disorders in CP ± L in this study was higher than previous studies. This could possibly be due to the nature of data collection and hence recommended a need for prospective study.

In Thailand, Prathanee, Pumnum, Seepuaham, and Jaiyong (2016) reported speech and language outcomes for children with CLP who were in the transitional phase from pre-school to early school age, around 5 years. 38 children (20 females & 18 males) age ranged between 4 to 7.8 years were recruited in the study. The protocol for assessment consisted of oral examination and facial grimaces, perceptual evaluation of speech using the Thai universal parameters of speech outcomes for people with cleft palate, and language screening test. Findings revealed that, 3 of 38 had delayed speech and language development, 18 had problem in understandability, 13 had resonance problems, 11 had voice problems, and 34 had articulation issues excluding the /r/ phoneme. They concluded that there was a high prevalence of speech disorders occurring in children with CLP. Authors also highlighted the need for reviewing early intervention program, surgical correction techniques and conduct of prospective studies to report speech outcomes.

2.1.2 Speech therapy in individuals with CLP

The speech characteristics of children with CLP clearly highlights the need for speech intervention in this population. Speech therapy has been structured and delivered in different formats across regions and their effectiveness has been evaluated. Van Demark and Hardin (1986) studied the effectiveness of 06-week summer residential program conducted for 13 children with CLP. Pre and post speech assessment were carried out to measure the speech outcomes. All children received 4 hours of
articulation therapy for 26 days. The findings of the study reported that although during the program children performed well, their progress was reported to be slower.

Albery and Enderby (1984) conducted a randomized control trial on 46 children with CLP with mean age of 8;7 years. They were randomly assigned to two groups. Intervention group (N=25) received intensive conventional speech therapy (2 independent 30 minutes session & a group session for 6 weeks) and control group (N=21) received weekly conventional speech therapy. Intervention group showed significant improvement than the control group post therapy with a maintenance noted at the end of 2 year follow up.

Pamplona, Ysunza, and Espinosa (1999) conducted a prospective randomized trial, grouping 29 children with CLP in the age range of 3-7 years into phonologic intervention and conventional articulation intervention. Both the groups received 1 hour sessions twice a week until participants achieved normal articulation. Speech therapy duration was significantly reduced for children who were receiving phonologic treatment to correct compensatory errors than those receiving conventional therapy. In another study, Pamplona, Ysunza, and Urihtegui (1996) compared two different speech therapy groups of cleft palate children. Twenty-one participants between the age ranges of 3-4.8 years who met the inclusion criteria were randomly divided into 2 groups, the first group included 10 participants and the second group included 11 participants and was treated by the same speech therapist throughout the intervention period. The first group received therapy according to whole language in which significant events for the child were recreated and utilized for therapy sessions every day. To enhance interaction and socialization, small groups of three members were assembled, including a speech pathologist, and two children with similar age, level of play and linguistic performance. The second group received speech therapy according to whole language and using the same events mentioned herein only that these children received therapy accompanied by their mothers. The purpose this study was to evaluate the presence of the mother and to modify, if necessary, the adult-child mode of interaction. A videotape recording of mother-child during a free play situation was obtained to evaluate the adult-child mode of interaction in each dyad. The patients accompanied by their mothers showed a
significantly higher linguistic advance as compared to patients receiving therapy without their mothers. The results in this study supported that linguistic development in the cleft palate child is strongly related to adult-child mode of interaction.

In a prospective randomized trial conducted by Pamplona, Ysunza, and Ramírez (2004), two modalities of speech intervention in children with cleft palate with compensatory articulation disorder (CAD) were compared. Thirty children between the age range of 3 and 7 years who met the inclusion criteria were randomly divided into two intervention groups (15 participants in each group) and were treated by the same speech therapist throughout the period. Intervention A included the phonological approach where groups of sounds were modified, and treatment goals were based on child’s active phonological rules, establishment and maintenance of phonological contrasts. Intervention B included whole-language approach involving play and storybooks. Sounds associated with CAD was treated indirectly through reinforcement of correct sounds and enhancement of cognitive linguistic organization. In both instances, therapy was conducted in small group including a speech pathologist, 2–3 children and mothers for one hour, twice a week until CAD was treated. The purpose of the study was to see whether a naturalistic intervention would reduce the total time of speech therapy necessary for correcting CAD in children with cleft palate as compared to phonologic intervention. Results revealed no significant difference between both groups in the total time of speech therapy for correcting CAD.

An intervention comparison study was carried out in Mexico by Pamplona, Ysunza, Patiño, Ramírez, Drucker, and Mazón (2005) to determine if a speech summer camp could significantly enhance articulation in cleft palate children with CAD. Ninety participants between the age range of 3-10 years who met the inclusion criteria were divided into two groups of 45 in each. Participants in first group were enrolled in speech summer camp for 3 weeks (4 hours per day from Monday to Friday) and participants in second group were enrolled in regular speech therapy (1-hour sessions twice per-week) for a period of 12 months. Pre and post therapy sessions were video recorded and analysed for intervention output. Pre intervention results in both groups revealed the severity of CAD was evenly distributed with non-significant differences across both groups of patients. At the end of intervention, both groups showed a
significant decrease in the severity of CAD. However, no significant differences were found between both groups in the distribution of severity of CAD at the end of the summer camp or the speech therapy period.

A systematic review of speech and language intervention was carried out by (Bessell et al., 2013) to document evidence related to therapeutic approaches reported in literature. Review included collecting information related to the approach used, study design, intensity and duration of the program, participant’s characteristics, service provider, model of service delivery and reported outcomes. Based on this study, details of speech and language therapy programs carried out between 2000-2010 are tabulated below in Table 2.
Table 2

*Speech and language therapy intervention programs carried out between 2000-2010 as reviewed by (Bessell et al., 2013)*

<table>
<thead>
<tr>
<th>Investigators/ Year/Place of study</th>
<th>Participant details</th>
<th>Intervention details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pamplona and Ysunza, 2000 (Mexico)</td>
<td>UCLP 3-4 41 Speech Therapist/Clinic RCT</td>
<td>3Sessions/Week for 08 months (01 hr session) Linguistic: Compared Focussed stimulation with and without parental interaction</td>
</tr>
<tr>
<td>Gibbon et al., 2001 (UK)</td>
<td>UCLP(7),BCLP(3),SCP(2) 5-18 12 Speech Therapist/Clinic RCT</td>
<td>NA Motor (EPG) compared with Conventional method (No Visual feedback)</td>
</tr>
<tr>
<td>Ma et al., 2003 (China)</td>
<td>CP 4-11 67 Home/Parents NA</td>
<td>05-10 hours in 20-40days of intervention period Motor: Non-speech</td>
</tr>
<tr>
<td>Yang et al., 2003 (China)</td>
<td>CP with obturator 5–29 16 Speech Therapist/Clinic Cohort</td>
<td>NA Motor: Traditional approach</td>
</tr>
<tr>
<td>Investigators/Year/Place of study</td>
<td>Participant details</td>
<td>Intervention details</td>
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<tr>
<td>Pamplona et al., 2004 (Mexico)</td>
<td>UCLP 3-7 30 Speech Therapist/Clinic RCT NA</td>
<td>Linguistic: Whole language compared with phonological method</td>
</tr>
<tr>
<td>Pamplona et al., 2005 (Mexico)</td>
<td>UCLP (45), CP (45 control) 3-10 90 Summer Camp model/ Clinic/ Speech Therapist Cohort Therapy in clinic: 2 hours/week for 08 months. Summer Camp: 5days/Week for 3 weeks (04 hours/day)</td>
<td>Linguistic Phonological whole language at summer camp compared with phonological whole language in clinic</td>
</tr>
<tr>
<td>Scherer et al., 2008 (USA)</td>
<td>CLP (10) 1-3 20 Parents/Home CT NA</td>
<td>Linguistic: Focussed stimulation compared with phonological whole language at summer camp</td>
</tr>
<tr>
<td>Investigators/Year/Place of study</td>
<td>Participant details</td>
<td>Intervention details</td>
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<tr>
<td>Hardin-Jones and Chapman, 2008 (USA)</td>
<td>BCLP (6), UCLP (20), hard and soft palate (3), SCP (1), Non CLP(10)</td>
<td>2-3 years, 40 participants</td>
</tr>
<tr>
<td>Pamplona et al., 2009 (Mexico)</td>
<td>CP, 0.42+11 months, 50 participants</td>
<td>Summer Camp model/ Clinic/ Speech Therapist, Cohort</td>
</tr>
</tbody>
</table>

NA-Not Available, BCLP-Bilateral Cleft of Lip and Palate, UCLP-Unilateral Cleft of Lip and Palate, SCP-Secondary Cleft Palate, CP-Cleft Palate Source: Adapted from Table 1 Characteristics of Included Studies in: (Bessell, A. et al., 2013). Speech and language therapy interventions for children with cleft palate: a systematic review. The Cleft Palate-Craniofacial Journal, 50(1), 1-17.
In their study they concluded that, the review couldn’t identify evidence to any one therapy approach/research design and other considerations such as timing, intensity, duration, service provider and model of service delivery. Authors also highlighted that future studies should consider all the above mentioned factors for carrying out a constructive systematic review.

Across the globe individuals with CLP usually receive surgical correction either from an international team or a local team. However, for speech therapy services, these children are referred/reviewed by local personnel only. Delay in availing speech services is still a problem in developing countries where there is some accessibility to surgical services but not for speech therapy. Hence, the effect of cleft on speech remains critical because of limited speech services in developing countries.

2.2 Addressing challenges in providing speech intervention services

The prevalence of communication disability across the world in specific populations that are under-served by speech-language pathology services in both majority and minority world countries are described by (Wylie, McAllister, Davidson, & Marshall, 2013). In this paper authors highlighted the need for novel ways of conceptualizing development of services, including population-based approaches, and highlighted the importance of developing equitable services for people with communication disabilities, in both majority and minority world settings.

Potential solutions to perceived barriers experienced by consumers when attempting to access paediatric speech pathology services in rural and remote New South Wales (NSW) was studied by O’Callaghan, McCallister, and Wilson (2005). A self-administered questionnaire was mailed to 1,100 members of the NSW branch of the Isolated Children’s and Parents’ Association (ICPA). Three-hundred-and-twenty-nine of the 1,100 members responded to the questionnaire. In that group 139/329 respondents felt a need to access paediatric speech pathology services. Of the 139 informants, only 105 families said that they were able to access speech pathology services. Many reported of experiencing some form of barrier in doing so, including lack of an available speech pathologist, long distances to travel to access speech pathology services, delays in treatment due to waiting lists, expensive travel costs,
limited choice of speech pathologists, no public transport, and a lack of awareness of services. Ninety one (28%) of the 329 informants thought that changes could be made to existing paediatric speech pathology services to make them more accessible to rural and remote consumers. The respondents stated that the barriers could be overcome by having speech pathologists working in different hours, such as working weekends when consumers may come into town. Also more mobile or visiting speech pathology services can be provided with more intensive periods of speech therapy being offered during school holidays.

In the developed world, speech services are delivered with focus to improving/facilitating more normal speech. This approach is referred to as medical/impairment model. This model is limited to few people, ideal in urban settings and requires professional expertise (McConkey & O'Toole, 1995). An alternative approach to the medical model is referred to as a social/disability model. The recent focus of WHO is shifting towards providing healthcare services within the community (WHO 2004). There have been reports on various projects involving training of volunteers from within the community for a program. There have also been use of parent implemented models in providing intervention for children with CLP which have shown high success in elimination of compensatory articulations and normal speech and language development (Scherer, D'Antonio, & McGahey, 2008)

**2.2.1 SLP monitored indirect intervention programs in communication disorders**

Several authors have reported the outcomes of various non-professional administered speech and language intervention programs. These include, educating community based health workers, day care staff in school, volunteers, teachers in school and members of the family to deliver intervention services to the client. A randomized, controlled pre-post experimental study was carried out on training volunteers as conversation partners for adults with aphasia by Kagan, Black, Duchan, Simmons-Mackie and Square (2001). Forty volunteers and persons with aphasia dyads were randomly allocated to experimental and control groups. The volunteers in the experimental group underwent specific training on being an effective communication partner. Measure of skill in providing supported conversation for adults with aphasia and measure of participation in conversation for adults with aphasia were both
evaluated pre and post intervention. The results revealed that the trained volunteers performed significantly better than the untrained. However, factors such as age, culture, motivation level of the volunteers, etc. which might have an influence on the performance of the aphasics weren’t well defined in the study.

An exploratory study reported the outcomes of training for child care providers in day care centres on language facilitation strategies (Girolametto, Weitzman, & Greenberg, 2003). Sixteen day care staffs were randomly assigned to experimental and control groups. Day care staffs in the experimental group were taught appropriate strategies to facilitate language skills in children. The children were evaluated pre and post the intervention. On the post evaluation, children in the experimental group talked more, produced more combinations, and talked to peers more often than the control group. The levels of performance of the day care staff before and after training were not adequately explained in the study. However, the results support that the training model can be implemented to facilitate language in developing children.

Hayes, Keegan and Goulding (2012) conducted an instructional session on home program for parents of children with speech and language difficulties. The home program was carried out by parents at home in addition to conventional speech and language therapy. Parent’s experience and knowledge post the home program were examined. The results revealed that more than half the parents found that the home-based activities were helpful in developing a better understanding of their children’s needs and to device strategies on how to help them.

A similar study done by Crowe, Norris and Hoffman (2004) examined the effects of training six caregivers to facilitate communicative participation of preschool children with language impairment during storybook reading. The outcomes were studied by measuring the child’s change in communicative participation and lexical diversity of utterances during adult–child shared reading pre and post intervention. Children significantly increased the frequency of communicative turns, total number of words, and number of different words produced during shared storybook reading because of caregiver training. The authors added that the study parameters should be well defined prior to the start of the study to monitor changes in them as the intervention
progresses. This study emphasizes that baseline of the child and caregivers should be carefully documented to efficiently track changes after the training program.

2.2.2 Caregiver involvement in the child’s intervention
A literature review of 25 studies of speech intervention methods for children with primary speech and language delay or disorder was carried out. The results of the meta-analysis suggested that speech and language therapy is effective for children with speech sound or vocabulary difficulties. No significant differences were shown between clinician administered intervention and intervention implemented by trained parents (Law, Garrett, & Nye, 2010). The authors mention that the quality of studies used in the review was variable. Several studies did not report potentially important factors such as attrition, method of randomization and baseline characteristics. They also added that there is a need to identify and investigate other potentially important factors that lead to positive outcomes both in terms of intervention approaches used and the physical characteristics of the intervention process.

Sugden, Baker, Munro, and Williams, (2016) performed a systematic review of articles that contained parent involvement in treating a child with speech sound disorder (SSD). The papers were analysed using a quality appraisal tool. This analysis provides evidence that the inclusion of home tasks in intervention has the potential to increase the amount of intervention available to children with SSD. However, the current evidence base does not provide speech and language therapists with specific details on methods to train parents, ways to monitor parents if the home plan was worked out efficiently, etc.

Fukkink and Lont (2007) published a meta-analysis and review of caregiver training studies published between 1980 and 2005. The goal of this study was to integrate findings from the experimental studies into the effects of caregiver training on caregiver competencies. Studies that involved specialized caregiver training with a focus on interaction skills with children, studies in which caregiver was the primary focus of the evaluation or supplemented with a focus on children were included. The studies that focused specifically on children with disabilities, early childhood special education or residential childcare were not included. On analysis, the results showed
that studies that involved fixed-curriculum courses to train parents appeared to be more effective than courses that did not have this curricular structure. However, the methodology of individual studies need to be examined to comment on the effectiveness.

Roberts and Kaiser (2011) reviewed 18 different studies which evaluated parent implemented intervention offered to groups of parents. Eight out of these 18 studies were based on Hanen programs. The remaining studies were on other programs in which parents were trained to promote their child’s communication. This study showed that children with a variety of communication difficulties make good progress when their parents learn to use specific techniques designed to improve the children’s communication skills. It also showed that trained parents were as effective if not more effective in some cases as SLPs at helping their child. This confirmed that parents should be partners with SLPs in the therapy process.

Pamplona and Ysunza, (2000) aimed to compare the outcome of speech therapy given in different settings to two groups of children with cleft palate. Forty-one children between the age ranges of 3-4.8 years who met the inclusion criteria were randomly divided into two groups (20 in control & 21 in experimental group). All the participants had 3 sessions a week for a period of 1 year and were also given the same treatment consisting of play with toys accompanied by the following strategies: parallel talk, language modelling, and expansion of utterances produced by the children. The two groups were assessed at the beginning of the study to find out the developmental level in language. The pre therapy test results revealed that participants in both the groups were similar in age, play, and language ability. The control group received therapy provided only by the speech therapist in small working groups. The experimental group was treated by a speech therapist in small working groups and mothers were also an active participant in the session. The purpose of this study was to find out if including the mother as an active participant in speech therapy sessions would improve the language development of children with cleft palate. Both groups were evaluated before and after treatment to evaluate the advance of each group. The results indicated that participation of mother in the session significantly increased the gains in language in 90% of the children. This could be probable as mothers learnt the
strategies for interacting and communicating with the child and applied it throughout the day.

In a study done in rural Tennessee, (Scherer et al., 2008) studied the effects of parent-implemented focused stimulation program in children with repaired CLP. The objective of the study was to determine if parents can be trained to provide speech services at home. The study included 2 groups: 10 normally developing children-mother pairs and 10 children with repaired CLP and their mothers. The two groups were matched for vocabulary size, age and socioeconomic status. The pre- and post-intervention parent child interaction skills were transcribed and analysed. The results showed that parents could be trained to provide speech services reliably. However, a well-organized training program that defines the study parameters to be analysed is necessary to measure the actual outcomes of the intervention model.

Several studies have been done in which the effectiveness of a parent-implemented intervention on children’s speech-language development and parents’ interaction styles was investigated. Seventeen children with cleft palate (CP) and their mothers participated in all sessions of a parent-implemented intervention program (Ha, 2015). The intervention program consisted of four phases, pre-intervention test, parent training, parent-implemented intervention at children’s home for 3 months, and post-intervention test. Children’s language and speech measures and maternal measures from pre- and post-intervention tests were compared between the experimental and control group who did not attend training. The results of the study support the effectiveness of parent-implemented early intervention on positive changes in children’s speech-language development and mothers’ use of communication strategies.

Eleven parents of preschool children with autism were trained to use operant procedures to teach speech in place of non-verbal gestures. The child’s speech skills were assessed pre and post parent training. Immediate follow up post-treatment results showed significant improvement in speech behaviours of the child. However, subsequent follow up results revealed that there was no evidence of significant improvement beyond that achieved at the end of training. The importance of support
for parents in continuing to do formal teaching and frequent follow ups after the training program ends was stressed (Harris, Wolchik, & Weitz, 1981).

The need of a structured training program to primary caregivers of children with autism to increase their child’s speech skills have been emphasized by Laski, Charlop and Schreibman (1988). The training began with the caregiver observing the therapist using facilitation strategies, followed by the caregiver demonstrating the skill. The performance of the caregiver was rated by the investigator and once the caregiver met the criteria, they were instructed to carry out the activities at home. The authors state that it was also important to monitor whether parents implemented the skills at home through self-report logs. Though individual variations of the child and parents may significantly influence outcomes, post training increases in parents' requests for vocalizations from their autistic children were observed, and the children’s speech skills were significantly better from the baseline. All the training programs included an education material that was given to the caregiver/parent to provide knowledge/steps on carrying out the intervention program.

Therapy assistants are widely used in the delivery of therapy services in rural Western Australia. In their project, the authors report that training is an essential part in providing any health worker with the appropriate knowledge and skills for their work. A comprehensive training system includes evaluation of general level of knowledge, choice of materials used for training, and hours of training. Monitoring the implementation of service plays an important role when evaluating outcomes of the service provided (Goodale, Spitz, Beattie, & Lin, 2007).

2.2.3 Need for alternate models of service delivery
Helander (1993) reported that number of people in low income countries with communication disabilities will be between 165.3 million and 213.2 million by 2025. It was also estimated that people with communication disabilities formed between 38% and 49% of the disabled population and they were seeking help from educational establishments and community based rehabilitation services. Providing speech intervention services are complex as they require a long timeframe than surgical services and may be extended up to several months. In developing countries there are
limited resources and high need for services (D'Antonio & Nagarajan, 2003). Some of the challenges faced in providing intervention for individuals with CLP in India are non-availability of trained professionals and characteristics of the population receiving services (Nagarajan, Murthy, & Raman, 2005). Sell et al. (2013) discussed the models of intervention in practice in the majority world. Based on their classification, models of intervention are discussed under three major categories and presented in Table 3.
Effectiveness of community based worker implemented speech correction program for children with repaired cleft lip and palate in rural districts of Tamil Nadu

**Table 3**

*Summary of different models of intervention*

<table>
<thead>
<tr>
<th>Service delivery method</th>
<th>Personnel</th>
<th>Strength</th>
<th>Challenges</th>
<th>Literature support</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Conventional/traditional models</strong></td>
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<tr>
<td>Specialist SLP (Institution/Hospital /Clinic based intervention)</td>
<td>Specialist SLP trained/ working in a multidisciplinary cleft care centre</td>
<td>Speech intervention services provided by specialist. Links to primary and secondary services. Acts as a resource for generalists and others</td>
<td>Only affluent families can afford this service if provided in private clinics/hospital. Rural/remote clients need to travel long distances to receive therapy. Services are restricted to major city hospital where cleft clinics exist.</td>
<td>(Pamplona, Silis, Ysunza, &amp; Morales, 2015); (Demark &amp; Hardin, 1986); (Sell, Grunwell, &amp; Mars, 1994); (Sell, 2005); (Hardin-Jones &amp; Chapman, 2008)</td>
</tr>
<tr>
<td>Generalist SLP (Institution/Hospital /Clinic based intervention)</td>
<td>Generalist SLP (not received any specific training in cleft) and not attached to a multidisciplinary cleft care team.</td>
<td>Speech therapist are available but few, in smaller towns/cities who could possibly carry out speech therapy for individuals nearer to his/her locality. Familiar with local language culture, tradition and beliefs which could help in effective communication.</td>
<td>No specialist knowledge of CLP speech work. Only affluent families can afford this service if provided in private clinics/hospital</td>
<td>(Lohmander &amp; Persson, 2008)</td>
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<tr>
<td>Service delivery method</td>
<td>Personnel</td>
<td>Strength</td>
<td>Challenges</td>
<td>Literature support</td>
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<td>---------------------------------------------------</td>
<td>--------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Parachute/Skill/Knowledge transfer</td>
<td>Services provided by trained non-native professionals</td>
<td>Assist the multidisciplinary team in making surgical decisions related to speech. Provide individualized plan for all individuals visiting the camp. Possibility of hands on training of local SLP or available personnel / parents in carrying out the program</td>
<td>Limited knowledge about local language, culture, tradition and beliefs. Language as a barrier even in knowledge transfer. Difficulty in follow up/review of work completed by newly trained personnel. Its time bound and not all individuals will benefit.</td>
<td>(Wirt, Wyatt, Sell, Grunwell &amp; Mars, 1990); (Sell &amp; Grunwell, 1990); (D’Antonio &amp; Nagarajan, 2003); (Morris &amp; Ozanne, 2003)</td>
</tr>
<tr>
<td>Service delivery method</td>
<td>Personnel</td>
<td>Strength</td>
<td>Challenges</td>
<td>Literature support</td>
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<tr>
<td>Camp Based</td>
<td>Local specialist SLP/volunteers</td>
<td>Specialist SLP team familiar with the local language organize intensive speech therapy sessions.</td>
<td>Usually provided in small groups. Maintenance of learnt correct placements are only based on practice at home post camp.</td>
<td>(Pamplona et al., 2005); (Prathanee et al., 2011); (Rai et al., 2013)</td>
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Also provides options for accommodation to include families of patients with CLP to reduce burden of travel and cost.
<table>
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<tr>
<th>Service delivery method</th>
<th>Personnel</th>
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<th>Challenges</th>
<th>Literature support</th>
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</thead>
<tbody>
<tr>
<td>Community based rehabilitation model</td>
<td>Implementation of service using the grass root level workers. Grass level workers belonging to the same community are empowered and involved in different levels of intervention.</td>
<td>Tested Model of intervention commonly used in developing countries in providing medical and rehabilitation services. Could provide continuous supervised service through the trained workers and overcome the challenges of travel, cost.</td>
<td>Retention of trained workers. Can be implemented only if there is local support from the organizations and beneficiaries.</td>
<td>(Prathanee &amp; Chowchuen, 2010); (Pumnum, Kum-ud, &amp; Prathanee, 2015); (Prathanee, Makarabhirom, Jaiyong, &amp; Pradubwong, 2014); (Shunmugam, Subramaniyan, Nagarajan, Hariharan, 2017); (Rao, Mukundan, &amp; Kant, 1990); (Deepak, Biggeri, Mauro, &amp; Kumar, 2013)</td>
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D’Antonio and Nagarajan (2003) highlighted the need of creating new service delivery methods for children with cleft lip and palate. They posed an outcome of a consensus workshop held in India which talked about application of the CBR model to cite the need for SLP services of children with CLP in case of limited or no traditional SLP services. They mentioned some barriers to SLP services, such as less number of SLPs, social problems, parent’s awareness toward cause & available facility. The possible solutions for these problems may be, institutional based rehabilitation, outreach programs, training allied professional, community based programs. For implementing community based services, they conducted a “consensus workshop” which facilitates a group to “think together”. Twelve participants gathered for the workshop and developed seven strategies for addressing the solution providing services for children with CLP such as develop a three-tiered training program, develop materials for information, education and communication, influence government policies through advocacy, create awareness at different levels and use different media, promote the formation of community and professional pressure groups, network with existing development projects, focus on the rural community.

Helander (1993) described Community Based Rehabilitation (CBR) as a common-sense strategy for enhancing the quality of life of people with disabilities by improving service delivery in order to reach all in need by providing more equitable opportunities and by promoting and protecting their rights. This model of rehabilitation builds on the full and co-ordinated involvement of people with disabilities and their families in a society, which requires combined efforts from various but relevant sectors such as educational, health, legislative, social and vocational. Objective of CBR model is to bring about a change; to develop a system capable of reaching all disabled people in need and to educate and involve governments and the public. CBR should be sustained in each country by using a level of resources that is realistic and maintainable.

Hartley and Wirz (2002) explained the need of creating a new speech service module particularly for low income countries. They did a retrospective analysis of five studies
which described the “need related” qualitative data regarding people with communication disorders, held in Uganda and Nigeria. Based on those study results, they formulated a “communication disability model” and compared the relationship with new “International Classification of Impairments Disabilities and Handicaps (ICIDH-2)”. Also, they gave suggestions about how this module could help in planning and practicing from the perspective of Government, non-government organizations, people with communication disorders, their families and professionals. This module was emphasized on providing community integration, early interventions using parents, developing training for community based rehabilitation.

In Thailand, Prathanee et al. (2010) carried out a study for establishing a community based module for speech therapy in Thailand and to implement it. They did workshops for SLPs which includes “Training for trainers” and “smart smile & speech”, described about how to treat speech and language problems in children with cleft lip and palate, training health care providers other than SLPs. Para-SLPs were used to rule out speech, language and hearing problems in CLP children and provide early intervention. Guidelines and manuals were given to SLPs and para-SLPs to treat speech and language disorders in children with CLP. Para-SLPs were guided to refer children with CLP who has severe and multiple speech and language disorders to a speech clinic. They finally concluded that, community based module is a suitable method to overcome the problems of lack of speech service for children with CLP in Thailand.

2.3 Alternate models of service delivery in cleft in South Asian Region
In India and South Asia, it becomes important to look for alternate models of service delivery that can be designed to meet the needs of our population and can be sustained in a long term basis. These models need to be delivered at the level of community. The alternate models of rehabilitation carried out in the South Asian region are presented below.
2.3.1 Parent Implemented Model

Outcome of a parent implemented model cleft in Andhrapradesh, India was reported by Andrea, D'Mello, and Kumar (2007). Twenty-eight parents had enrolled for the five day speech camp and underwent parent-training program. Parents were chosen based on literacy skills to read materials in hindi or telugu and attended five-day speech training and followed up for scheduled reviews. Out of 28, 18 reported for one follow up review, referred as group 1. Ten parents reported for two consecutive follow ups, referred as group 2. Pre and post training speech understandability scores were obtained from two speech tasks (known context & unknown context). Authors reported that a higher percentage of cases showed significant improvement in understandability in the unknown context after treatment. They concluded that parents can effect a positive change in the speech understandability of their children when the exercises are carried out regularly at home and when parents followed up for further assessments and guidance sessions.

2.3.2 Volunteer /Grass root level worker implemented model

One such long standing model for multidisciplinary care includes the Sri Lanka Cleft Lip and Palate Project (SLCLPP) (Wirt et al., 1990). This project initiated in 1982 aimed to develop self-sustained multidisciplinary teams, teaching and research, identifying sustainable local teams in one country over 25 years. The project enrolled 620 individuals with CLP, provided 900 surgeries over the last decades. One of the major aims of the SLCLPP was to provide research outcomes in developing countries. This project provided speech intervention services by speech therapy assistants/local workers. This was carried out with respect to choosing the assistants, developing curriculum and training methodologies and transferring knowledge and skill. Individuals who showed concerns in seeking services were divided into 4 groups. These groups were classified based on the priority of treatment services. This process identified outcomes among various groups and services that need to be implemented appropriately. This process was replicated in several parts in the developing world where resources were few and needs were many. Over years this project has also developed a diploma and undergraduate training course to provide speech therapy (Wickenden, Hartley, Kariyakaranawa, & Kodikara, 2003).
2.3.3 Community Based Model

In other regions in South Asia, only a handful of speech language pathologists have expertise in areas of cleft lip and palate. Their services are also available only in urban centres and almost do not exist in rural areas. There have been various efforts by WHO in promoting “Community Based Rehabilitation” model of service delivery. Community based rehabilitation can be defined as strategy within the community for the rehabilitation, equalisation of opportunities and social integration of all people with disabilities (WHO, 2004).

In two regions in South Asia, community based model of service delivery has been implemented. In India, Sri Ramachandra University-Transforming Faces (SRU-TF) project initiated in 2005 aimed at extending comprehensive management to individuals with CLP living in rural district in Tamil Nadu, India. In this model grass root level workers are trained and involved in extending the services related to communication disorders in individuals with CLP. (D’Antonio & Nagarajan, 2003; Balasubramaniyan, Raghunathan, Rajashekar, Sathiasekaran, & Nagarajan, 2017; Shunmugam, et al., 2017).

A similar approach was used in north east Thailand where community based workers was used in the delivery of services. This project also originated out of the need to supplement speech services after surgical intervention. Prathanee et al. (2006) reported that the members of Association of Plastic Reconstructive Surgeons of Thailand (APRST), Thai-American Palate Surgery, and ACPA were sent to the remote areas to address the surgical issues. However, most children with CLP received delayed or no speech therapy because of the lack of speech therapists. The need for a community-based model was identified and a project was developed along those lines. They combined the principles of community based rehabilitation (CBR), primary health care (PHC) and institutional medical approaches for reach out and management of children with CLP in remote area to develop a community based model to treat speech disorders in children with CLP living
Review of Literature

in remote areas. The process of establishing CBR model was divided into three stages. The first stage involved the development of consensus of the institutional, medical, and professional approaches. A model was developed after obtaining consensus on community-based speech therapy model for Children with Cleft Lip/ Palate, and development of interdisciplinary teams, networking and holistic care, health promotion, speech and language intervention for CLP in the community. They majorly emphasized on empowering the local healthcare providers to increase the availability of speech therapy for children with cleft lip and palate in Thailand. The further plan is to apply this model and improve the availability of services for the North-East region and perhaps other regions in Thailand.

Prathanee and Chowchuen (2010) reported that community based network system and interdisciplinary management for children with CLP is valid for Thailand and other developing countries. They developed a protocol for providing regional care to children with cleft lip and palate and conducted 5 workshops for establishment of regional development of care for patients with CLP. A community-based model of network system for children with CLP was developed by combining Primary Health Care (PHC), CBR and institutional cooperation. An interdisciplinary team was developed focusing on providing them in underserved areas in North Eastern Thailand. Authors suggested that this module can be a better way for developing countries where there is lack of co-ordination among multidisciplinary professionals exists.

Prathanee, Pumnum, Jaiong and Seepuaham (2011) reported the establishment of a speech and language therapy model in Lao People’s Democratic Republic (Lao PDR), by combining the principles of CBR, PHC, and institutional medical approaches. Applying the model developed by the authors for developing speech therapy services in Thailand, participatory workshops were conducted. Fifty-six Laotian healthcare providers participated in the workshop. A speech and language therapy model for children with CLP in Lao PDR was established, based on the principles of model service delivery developed for Thailand to address the challenges of non-availability of SLP.
Prathanee (2012), highlighted the need for both bottom up and top-down models in sustaining services related to speech for children with CLP in Thailand. Bottom up development module consist of community based model that had combined principles of CBR, PHC, and institutional medical approaches which is more emphasized on training the local health care providers for providing speech therapy. Top down development module consists of developing standard perceptual assessment based on guidelines of universal parameters for reporting the speech outcomes in individuals with cleft palate and objective measurements for nasoendoscopy and videofluroscopy. These two modalities might be more effective way to resolve the problems of lacking speech services in Thailand and developing countries.

From the review it can be inferred that ideal model of service delivery does not exist all around the world. These models of service delivery were developed keeping in mind the local resources and strengths. The challenges and solutions derived have been unique and as an outcome different models have evolved and practiced. The review also indicates that no one method has been identified or marked as a standard method for implementation of therapy and evaluation of its outcomes. However, it highlights the need for development and evaluation of such alternative models where the needs are high, and resources are scarce.