CHAPTER 5:

RESULTS AND DISCUSSION

The aim of this chapter is to present and discuss the results of the evaluation of the clinical applicability and acceptability of the newly developed Communication Assessment Protocol in Mauritius.

5.1 INTRODUCTION

Research requires collection and interpretation of data in an attempt to resolve a problem (Leedy & Ormrod, 2005: 5). The development of a new tool is dependent on what is available in the context (Denzin & Lincoln, 2000: 4). This is particularly relevant in a developing country where resources for the development of a new tool are limited. In Mauritius, a need for the research was identified to bridge the gap between current practice of cleft care and the best practice model. The main aim of the research was to develop a Communication Assessment Protocol for young children with cleft lip and/or palate (CL/P) that was applicable for routine clinical practice and acceptable to speech-language therapists and audiologists for ECI and improvement of cleft care. In this chapter, the results of descriptive and qualitative studies conducted to achieve the aim are presented.

The results are presented as illustrated in Figure 5.1

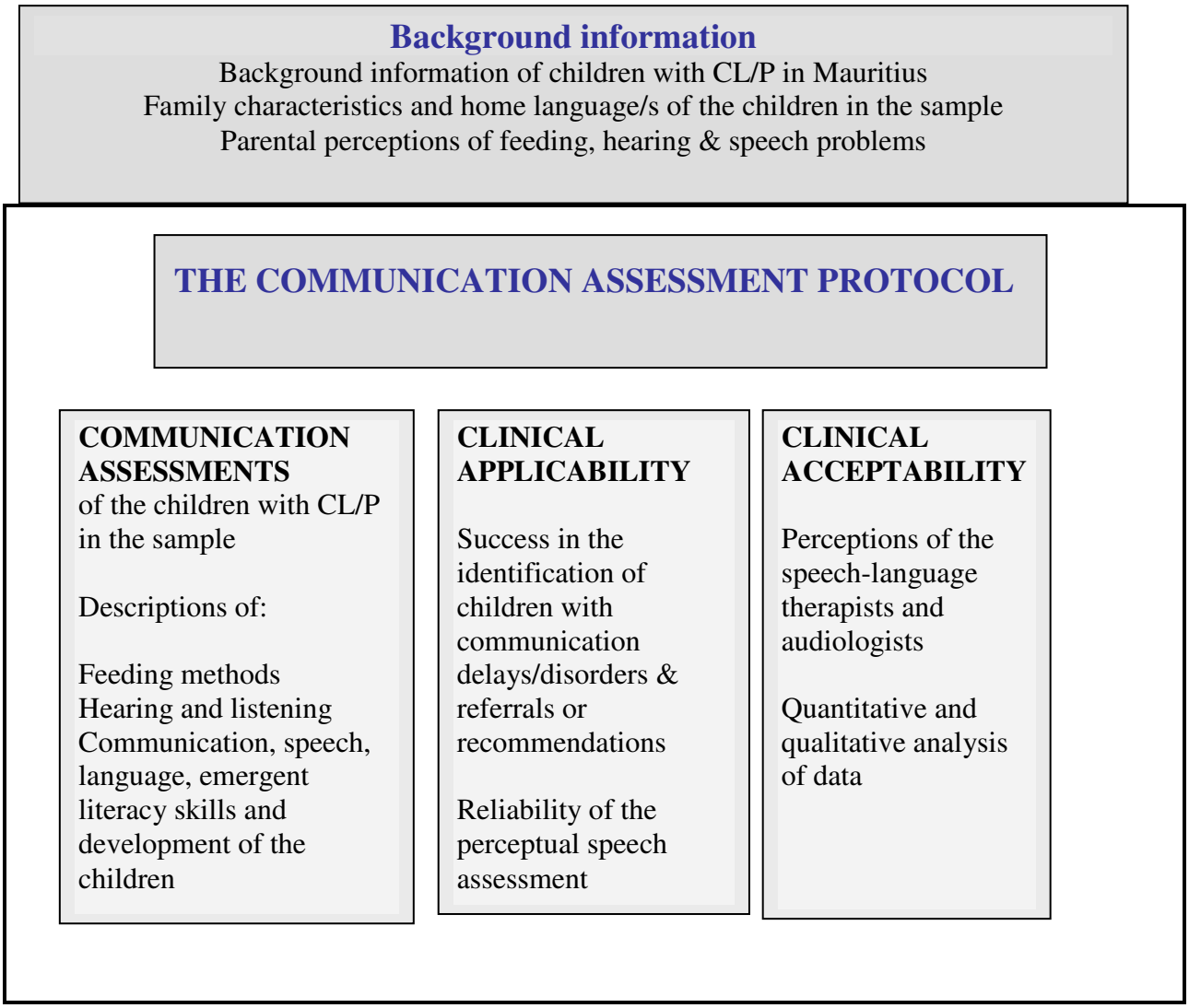

FIGURE 5.1 Schematic overview of the presentation of the results

5.2 BACKGROUND INFORMATION

The results in this section depict the context in which the Communication Assessment Protocol was implemented. Involvement of the affected child's parents and family is crucial to successful ECI (Blackman, 1995: 63; Guralnick, 1997: 3; Rossetti, 2001: 94). Therefore a description of family characteristics, particularly the language(s) spoken at home, and parental perceptions of feeding, hearing and speech problems in their child with CL/P is provided.

5.2.1 Background information of the children with CL/P in the sample

Descriptive characteristics of the children with CL/P were collated from interview schedules (Appendix V), clinical observations and medical case-records. These included maternal history, birth history, surgical history and the services accessible to the children with CL/P. The parental responses were analysed quantitatively and the results are described and discussed in this section.

- ***Maternal history***

The relevant maternal history is shown in Table 5.1.

TABLE 5.1 Maternal histories of children with CL/P (n=80)

Characteristic	Category	Percentage of mothers
Significant maternal antenatal history; examples: maternal history of convulsions, miscarriages, anaemic mothers	• Yes • No	25% 75%
Type of delivery	• Normal • Caesarean • Other (forceps)	63% 37% 0%
Maternal age	• Younger than 20 years • 20-40 years • Older than 40 years	8.5% 86% 5.5%

The age of most mothers of the children with CL/P was between 20-40 years. The national statistics, showed that only 1.8% of the mothers were older than 40 years at the time of birth of their first child (National Maternal Health Statistics, Mauritius: 2000-2006) as compared to those participating in this study where this percentage was three times higher. The risk of CL/P increases with an increase in maternal age (Cooper, Stone, Hu, Melnick & Marazita, 1999: 278; Forrester & Merz, 2004: 625; Vallino-Napoli et al., 2004: 189; Wyszynski, 2002: 44). In addition to maternal age, various external and environmental factors during pregnancy such as alcohol intake have also been linked with an increase in risk of a child with CL/P (Shaw, 2004: 246; Watson et al., 2001: 90). The other risk factors for cleft, in Mauritius, were not in the scope of this study.

- ***Birth History***

Information obtained from the parents regarding the birth place of the children in this study, revealed that almost all births (99%) occurred under the supervision of skilled medical care either in hospitals or private health care facilities. This probably contributed to an early identification of the cleft condition which makes early intervention possible. Information about the birth weight was obtained from the health card of the children with CL/P. The average birth weight of the children with CL/P was 2.8 kg. However, seven children (9%) had very low birth weight (less than 1.5 kg) and five of them were also diagnosed with a syndrome. Low birth weight is an important risk factor for craniofacial anomalies including CL/P (Kritzinger, 2000: 239).

- ***Age of identification of the cleft***

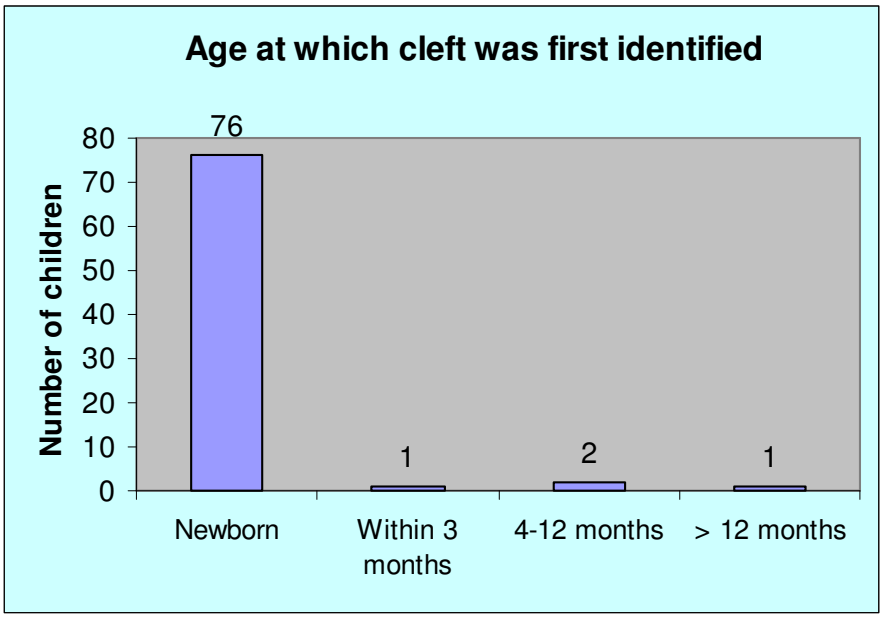

FIGURE 5.2 Ages of the children when the cleft was first identified (n=80)

Except for one child, with a submucous cleft palate, all other children's clefts were diagnosed before the age of one year. The diagnosis of a submucous cleft palate requires specific instrumentation and techniques such as nasal endoscopy (Peterson-Falzone et al., 2010: 23).

In none of the children, the CL/P was diagnosed antenatally although diagnosis during this period is possible by using imaging techniques such as ultrasonography (Watson et al., 2001: 107). In Mauritius, despite the availability of ultrasound facilities, it has not been used for prenatal diagnosis of CL/P. Prenatal diagnosis of CL/P may help parents to prepare themselves emotionally and to come to terms with the need for surgery after birth of the child (Watson et al., 2001: 115). However, Ter Poorten and Louw (2002: 66) reported that there was no great difference in the emotions expressed by mothers with pre- or post-natal diagnosis of the cleft condition as long as the information was conveyed by a caring professional.

The above results suggest that favourable conditions exist in Mauritius for the initiation of early interventions in accordance with best practice guidelines (ACPA, 2007).

- ***Surgical history***

Information regarding the cleft repair was obtained from reviewing the surgical case records, plastic surgeon treating the children and parents of the children. The plastic surgeon in Mauritius (personal communication) mainly uses the Tennison's technique (Peterson-Falzone et al., 2010: 146; Watson et al., 2001: 165; Wyszynski, 2002: 326) to repair the lip and the Veau technique (Peterson-Falzone et al., 2010: 154) to repair the cleft palate. Palate repair is performed in one stage but in cases with a wide and complete cleft palate the repair is performed in two stages; the lip and soft palate are repaired first and at a later stage the hard palate is repaired. Alveolar grafts are planned for children with maxillary arch problems by the plastic surgeon after the age of six years when the secondary dentition appears. A summary of the surgical history of the children with CL/P in this study is provided in Table 5.2.

TABLE 5.2 Surgical histories of the children with CL/P (n=80)

Surgical History	Category	No. of Children	Percentage
Number of times a child has been operated	• None • Once • Twice • Thrice • More than three times • Missing data	17 33 17 7 5 1	21% 41% 21% 9% 6% 2%
Repair of : **Lip (primary repair)**	Age range: 1-24 months Mean age: 6.8 months **Median age: 5 months** SD: 4.9	43	-
Palate (primary repair)	Age range 5-36 months Mean age: 15.4 months **Median age: 12 months** SD: 7.7	45	-
	Lip and palate repairs Lip, palate and secondary repairs Missing data	17 5 1	- - -
Other than cleft repair surgeries	• Insertion of grommets in the ears • Cardiac surgery • Other (for congenital anomalies)	13 3 4	- - -

A total of 63 children had surgical repair of CL/P and the remaining were still on a surgical waiting list at the time of data collection. Complete details of the surgical repair were available for all children except one. The median ages of children for cleft lip repair were 5 months and for cleft palate were 12 months. All children were operated by the same plastic surgeon and the repairs were performed either in one stage or two stages. Twenty-nine children were operated more than once; the secondary surgeries were performed to repair a break down in the operated palate and repair of the alveolus area in children with wide clefts. Although the plastic surgeon aimed at repairing the cleft lip by the age of three months and the palate before the age of six months, the cleft palate repair was carried out at an average of 12 months in the cohort of children studied. In some cases delay in the cleft repair, was due to availability of only one

plastic surgeon. In few other cases, the delay was due to poor general health of the child, and upper respiratory tract infections that placed the child with CL/P at high risk of anaesthesia complications.

The recommended timing of surgery for primary repair of palate to achieve the best possible speech is at six months before the onset of canonical babbling (Watson et al., 2001: 159). Late repair is associated with delayed speech development and severe articulation errors (Peterson-Falzone et al., 2006: 7). Nevertheless, a child's general health and width of cleft palate may not permit early repair in some children. In these children repair, even at the age of 12 to 18 months, can still achieve good speech (Bzoch, 2004: 327). Secondary surgery at a later age is required in up to 41% of the children with CL/P to eliminate signs of cleft type speech associated with velopharyngeal inadequacy (Haapanen & Rantala, 1992: 71; Ysunza et al., 1998: 675). The current practice by the plastic surgeon in Mauritius is to follow the one-stage approach except in children with a wide and complete cleft palate.

While the recommended timing of primary repair of palate is between 6 and 18 months the preferred time of cleft lip repair is between one and three months to achieve the best speech outcome (ACPA, 2004: 14, Kernahan et al., 1990: 33). However, the majority of surgeons prefer to wait until the child is three to six months to repair the lip (Peterson-Falzone et al., 2010: 144; Watson et al., 2001: 161). This is to allow time for the pre-surgical oral orthopaedics alignment of the alveolar arch. In Mauritius, the pre-surgical orthopaedics alignment for cleft lip is not performed by orthodontists. Currently they are not trained in the management of orthodontic problems in infants and toddlers with CL/P. This can have a negative impact on the appearance outcomes in children with CL/P in Mauritius. Interestingly, the primary cleft repair of lip (5

months) and palate (12 months) in Mauritius were still found to be in accordance with the recommended timing of cleft repair, even though later than the surgeon intended (Table 5.2).

- ***Health care professionals involved in cleft care***

Information regarding the health professionals involved in the care of these children were obtained from the parents (refer to Appendix V, Section G).

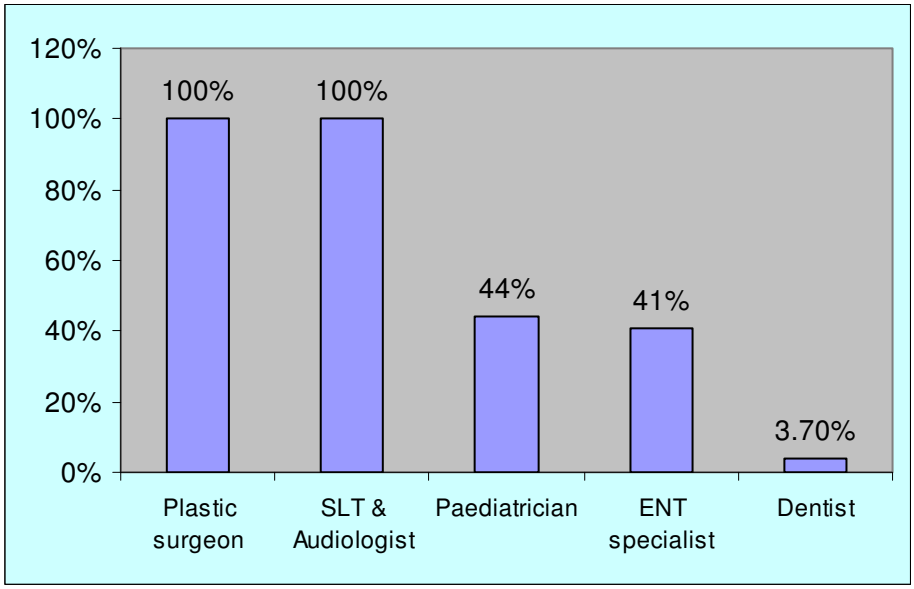

FIGURE 5.3 Consultations of the children with CL/P with health care professionals (n=80)

In Mauritius, the plastic surgeon referred all children with CL/P to the speech-language therapists and audiologists. This is attributed to the fact that a speech-language therapist and audiologist and the plastic surgeon see children referred with CL/P simultaneously in the clinic. This practice was established in 1984 when the principal researcher of this study started the speech-language therapy and audiology services in Mauritius. However, other professionals needed for a cleft care team, namely an orthodontist, ENT specialist, paediatrician, nutritionist

and psychologist, are not located in the same health centre in Mauritius. This may be one of the reasons for not establishing a coordinated multidisciplinary team-based approach for cleft care, in Mauritius.

In this study, only 44% of the children were seen by the paediatricians. In a well-established multidisciplinary team, paediatricians play a pivotal role in the care and management of children. Their main role is to identify associated medical and psychosocial problems; syndromes associated with CL/P and provide nutritional assessments (Kernahan et al., 1990: 28; Watson et al., 2001: 123). This requires attention in Mauritius, as less than half the number of children in the sample had follow-up appointments with paediatricians.

The study also revealed that only 41% of the children had consultations with an ENT specialist. Children with CL/P have a high incidence of hearing loss and middle ear infections. Prior to primary palatal surgery, middle ear problems such as otitis media are universal (Broen et al., 1996: 132; Bzoch, 2004: 337). In young children even a mild and fluctuating hearing loss as a result of otitis media has a detrimental effect on development of communication skills (Friel-Patti & Finitzo, 1990: 192; Kemker & Antonelli, 2004: 361). In Mauritius, it is therefore important that the hearing of all children with CL/P is monitored and managed by ENT specialists in collaboration with audiologists.

In addition to the services of paediatricians and ENT specialist, children with CL/P also require the services of dentists. In this study only three children were seen by a dentist as compared to the U.K., where 91% children with CL/P were registered with a dentist (McDonagh, Pinson & Shaw, 2000: 432). Furthermore, none of the children with CL/P in this study were examined by

an orthodontist as the latter, in Mauritius, only intervenes after the appearance of secondary dentition of the children with CL/P. None of the children had any consultations with other specialists such as a nutritionist, psychologist, or community health worker. Although few of these specialists are available in Mauritius, they need to be involved in interdisciplinary team cleft care.

The results show that in Mauritius, despite the availability of most of the specialists required for cleft care, a coordinated multidisciplinary team-based approach to assessment and treatment is lacking. Nevertheless some positive aspects of cleft care in Mauritius are: early identification of the children, timely surgery and availability of key professionals for cleft care, namely plastic surgeon, speech-language therapists and audiologists, ENT specialists, paediatricians, nutritionists, dentists and psychologists. It is important to set up an interdisciplinary team so that children with CL/P and their families can benefit from organised, well-coordinated and comprehensive approach to cleft care (ACPA, 2007: 5; CSAG, 1998: 30; WHO, 2002: 143). Quality improvement in cleft care is the outcome of a holistic approach to the children with CL/P and their families that takes account of growth, function and appearance of the child with CL/P (ACPA, 2007: 6).

5.2.2 Family characteristics and home languages of the children

Parents of 88% of the children with CL/P were living together. While the father was the only working member in most of the families interviewed, both parents worked in 28% of the families and only two children's neither parent was employed. The family characteristics were further

analysed according to size, number of siblings, history of consanguinity, family history of CL/P, and the languages spoken at home.

Data on the family size of children with CL/P revealed that a maximum of two children per family was the norm in this study. The average number of children per family in Mauritius is 1.87 (Central Statistics Bureau of Mauritius, 2005). The above findings show that the majority of children with CL/P were from stable and small-sized family with both parents living together, educated (refer to Figure 4.7), and mothers staying at home to care for the children.

Children born with CL/P are at risk for communication disorders and any additional family stressors are likely to compromise the effectiveness of early intervention. If family characteristics constitute stressors such as extremely limited financial resources, marital difficulties then family patterns of interaction may not be optimal for a child's development (Guralnick, 1997: 6). Therefore, it is necessary to view the child in the family context and it is important for the health team to be familiar with the profile of the families and their situations (Bagnato et al., 1997: 11; Guralnick, 1997: 6; McLean, Wolery & Bailey, 2004: 19; WHO, 2000: 42).

Information regarding consanguinity was sought and the responses indicated that only 2 out of the 80 children's parents were in a consanguineous marriage. There is a positive correlation between incidence of a cleft and consanguinity as shown in a study from Iran which showed that consanguineous marriages were more frequent among parents who had a child with CL/P (Jamilian, Naveri & Babavan, 2007: 176; Watson et al., 2001: 88). Clearly in Mauritius,

consanguinity is not an etiological factor for CL/P. Interestingly, 21% (n=17) of the children had a family history of CL/P. Three mothers had CL/P and five children had siblings with CL/P but none of the children were twins. It is reported that for monozygotic twins (identical twins) the likelihood of both children being affected with CL/P is 35% (Watson et al., 2001: 88). For one child, the grandparent had a cleft and for the remaining eight children, cleft was also reported for an aunt or uncle. The estimation of recurrence risks for cleft in a child with family history of CL/P requires a highly trained geneticist to conduct physical examination, of an index case together with detailed prenatal, birth history and investigations such as imaging to determine the risk factors in an individual case. As the services of a geneticist in the public health sector are presently lacking in Mauritius, parental questions concerning future children being born with CL/P, remain therefore unanswered from a specialist's perspective. However, the plastic surgeon and speech-language therapist and audiologist provide some general information to parents of the children with syndromes.

- ***Home languages***

From the interview schedule (Appendix V, section B6) and parental responses, data on the languages spoken in the families studied revealed that two languages were spoken at home (Figure 5.4).

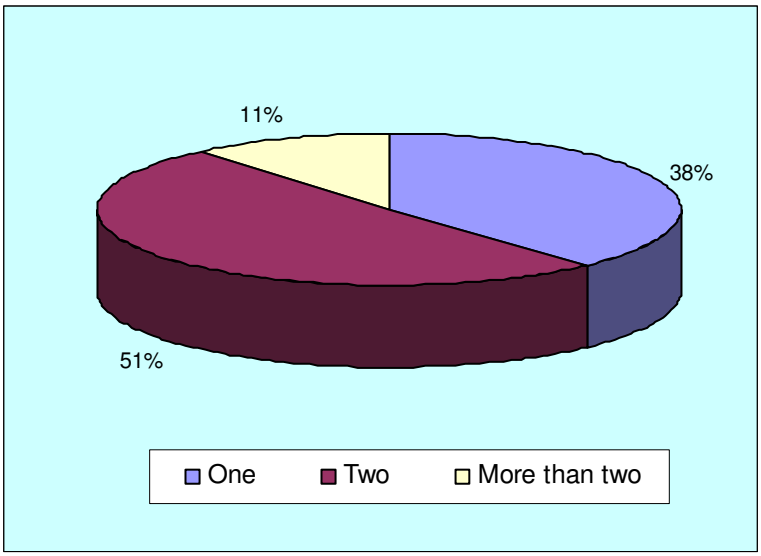

FIGURE 5.4 Number of languages spoken in the children's homes (n=80)

Hoff (2005: 336) points out that globally, exposure to more than one language and bilingualism in childhood may be more prevalent than monolingualism which appears to be the case in the current study as well. One of the basic principles of early communication intervention is that it should be sensitive to a child's linguistic background (Roth & Worthington, 2005: 5). This implies that appropriate standardized and uniform assessment of communication and identification of communication disorders can be a challenging process in young children from a bilingual/multilingual home and pertains to the Mauritian context as well.

Information relating to the most commonly spoken language at home was obtained from the parents and confirmed the predominance of Creole over French (Figure 5.5).

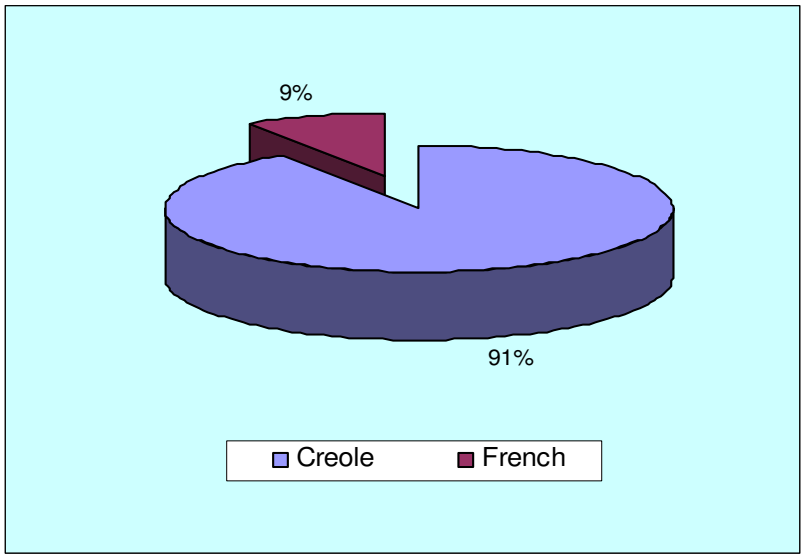

FIGURE 5.5 The most commonly spoken language in the children's homes (n=80)

Only nine families (out of 80) spoke three languages at home: - the third language being English in five of the families, Bhojpuri (a regional language from India) in two and the remaining two spoke Chinese. The challenge posed by using two languages at home may contribute to communication problems of young children with CL/P as these children are already at risk of speech-language delays/disorders. Moreover, hearing impairments are prevalent in this population which may further compromise language development.

Communication assessment of children requires linguistically appropriate assessment materials to be valid and reliable (ACPA, 2007: 6). In Mauritius, the official language is English but the most commonly spoken languages are Creole and French. Thus, speech assessment, in Mauritius, requires a standard list of words and sentences in Creole.

5.2.3 Parental perceptions of feeding, speech and hearing problems in children with CL/P

Parent's opinions regarding feeding, speech and hearing difficulties of their children with CL/P were analyzed (Appendix V, Section F). The number of children perceived to have histories of difficulties in feeding, speech and hearing varied according to cleft type (Figure 5.6).

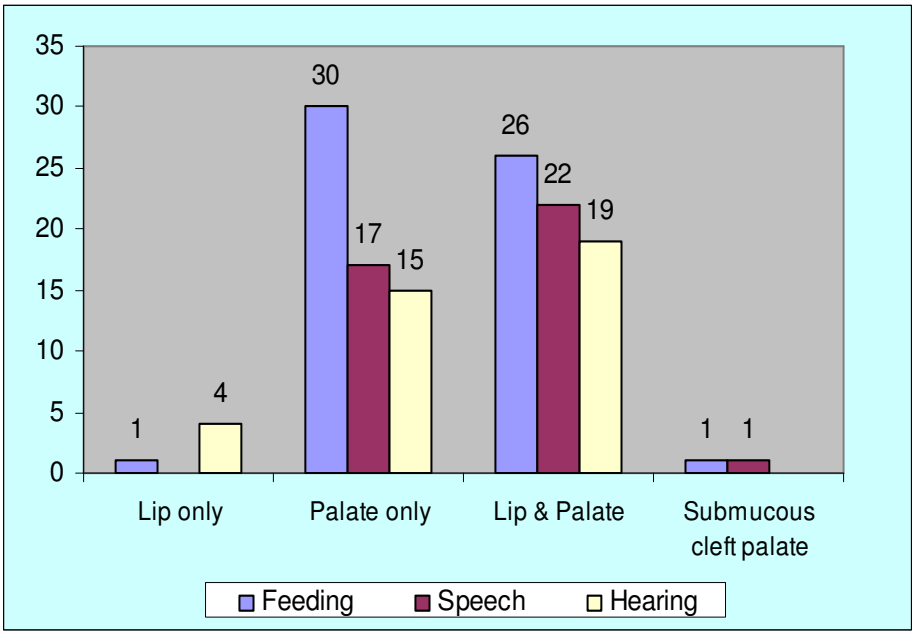

FIGURE 5.6 Feeding, speech and hearing problems among the children: parental reports (n=80)

- ***Feeding problems***

Parental responses showed that 73% of the children with CL/P had feeding problems soon after birth. These were partly attributed to the difficulties parents faced in coping with the stress of feeding a child with an oral cleft. A high parental concern regarding feeding during the neonatal period has been reported in the literature (Oliver & Jones, 1997: 529; Young et al., 2001: 57),

and this was confirmed by this study. In addition to the speech-language therapists and audiologists, other professionals namely doctors, nurses, and family members gave them advice regarding feeding. The different types of advice may be confusing because they are not based on any formal, uniform infant feeding assessment. This study demonstrates a need for conducting feeding assessments by speech-language therapists in collaboration with pediatricians and nurses in infants with CL/P before providing appropriate cohesive guidance to the parents.

- ***Hearing problems***

A significant proportion of parents (48%) perceived that their child had hearing problems. Early identification and management of hearing impairments is crucial to communication development. Parents require information concerning their children's hearing abilities (Moss & Fonseca, 2006: 421). Therefore, a detailed hearing evaluation of children with CL/P by an audiologist is mandatory to provide accurate information and guidance to the parents. In developing countries, hearing impairment in children is more often identified by parents than professionals (Zinkin & McConachie, 1995: 108). However, a systematic standard protocol for the surveillance and monitoring of hearing would be beneficial to identify a hearing impairment early and prevent the negative impact of hearing loss on communication development skills.

- ***Speech problems***

Speech problems in children with CL/P were reported by 50% of the parents. Parental concerns are recognized as important indicators for further assessment to identify communication disorders (WHO, 2002: 140). The incidence of speech problems in children with CL/P is variable and depends on the heterogeneity of cleft type, presence of syndrome, hearing loss, and

age group of children (Hardin-Jones et al., 2003: 458; Peterson-Falzone et al., 2010: 231; Shprintzen & Bardach, 1995: 138). Speech-language therapists and audiologists need to be alert to parental concerns about their child's communication skills. It was interesting to note that in Mauritius parents were aware of the speech problems in their young children with CL/P as participation of parents is of prime importance in early intervention. This finding is attributed to the early identification and information received from the health care professionals. This finding indicates that ECI in Mauritius is a feasible option.

Based on this study the first electronic database for young children with CL/P in Mauritius, to record the essential demographic and background information in a uniform and consistent manner, was created. Parental perceptions of feeding, speech and hearing problems in their children demonstrated that they can provide valuable information contributing to communication assessments in young children. Moreover, a description of the identification and the current care provided to these children in Mauritius was necessary to implement the newly developed Communication Assessment Protocol within the existing framework of the health care system.

5.3 CHARACTERISTICS OF THE CHILDREN WITH CLEFT LIP AND/OR PALATE BASED ON THE COMMUNICATION ASSESSMENTS

The implementation of the Communication Assessment Protocol was tested on 80 children with CL/P. The characteristics of children are presented according to the areas of assessment namely feeding, hearing, orofacial features, communication, speech-language, emergent literacy skills and general development (refer to Appendix VI).

5.3.1 Feeding

Feeding problems in newborns and infants mainly occur prior to the closure of the cleft (Reid et al., 2006: 702). Therefore feeding assessment was conducted for children in Group 1 only and findings are illustrated in Table 5.3.

TABLE 5.3 Feeding methods of children in age Group 1 (n=24)

Feeding aspects	Description	Frequency in percentage
Type of milk	Formula milk Breast milk	100% 0
Method	Oral diet (no children currently with naso/orogastric tube feeding)	100%
Equipment	Bottle Cup Syringe Combinations: - cup and bottle - spoon and cup	31% 19% 0 44% 6%
Modifications/special adaptations	Bottle type: standard Texture of teat: - normal - soft - silicon Hole of teat: - normal - enlarged - cross-cut	100% 92% 4% 4% 65% 28% 7%
Observations of feeding	Positioning: appropriate No nasal regurgitation Nasal regurgitation	100% 77% 23%
Oronasal fistulae & Special devices	Oronasal fistula (post primary palate surgery) Obturators	33% 0%

None of the infants with CL/P in this age group were breast-fed or received breast milk despite a national health care policy and breast-feeding campaigns in Mauritius (Ministry of Health & Quality of Life, Mauritius, 2002). All infants in the sample were fed with formula milk. This

differs significantly from normal practice in Mauritius as shown by a recent survey concerning breast-feeding practice in Mauritius (Sunkur, Akaloo, & Ameerbeg, 2002) in which 93% of infants were breast-fed. The same survey carried out by Sunkur et al. (2002) indicated the mean duration of any breast-feeding was 13.6 months and the mean duration of exclusive breast-feeding was two months. The results obtained in this study are not different to those obtained by Kritzinger (2000: 249) in South Africa who found that only one out of 79 children with CL/P was breast-fed. The exact reason for this practice is not known but it is possible that the cleft condition is a deterring factor for mothers not to breast feed the infants because of their worries about sucking abilities of the infant with the cleft. Breastfeeding requires greater skill and sucking endurance than bottle feeding. The feeding difficulties of neonates with CP are a challenge to successful breast feeding. Furthermore mothers of infants with CL/P may not be supported and encouraged by nursing staff, due to lack of knowledge, to attempt feeding breast milk via bottle. Yet, research indicates that breast milk decreases the incidence of otitis media (Paradise, Elster & Tan, 1994: 859) and contributes to normal growth of young children (Smedegaard et al., 2008: 632). The promotion of extracted breast milk to be given to infants with CL/P could therefore be potentially beneficial to them.

The infants in the study were bottle fed but none of them were using special types of feeding bottles, for example soft plastic squeeze bottles or a Habermann feeder that facilitate feeding (Reid, 2004: 271; Shaw, Bannister & Roberts, 1999: 266). This may be due to the fact that the special equipment is not easily available and that the parents do not receive any guidance regarding the importance and use of special equipment for feeding.

Speech-language therapists and audiologists observed that all infants with CL/P were held in appropriate positions during feeding and 77% did not exhibit any nasal regurgitation during

feeding. The reported nasal regurgitation of oral feed in some children was possibly due to oronasal fistulae. None of the children were using obturators as the services of paediatric orthodontists are not available in Mauritius for such feeding aids.

In addition to the feeding methods, information regarding weight gain and growth was noted from the health card. This was recorded in the local health care centres by nursing personnel. A total of 96% of the children had age appropriate weight gain and growth. This positive finding can be attributed to maternal-child health care services that are free and easily accessible to all Mauritians and early surgical repair of the cleft (see Table 5.2). Contrary to the findings of the weight gain and growth in Mauritius, in a study conducted in Brazil (Amstalden-Mendes, Magna & Lopez, 2006: 332), weight gain was affected in 92% of the children with clefts associated with syndromic conditions and in 72% of non-syndromic cleft children, despite the guidance provided to parents. Furthermore, surgical planning for lip or palate correction was delayed in 67% of the children due to inadequate weight gain.

The valuable information obtained from the feeding assessments can be used to provide appropriate guidance to mothers of infants with CL/P. This may consequently reduce the stress experienced by the mother and promote growth and development of the infant (Reid, 2004: 275).

5.3.2 Hearing abilities

Risk indicators for ear disease, hearing loss and congenital malformations of the auditory system for children with CL/P are well documented in the literature (JCIH, 2007: 921; Peterson-Falzone et al., 2010: 216). Early identification of hearing loss and referrals for management to the ENT

specialists reduces the prevalence of hearing impairment in children with CL/P and the impact thereof on development (Broen et al., 1996: 132; Watson et al., 2001: 216; WHO, 2002: 142). Hearing evaluations of the 80 children in the sample were conducted according to the Communication Assessment Protocol (Appendix VI, Section C) and the results are presented forthwith.

- ***Risk indicators***

Risk indicators other than the craniofacial anomaly for congenital hearing loss are presented in Table 5.4.

TABLE 5.4 Hearing risk indicators (n=80)

Risk indicators other than craniofacial anomaly	Description (refer to Appendix VI, item C7)	Children with CL/P	
		No.	Percentage
Yes	Children with: • Pierre Robin Sequence or suspected syndrome and high risk of hearing loss • Prematurity/ very low birth weight (less than 1.5 kg.) • Prolonged mechanical ventilation • External ear anomaly • History of consanguinity • NICU stay of more than 48 hours? • Maternal history of viral infections during pregnancy • Other postnatal illnesses, such as meningitis?	8 7 3 2 2 - - -	Overall **19%** displayed risk factors
No	Parents did not report any of the risk factors on the high risk register	62	77%
Missing data	Information not available	3	4%

It is noteworthy that 19% of the parents of the children could confirm the presence of high risk factors. The possible reason for their awareness is that the birth place of these children was

hospitals and parents may have already been informed by the health care professionals of the risk factors for hearing loss. There is also a possibility that more than one risk factor for hearing loss such as a syndrome and very low birth weight were present in some of these children. The JCIH (2007: 898) recommends that all infants with risk indicators for auditory disorders, and/or speech and language delay should receive ongoing audiologic and medical surveillance and monitoring for communication. In Mauritius, although universal newborn hearing screening is not in place, diagnostic equipment for hearing evaluations is available and speech-language therapy and audiology services are established in the regional hospitals. Therefore, routine hearing evaluations are possible for children with CL/P and are strongly recommended.

- ***Hearing Loss***

The results with respect to age appropriate hearing evaluations showed that a large percentage of children, (65%) were identified as having hearing loss, of which 60% had conductive hearing loss and 5% of the children were identified as exhibiting a mixed and sensorineural type of hearing loss (see Table 5.5). This finding confirms literature reports that children with CL/P frequently exhibit hearing loss (Bzoch, 2004: 356; Peterson-Falzone et al., 2010: 209). Moreover, the fact that 48% of the parents perceived that their child has a hearing loss (refer to Figure 5.6) again confirms literature reports (Rossetti, 2001: 94; Zinkin & McConachie, 1995: 108), that parental reports can be relied upon to identify children with hearing loss.

TABLE 5.5 Type and degree of hearing loss (n=80)

	No of Children	Percentage
Type of hearing loss (HL)		
Conductive	48	60%
Sensorineural	2	2.5%
Mixed	2	2.5%
No hearing loss	28	35%
Degree of hearing loss		
Mild (15 dB to 30 dB HL)	20	25%
Moderate (30 dB to 50 dB HL)	22	28%
Severe (50 dB to 70 dB HL)	3	4%
Profound (>70 dB HL)	1	1%
No hearing loss	28	35%
Missing data	6	7%

In general, children of 0-78 months are vulnerable to conductive hearing loss. The prevalence of a conductive hearing loss is highly variable, primarily because conductive hearing loss typically fluctuates. Kemker and Antonelli (2004: 357) reported that the incidence of hearing loss across studies is 58%. A recent study in Greece (Paliobei, Psifidis, & Anagnostopoulos, 2005: 1379) found that 69% of the children with CL/P presented with mild and moderate hearing loss. Vishwanathan, Vidler and Bruce (2008: 189) assessed hearing of 90 infants with CL/P with auditory brain stem response audiometry and reported that 82% of infants had a hearing loss and in the majority of cases it was conductive type of hearing loss.

Responses from the parents indicated a low incidence of surgical intervention for the management of conductive hearing loss. Only 16% (n=13) of the children were reported to have undergone surgical interventions, mainly grommet insertion. The literature recommendations are

for aggressive forms of management whereby ventilation tubes or grommets should be inserted in the ears of all children with CL/P due to the known risk of otitis media amongst these children (Broen et al., 1996: 132; Peterson-Falzone et al., 2010: 216; Watson et al., 2001: 220). Moreover, even mild and moderate hearing loss has a negative impact on communication, speech-language development and later academic outcomes (ASHA, 2004: 2; Friel-Patti & Finitzo, 1990: 192; JCIH, 2007: 900; Northern & Downs, 2002: 84). The large percentage of children with CL/P and hearing loss implies there is a double risk of communication disorders and the recommendation for aggressive forms of management should be implemented in Mauritius to minimise/prevent the impact of hearing loss on these children.

- ***Listening behaviour***

The Listening Evaluation scale (Hugo et al., 2000: 53) was administered to determine the listening behaviour of the children with CL/P (Appendix VI, Section C8). Children were divided into two groups, namely those with and those without hearing loss. The results are illustrated in Table 5.6.

TABLE 5.6 Listening behaviours of the children during communication assessments (n=80)

Reaction to:	Children with hearing loss (n=52)		Children without hearing loss (n=28)		Comparison
	Good (1)	Poor (2-3)	Good (1)	Poor (2-3)	P-Value Fisher's exact test
Environmental sounds	67%	33%	85%	15%	0.1112
Whispered speech	40%	60%	69%	31%	**0.0297**
Non speech sounds	44%	56%	78%	22%	**0.0336**
Speech	60%	40%	78%	22%	0.1365

The difference between the two groups was statistically significant ($p<0.05$) only for reaction to whispered speech and non speech sound. Comparisons of the two groups, using the Fisher's exact test revealed that children with hearing loss were rated as manifesting 'poor' listening behaviour more frequently (33%) than children without any hearing loss (15%). On the other hand, children without any hearing loss were rated as 'good' listeners more frequently as compared to children with hearing loss for reacting to environmental sounds (85% vs. 67%), whispered speech (69% vs. 40%), non-speech sounds (78% vs. 44%) and speech (78% vs. 60%).

It was observed that there was an association between the presence of hearing loss and both, reactions to whispered speech and to non speech sounds (noise makers). The association ($p<0.05$) of the listening behaviour for whispered speech and non-speech sounds were observed during the assessment due to the fact that the majority of the children in the study had mild to moderate conductive hearing loss, which could easily affect hearing ability for whispered speech and non-speech sounds. Thus it can be inferred that listening behaviour results could differentiate between children with hearing loss and without hearing loss on two parameters namely whispered speech and responses to noise makers. Listening behaviour for environmental sounds and speech was not significantly different between children with and without hearing loss possibly because this was based on parental reports. The results based on elicitation reflect the expected difference between children with and without hearing loss, whereas the results based on parental perceptions may not be reliable. The method of data collection for all four categories of listening skills of the listening scale should be similar, and preferably by means of elicitation rather than parental report. Thus the Listening Evaluation scale (Hugo et al., 2000) is useful and a clinically relevant tool for high risk population between 0-36 months. Its implementation helps identify children with poor listening skills even though they may have normal hearing.

It is deduced from the above findings that parental perception of hearing loss, the use of a high risk register and listening behaviour evaluations all provide valuable information about hearing status. However, a comprehensive test battery including electrophysiological measurements needs to be carried out to identify hearing loss, which should be monitored regularly, and when necessary, referred for ENT management.

5.3.3 Orofacial characteristics

The descriptions of the orofacial characteristics of children with CL/P in this study are based on orofacial examinations that were conducted by the speech-language therapists and audiologists according to the Communication Assessment Protocol (refer to Appendix VI, Section D). The results are shown in Table 5.7.

TABLE 5.7 Orofacial characteristics contributing to speech production errors (n=80)

Orofacial factors contributing to speech production errors	Percentage of children with presence of the contributing factor
Abnormal lip movements (example: restricted lip movements)	8%
Abnormal tongue movements (example: poor tongue neuromuscular control)	3%
Abnormal dentition (malocclusion, missing teeth, supernumery teeth)	5%
Palatal fistulae	23%
Suspected velopharyngeal dysfunction	35%
Suspected syndrome	11%
Other etiology suspected	3%
No identifiable contributing factor	44%

** The total percentage of children in the table is more than 100 as some children had more than one contributing factor.*

The most frequent contributing factor to speech production errors among 35% of the children was suspected velopharyngeal inadequacy. The results were based on listener perceptual evaluations only. A perceptual speech evaluation is the first step to determine whether the velopharyngeal functioning is adequate (Kuehn & Henne, 2003: 107; Sell, 2005: 103). The use of instruments for visual examination of the structures of the velopharyngeal area is recommended (Shprintzen & Bardach, 1995: 267; Whitehill, 2002: 92-93). However, Kummer (2008: 319) states that the velopharyngeal dysfunction is only a problem if it affects speech therefore perceptual judgement has face validity. In this Communication Assessment Protocol, perceptual speech analysis was conducted to judge the adequacy of the velopharyngeal closure and to make recommendations for instrumental assessment. Although, instrumental assessments for velopharyngeal closure are not currently used in public health service for cases with CL/P, the possibility of speech-language therapists collaborating with ENT specialists to use the nasopharyngoscope for assessment of velopharyngeal function can be considered. The speech stimulation material in Creole could be used during nasopharyngoscopy and the recordings of velopharyngeal closure analysed to make important management decisions for speech and resonance disorders.

According to this study, 5% of the children evidenced occlusion and dentition problems such as missing or supernumery teeth and malocclusions. As shown earlier (Figure 5.3) only 3.7% of the children were receiving dental care mainly for treatment of caries. This is contrary to the ACPA (2007: 18) recommendation that children with CL/P receive dental examination and referral to appropriate providers for caries control, preventative measures, restorative dental treatment and space management. Also, active orthodontic treatment is indicated from the stage of primary dentition (0-72 months). However, in the Mauritian context and many of the other developing

countries, children with CL/P cannot access orthodontic treatment as the personnel may not be available or the treatment is unaffordable by the families (Watson et al., 2001: 299). Unavailability of orthodontic treatment from the stage of primary dentition will negatively impact outcome measures, not only for dental treatment but also speech aspects among young children with CL/P (Bearn et al., 2001: 33; Mars et al., 2008: 116; Wyszynski, 2002: 433).

The orthodontic treatment of young children with CL/P also includes prosthetic obturation of palatal fistulae and prosthetic speech appliances for velopharyngeal inadequacy in some children (ACPA, 2004: 18). Among the children sampled, 23% had palatal fistulae caused either by a breakdown in repaired cleft palate or left deliberately by the plastic surgeon to be closed later by a bone graft (Table 5.9). Depending on the location, size, aetiology and how long the palatal fistulae have been present, they can affect both the degree of hypernasality and speech sound production (Kummer, 2008: 192; Shprintzen & Bardach, 1995: 316). There is a controversy regarding the effect of fistulae on speech; some authorities maintain that they always result in speech disorders (Karling, Larson, & Henningsson, 1993: 197; Shprintzen & Bardach, 1995: 328) while others suggesting that this is not the case (Harding & Grunwell, 1993: 65). The significant number of children with palatal fistulae in this study indicates that it might be an important contributing factor to the speech impairments observed among them.

The orofacial features and oral movements among children with syndromes are reported to be atypical and may contribute to speech production problems. The presence of syndromes among 11% of the children was found to be a contributing factor for speech production errors. Compensatory errors (for e.g. lateral distortion) may occur due to structural abnormalities such as maxillary retraction and/or micrognathia observed in children with syndromes/sequences (Kummer, 2008: 185). Speech-language therapists and audiologists along with surgeons and

paediatricians may be required to take a proactive role in describing the phenotypical features that may indicate the presence of a syndrome. The confirmation of a syndrome, however, remains problematic until genetic services are available in Mauritius. Syndrome diagnosis is very important for a treatment plan and the future development of the young child. For example young children identified with VCF syndromes can be better managed through an early intervention programme as future learning difficulties can be predicted and preventive measures taken. The Communication Assessment Protocol was useful in identifying one or more abnormal orofacial characteristics of the children with CL/P.

5.3.4 Communication, speech and language characteristics

The characteristics of communication, speech and language development skills among children with CL/P in the sample are presented according to the two age groups; Group 1: younger than 36 months and Group 2: 36-78 months (Appendix VI, Section E).

- ***Characteristics of the children in age Group 1 (younger than 36 months)***

Parental reports were obtained concerning prelinguistic communicative behaviours in age Group 1 (refer to Appendix VI, Sections E8 & E9).

TABLE 5.8 Pre-linguistic communicative behaviours of children in age Group 1 (n=24)

Prelinguistic behaviour	Percentage of children		
Items	Yes	Unsure	No
Non-verbal communication	100%	0	0
Behaviour regulation	88%	8%	4%
Social interaction	95%	0	5%
Joint attention (1 record missing information)	52%	18%	30%
Discourse structure: respond to and initiate communication (1 record missing information)	57%	30%	13%

The majority of the children younger than 36 months were reported to have developed behaviour regulation and social interaction. However, in this study the descriptions of functional communication development such as joint attention indicated that the cleft may have a negative impact on parent-child interactions and attempts by the child with CL/P to communicate may not be recognised by the parents as the beginnings of verbal communication. Behaviour regulation, social interaction and joint attention follow a developmental sequence, with behaviour regulation as the most basic form of communication. Joint attention, unlike behaviour regulation and social interaction, requires ongoing turn taking (Blackman, 1995: 158). Mothers require training to promote vocabulary use and speech production (Pamplona & Ysunza, 2000: 231).

Based on the assessment results of prelinguistic communication behaviour, speech-language therapists can plan early communication intervention and train mothers to deliver the intervention reliably (Scherer, D'Antonio & McGahey, 2008: 18-31).

- ***Phonetic development***

The consonant repertoire produced by the children with CL/P in the sample was obtained from parental reports (Appendix VI, Section E10).

TABLE 5.9 Consonant repertoire of children in age Group 1 (n=24)

Consonant repertoire	Frequency	Percentage
Age appropriate	6	25%
Limited	13	54%
No identifiable consonant	4	17%
Missing Data	1	4%

A total of 71% of the infants and toddlers had limited or no identifiable consonants according to their parents (Table 5.9). Kritzinger et al. (1996: 81) reported that 80% infants with CL/P displayed a limited phonetic repertoire in comparison with normal developmental levels. A comparative study by Chapman et al. (2001: 1277) regarding prelinguistic vocalisations between 9 month old infants with and without cleft suggested that infants without cleft produced two to three times as many consonants as the babies with clefts. Various studies (Chapman et al., 2003: 193, Harding-Jones et al., 2006: 8; Kummer, 2008: 161; Morris & Ozanne, 2003: 465; Scherer, 1999: 90) have provided evidence of a link between the development of expressive language and the increase in the phonetic repertoire in young children with CL/P. These findings highlight the importance of assessing the consonant repertoire of children with CL/P and providing intervention when required, in the early speech development stage. Delays in consonant production during the prelinguistic phase have been linked to delayed language and speech (Peterson-Falzone et al., 2010: 232). Jones et al. (2006: 9) identified increasing the consonant repertoire of a child with CL/P as an important ECI goal. Therefore, assessment of phonetic

repertoire during the prelinguistic stage is a preventative measure for future language delays or speech disorders. In addition to parental reports, speech-language therapists should elicit and record (video and audio recordings) the babbling and vocalizations of infants for perceptual analysis of phonetic repertoire.

- ***Language characteristics***

In Group 1 (children younger than 36 months), 54% of the children had delayed language, possibly due to the inclusion some with syndromes/sequences in the study sample. The presence of a syndrome increases the risk of developmental problems (Peterson-Falzone et al., 2010: 58; Scherer & Kaiser, 2007: 355).

- ***Characteristics of the children in age Group 2 (36-72 months)***

The children in Group 2 were assessed by the speech-language therapists and audiologists, and information derived from parental reports and elicited standard speech responses with respect to language, speech and voice characteristics.

- ***Language characteristics***

The language screening results of children in Group 2 (refer to Appendix VI, Section E24) indicated that 52% of them required referrals for in-depth speech-language assessment due to a suspected or confirmed language delay which closely correlates with the findings from Group 1. This may be attributed to any one or a combination of the following reasons:

- the presence of congenital risk factors for hearing loss in addition to the cleft and confirmed hearing loss in a large percentage of children
- inclusion of children with syndromes/sequences in the sample (11%)

- limited phonetic repertoires (in 71% of the children in the sample) in which the speech production capabilities were compromised and may partly explain the expressive language delays.

Data from this study confirm the reported developmental language delays among children with CL/P (Broen et al., 1998: 682; Jocelyn, Maureen, Penko & Rode, 1996: 532; Morris & Ozanne, 2003: 469; Pamplona et al., 2000: 88). It is therefore imperative to include language acquisition screening followed by in-depth language assessments and interventions for young children with CL/P.

- ***Speech characteristics***

Speech samples were elicited from the children in the age Group 2 and digital recordings were made for speech analysis (refer to Appendix VI, Section E26 to E33). The speech characteristics of 47 children were completed as speech recordings for 9 children could not be made due to non-compliance and limited expressive abilities (Table 5.10).

TABLE 5.10 Speech characteristics as determined by perceptual speech analysis in age Group 2 (n=47)

Speech characteristic	Number of children		Percentage of children presenting with the cleft type speech characteristic
	Yes	**No**	
RESONANCE: i) Hypernasal ii) Hyponasal iii) Mixed nasality	 35 2 2	 12 45 45	 75% 4% 4%
NASAL EMISSION	14	33	30%
NASAL GRIMACE	12	35	26%
	Dysphonia	**Normal**	
VOICE	13	34	28%
	Yes	**No**	
ARTICULATION Cleft type speech characteristics (CTCs) * Some children had more than one type of CTC i) Anterior CTS ii) Posterior oral iii) Non oral iv) Passive CTC	33 15 9 15 27	12	70%
	* for 2 children the SLTs were unsure		
DEVELOPMENTAL ARTICULATION ERRORS	**Yes**	**No**	
	14	24	30%
	*for 9 children the SLTs were unsure		
VISUAL APPEARANCE i) unremarkable ii) asymmetry of facial movements iii) tight upper lip iv) tongue tip appearing (interdental lisping) *Some children had more than one type of remarkable appearance	 28 2 10 3		 - -

The ratio of children judged as having hypernasal resonance and articulation errors was high. The findings of this study are similar to those by Hardin-Jones and Jones (2005: 10) where among 212 preschool children 68% required speech-language therapy services for speech

disorders. However, the CSAG report (Sell et al., 2001: 35) in the UK reported only 18% of the children with CL/P exhibited consistent hypernasality and 19% of the five year-olds with craniofacial anomalies were judged to be unintelligible to strangers. This disparity in the literature may be attributed to differences in inclusion criteria of children with different types/severity of cleft. In the Hardin-Jones and Jones study (2005: 8), children with bilateral CL/P were included whereas the participants in the CSAG study were all children with unilateral CL/P and they were receiving speech-language therapy services (some cases for more than two years) and were treated by a multidisciplinary team of professionals.

Results from this study also indicate that 30% of the children in the sample had developmental articulation errors. Hutters et al. (2001: 465) reported that developmental speech characteristics are more frequent in consonants produced by children with CL/P than children without CL/P.

The speech delays/disorders of the sample may be partly attributed to lack of ECI and a coordinated team approach to management as young children with CL/P in Mauritius may not have had timely access to the range of professionals required to ensure good speech outcome. This indicates the importance of a perceptual speech analysis which distinguishes the types of articulation errors and guides therapy planning by the speech-language therapists.

- ***Voice problems***

In this study, 28% of the children with CL/P were identified with voice problems such as hoarseness and low intensity. This incidence is higher than that reported in a recent study by Hocevar-Boltezar, Jarc and Kozelj (2006: 279) where only 9.2% of the children with clefts had functional dysphonia. Voice problems among children with CL/P are usually characterised by

weak and/or aspirate (breathy) voice (Bzoch, 2004: 409). This phonatory characteristic is more prevalent in the cleft group than in the general population (Peterson-Falzone et al., 2010: 240). Identifying the interactions of voice and resonance can be challenging and the judgment of voice quality on basis of auditory-perceptual voice analysis is subjective. Therefore, the significant discrepancy in the voice quality of this sample compared to results obtained elsewhere is understandable.

- ***Identifiable etiological factors of the speech disorders***

In addition to the cleft condition, other etiological factors contributing to speech disorders among children in age Group 2 (refer to Appendix VI, Section E34) were determined.

TABLE 5.11 Identifiable etiological factors of the speech disorders in age Group 2 (n=56)

Identifiable etiology	Frequency count	Percentage of children
i) Hearing loss	25	45%
ii) Developmental delay	16	28%
iii) Oral fistulae	11	20%
iv) Dental abnormalities	4	7%
v) Syndrome	5	9%
vi) Other (for example learning difficulty)	4	7%

** The total is more than 56 as some children had more than one identifiable etiology*

Hearing loss and developmental delays accounted for a significant proportion of the etiological factors for speech disorders in children from 36-72 months (Table 5.11). The palatal fistulae appeared to cause speech disorder in a high proportion (20%) of children assessed. Harding and

Grunwell (1998: 342) reported that fistulae influence articulation and phonological development and Kummer (2008: 192) added speech outcomes depend on the size and location of fistula. The orthodontist, plastic surgeon, oro-facial-maxillo surgeon and speech-language therapist need to make joint decisions on management of the cases with fistulae.

In addition to factors listed in Table 5.11, velopharyngeal inadequacy (VPI) is an important etiological factor of speech disorders. The VPI was assessed by perceptual assessment as part of the orofacial examination procedures and was identified as a contributing factor to speech production errors in 35% of the children.

The combination of etiological factors, in the study sample, confirms literature reports (Broen et al., 1998: 685; Hutters et al., 2001: 465) that the cleft itself is not the only cause of speech disorder and that the speech-language therapist and audiologist should conduct a holistic assessment of children with CL/P.

5.3.5 Emergent literacy skills

The children's emergent literacy skills were described based on information elicited from the parents (Appendix VI, section E11). As three of the 24 children in age Group 1 were younger than six months they were not included in the sample. The results of parental responses for the 21 children between six and 36 months are illustrated in Table 5.12.

TABLE 5.12 Emergent literacy skills in age Group 1 (n=21)

Emergent literacy skill (as reported by the parents)	Frequency in percentage	
	Yes	No
i) Parents have introduced the children to books	76%	24%
ii) Child responds to being read to	62%	38%
iii) Child shows an interest in books	67%	33%
iv) Child pretends to read books	52%	48%

The results for emergent literacy skills are positive as the majority of children under the age of 36 months were introduced to books (Table 5.12). This may be attributed to the fact that all parents of children in this sample had, at least, received primary school education and that parents in Mauritius have a high literacy rate in general. Joint book-reading enhances language and literacy development of all infants and should be actively promoted in early intervention programmes (Kritzinger & Louw, 1997: 2).

Emergent literacy skills (refer to Appendix VI, Section E25) were also studied among 54 children in Group 2. The trend that was established by parents in the younger group of participants was found to be sustained with children above 36 months (Table 5.13).

TABLE 5.13 Emergent literacy skills in age Group 2 (n=54)

Emergent literacy skill (as reported by the parents)	Frequency of children in percentage	
	Yes	No
i) Shows an interest in books and reading	96%	4%
ii) Listens attentively to parent/teacher reading	91%	9%
iii) Is sensitive to some sequences of events in a story	87%	13%
iv) Correctly answers questions about stories read aloud	75%	25%
v) Displays attempts at reading	80%	20%
vi) Recognises and can name a few letters	69%	31%

Children with speech and language problems are particularly vulnerable to deficits in early literacy skills (Broder et al., 1998: 130; Nathan, Stackhouse, Goulandris & Snowling, 2004: 377-391). As far as could be determined, the emergent literacy skills of children with CL/P have not been explored *per se*. However, literature reviews indicate that children with CL/P are at risk for learning difficulties and poor academic performance (Broder et al., 1998: 130; Endriga & Kapp-Simon, 1999: 7; Peterson-Falzone et al., 2010: 378; Strauss, 2004: 170). Assessment of emergent literacy skills is recommended to facilitate the literacy process in young children (ASHA, 2001:17-27; Pence & Justice, 2008: 225).

5.3.6 Developmental and educational aspects

Information concerning developmental aspects of the children was also obtained from parental reports (refer to Appendix VI, Section F) and the findings are presented with respect to the general development and educational aspects.

- **General development**

Concerns regarding the delayed motor milestones were raised by 21.25% of parents of the children in the sample of 80 children with CL/P. Literature review suggests that the motor milestones and the average age for attaining them may be used as benchmarks for investigating the presence of developmental delays (Kapp-Simon & Krueckeberg, 2000: 69; Neiman & Savage 1997: 222; Swanenburg de Veye et al., 2003: 300). However, to determine the developmental motor patterns of infants with CL/P longitudinal data is needed (Savage et al., 1994: 227). As this study was a cross sectional study, the children's developmental patterns could not be determined. Developmental delays have important implications for early diagnosis and intervention among children with CL/P. Speech-language therapists and audiologists identified and referred 19% of the children to paediatricians for in-depth assessments and 3% of the children for a psychological assessment. In contexts similar to Mauritius where a multidisciplinary team approach is not available, speech-language therapists and audiologists need to have a holistic view and include a general developmental assessment when conducting communication assessment of the child with CL/P

- **Educational aspects**

The children's educational history was obtained from the parents (Appendix VI, item F 9). Among the 56 children in Group 2, almost all (54/56) were attending school. This is an encouraging finding as it indicates that in Mauritius, children with clefts have access to same educational facilities as children without any cleft lip and /or palate. In some countries, for example Madagascar (another island in the Indian Ocean), many children with CL/P are not sent to school due to the stigma associated with facial anomalies (personal experience of the

researcher during an Operation Smile mission to Madagascar in November 2007). However, in Mauritius, children with CL/P have equal opportunities and the system supports their integration in mainstream schools.

The implementation of the Communication Assessment Protocol allowed for a rich description of the characteristics of children with CL/P in Mauritius. This information was captured the electronic database.

5.4 CLINICAL APPLICABILITY OF THE COMMUNICATION ASSESSMENT PROTOCOL

The clinical applicability of the protocol in Mauritius was evaluated by conducting assessments using the newly developed assessment tool on a cross section of 80 children with CL/P and determining if it was effective in identifying children with communication delays/disorders.

5.4.1 Identification of communication disorders using the Communication Assessment Protocol

The compilation of the Communication Assessment Protocol was based on recommendations for best practice in assessments (ACPA, 2007) and it was specifically adapted for the Mauritian context (refer to section 4.8.7 and Table 4.8). The content validity of the instrument was assured by including various areas of communication assessment and specific aspects of each area were included in the checklist format of the communication assessment tracking form (refer Appendix VI) according to best practice recommendations (ACPA, 2007). The clinical applicability of the Communication Assessment Protocol was established as various speech-language therapists and

audiologists (investigator triangulation) could use the assessment instrument to identify children in the sample with communication problems. This is a useful measure of internal validity of an instrument (Denzin & Lincoln, 2000: 391; Leedy & Ormrod, 2005: 97).

Data collection, data analysis, and data interpretation are interactive and cyclical steps in the mixed-methods research process (Collins, Onwuegbuzie & Sutton, 2006: 72). Assessments through implementation of the Communication Assessment Protocol generated sufficient data pertaining to characteristics of young children with CL/P in Mauritius. The analyses of the results from assessments of the young children with CL/P established that the ratio of children identified with the various communication problems in general concurred with literature reports. This provided evidence to suggest that the Communication Assessment Protocol was a clinically applicable instrument for assessment of young children with CL/P in Mauritius.

The clinical applicability of the instrument was verified as follows:

- In the empirical research, use of the Communication Assessment Protocol identified 73% of the young children with speech-language delays/disorders and recommended them for speech-language therapy. This is similar to results of studies undertaken in other parts of the world where 70% of young children with CL/P in preschool age group required intervention by speech-language therapists (Brunnegard & Lohmander-Agerskov, 2007: 33; Hardin-Jones & Jones, 2005: 10; Hirschberg, 2001: 1259; Peterson-Falzone et al., 2010: 243).
- Previous studies have reported that 58% of children with CL/P exhibit hearing loss (Bzoch, 2004: 357). This was found to be similar to percentage of children identified with hearing loss (65%) using the Communication Assessment Protocol. Moreover, correlations were determined between the hearing test results and the listening scale to compare and corroborate the results.

This provides further support that the protocol was successful in identifying children with speech-language and hearing impairments.

- The Communication Assessment Protocol allowed a comprehensive assessment of children with CL/P (ACPA, 2007: 3). In addition to communication assessment it included assessments of feeding methods, general developmental and educational aspects of the child. Although emergent literacy skills *per se* in young children with CL/P have not been extensively studied, few studies, for example, by Broder et al. (1998: 129) and Richman and Ryan (2003: 159) have reported that 46% of children with CL/P had reading and writing difficulties. The emergent literacy section of the Communication Assessment Protocol identified that 43% of the children's parents required guidance to facilitate emergent literacy skills in their young children. This provides additional credence to the concurrent validity of the Communication Assessment Protocol.

The Communication Assessment Protocol procedures followed a holistic approach which focused on identifying strengths and problems in order to make referrals and to include all areas of concern into early communication assessment. The Communication Assessment Protocol was based on the theoretical construct that the outcome of broad screening of communication and other related functions (feeding, general development) of young children with CL/P would make it feasible for speech-language therapists and audiologists to refer the identified children to the concerned specialists for further assessments and management. Therefore, using the protocol, the speech-language therapists and audiologists should identify children with communication problems as well as problems related to communication development.

-The feeding methods' assessment and observations on growth (from health card of infants and toddlers) identified 4% of the children as being at risk and were referred to paediatrician for further management.

- Using the orofacial examination checklist helped to identify 5% of the children in the sample (refer to Table 5.8) with abnormal dentition who would require orthodontic intervention.

- The screening of general development (motor, social interactions, educational history) of the children (refer to Section 5.3.6) allowed the speech-language therapists and audiologists to identify 19% of the children who required referrals to a paediatrician and psychologist

In conclusion, the clinical applicability of the Communication Assessment Protocol was verified by implementing the protocol in Mauritian children with CL/P and comparing the assessment results to international research findings.

For perceptual speech analysis the reliability of data, recording, analysis and interpretation are of utmost importance (Eurocleft Speech Group 2000; Sell, 2005: 113). The reliability of the data collection was discussed earlier (refer to 4.8.7). It involved using pre-tests, pilot studies and training to conduct the assessments in a uniform manner. However, speech assessments of children in the age group 36-78 months were based on perceptual speech analysis by speech-language therapists who made subjective judgements of the speech characteristics. Interobserver consistency of judging speech elicited from preschool age children in the sample is based on recommendation by John et al. (2006) and discussed in the following section.

5.4.2 Reliability of the perceptual speech analysis

The reliability of perceptual speech analysis was determined by randomly selecting eight speech samples from the 47 video and audio recordings of the children's speech assessments and speech analysis by each of the four speech-language therapists and audiologists for hypernasality, nasal emissions and cleft type characteristics. The speech analysis results from each assessor were compared. The results are presented in Table 5.14.

TABLE 5.14 Percentage agreement of perceptual speech analysis: interobserver reliability

Subjects' Speech Parameters	Subject 1 ID 15 Age: 68 months		Subject 2 ID 23 Age: 54 months		Subject 3 ID 25 Age: 72 months		Subject 4 ID 28 Age: 62 months		Subject 5 ID 68 Age: 40 months		Subject 6 ID 82 Age: 75 months		Subject 7 ID 84 Age: 71 months		Subject 8 ID 86 Age: 49 months		~~Mean Age:~~ 61 months
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Percentage Agreement
Hypernasality E26 a																	
P 1	+			+		+	+			+	+			+		+	
P 2	+		+			+	+		+		+			+		+	**97%**
P 3	+		+				+		+		+		+			+	Missing data: 1
P 4	+			+		+	+		+		+		+			+	
Nasal emission E27																	
P 1		+		+		+	+			+						+	
P 2		+			+					+						+	**62%**
P 3		+		+						+			+			+	Missing data:
P 4				+		+				+			+			+	12
Cleft type speech E31																	
P 1	+					+	+		+		+		+			+	**94%**
P 2	+			+		+	+		+		+		+			+	Unsure (U=1)
P 3	+		+			+	+		U		+		+			+	Missing data: 1
P 4	+			+		+	+		+		+		+			+	

There was 97% agreement on findings among the four assessors for hypernasality and 94% agreement for cleft type speech characteristics (Table 5.14). There were, however, less consensus with respect to the judgements of nasal emissions (Percentage agreement 62% only). The missing data for nasal emissions indicates that the speech-language therapists and audiologists did not feel confident about making their judgement from digital recordings regarding the presence or absence of nasal emissions. This may be attributed to the fact that the judgement of nasal air emissions requires actual observations of the child (mirror fogging) while he/she is speaking (Kummer, 2001: 283).

Consistency in perceptual speech assessment results is an important consideration in research to determine the protocol's reliability. Sell's (2005: 106) recommendations for clinical practice to perceptual speech analysis such as training of the therapists in listening to speech samples, eliciting speech samples through repetition of standard sentences and high fidelity digital recordings of speech samples for comparisons were followed and contributed to agreement of the therapists regarding the speech characteristics of preschool age children. The speech-language therapists and audiologists were not able to transcribe the children's speech using the International Phonetic Alphabet (IPA) and the diacritics described for cleft type speech (Trost-Cardamone, 2004: 263). This could probably be ascribed to their limited clinical experience (refer to Table 4.3) as well as to inadequate practice in transcribing cleft type speech characteristics. In the future training in transcribing cleft type speech patterns will be necessary.

A reliable Communication Assessment Protocol that could be implemented to assess communication of young children with CL/P accessing public health service in Mauritius was

developed. An important question that remained to be answered was whether, from the perspectives of speech-language therapists and audiologists who would be using the protocol, it was clinically applicable and acceptable.

5.5 CLINICAL ACCEPTABILITY OF THE COMMUNICATION ASSESSMENT PROTOCOL

The qualitative approach used to judge the perceptions of the speech-language therapists and audiologists sought an answer to the question: *Is the Communication Assessment Protocol a clinically acceptable tool?* As the speech-language therapists and audiologists first completed a questionnaire on the Communication Assessment Protocol before participating in the focus group discussion, an equal status was provided to both methods in the interpretation of the results (Leech & Onwuegbuzie, 2005).

The perceptions of the three speech-language therapists and audiologists who participated in the implementation of the Communication Assessment Protocol are presented and discussed in sections 5.5.1 and 5.5.2. The fourth participant was the principal researcher who developed the Communication Assessment Protocol.

5.5.1 Speech-language therapists' and audiologists' perceptions as obtained by the questionnaire

All three participants were of the opinion that the Communication Assessment Protocol was user friendly and comprehensive and felt that they would use the protocol in the hospital context.

TABLE 5.15 Perceptions of the speech-language therapists and audiologists regarding the Communication Assessment Protocol (n=3)

QUESTIONS & SUB-QUESTIONS	RESPONSES OF PARTICIPANT 1 P1	RESPONSES OF PARTICIPANT 2 P2	RESPONSES OF PARTICIPANT 3 P3
1. **Number of children** assessed **(n=80)** Group 1: younger than 36 months Group 2: 36-72 months ** 32 children were assessed by the principal researcher.*	Pilot study: 2 Main study Group 1 = 7 Group 2 = 13 Total = 20	Pilot study: 2 Main study Group 1 = 2 Group 2 = 7 Total = 9	Pilot study: 2 Main study Group 1 = 3 Group 2 = 16 Total = 19
2.1 **Suitability** of the protocol for hospital context	Yes- as assessment of all areas of communication on one form. Could conduct assessments in the hospital context	Unsure- as found the protocol lengthy and some children did not maintain attention throughout the assessment. Recording equipment available only in one hospital	Yes- as different areas of communication are assessed that are appropriate and useful. The layout is easy as different areas are on different colour paper
2.2 **Detailed enough** in the specific areas assessed	Yes- as all important aspects having an impact on communication were included	Yes- as there were checklists for every section	Yes- as protocol contains all the areas for a complete assessment and it forms a basis for a good management plan. Protocol also provides the therapist with concrete clear grounds for referral to other professionals
2.3 **Ease** of assessment	Could assess - some difficulty in the hearing and the communication sections	Could assess- some difficulty for section E of the protocol, communication, speech and language	Could assess -with ease
3.1 Rating of **resonance** for children from group 2	Could rate with ease as training was provided	Could rate with ease as the scale was described well	Could rate with ease as checklist provides sufficient information
3.2 Description of **cleft type speech** characteristics	Had some difficulty- needed to view the video training programme once more and familiarise with the speech characteristics	Had some difficulty- needed prior training and listening practice	Could describe with ease- the training video and observations during the pilot study were helpful

TABLE 5.15 Perceptions of the speech-language therapists and audiologists regarding the Communication Assessment Protocol (n=3) (continued)

QUESTIONS & SUB-QUESTIONS	RESPONSES OF PARTICIPANT 1 P1	RESPONSES OF PARTICIPANT 2 P2	RESPONSES OF PARTICIPANT 3 P3
4. Were some children **difficult to assess?**	Yes- in group 1 for hearing evaluations and in group 2 for speech recordings probably the children were shy or not familiar with the therapist	Yes- in group 2 for speech recording due to decreased attention and shortage of time to establish rapport with the children	Yes- in group 2 some children did not cooperate for hearing test, orofacial examination for example the mirror test and speech assessment Probable reasons were no rapport with the therapist, unfamiliar environment
5. **Guidelines** for intervention could be determined from the results?	Yes the assessment provided guidelines for referring and redirecting the children. Clear goals regarding speech correction could be identified	Yes as speech sound correction is easier when you know exactly what the child is doing wrong. Short term and long term goals became clearer	Yes as the protocol is detailed and the results provide a good basis for intervention and appropriate referrals. The therapist on completion of the assessment has a clear idea of how, where and when to start intervention.
6. Will you **use** the protocol in the future?	Yes- as all the required information available on one form. Now I am familiar with the protocol and it is easy to conduct assessment. The checklist is good for pre- therapy and post therapy assessments	Yes- especially the section E as a tool for diagnosis initially and for evaluating progress in therapy periodically	Yes as the protocol is useful, complete and appropriate for clinical practice. The checklist helps to save time.
7. **Open-ended** question for additional comments regarding **clinical applicability**	Time constraint to conduct the protocol especially if the child is not co-operative for example for the hearing test. The equipment provided was of good quality. The protocol included all important information to plan therapy.	This protocol is the first standardised test that can be used in each of the speech-therapy and audiology units in the Mauritian context. A useful tool in evaluating progress of the child following speech therapy The protocol also has potential to evaluate outcome of surgery from point of view of communication development.	Difficult to complete assessment in all areas in one session as therapist has a heavy case-load and the child may not co-operate. The video recording is very helpful in management but apparatus is not available at all regional hospitals Protocol provides information that is helpful in management of the child.

The training provided in perceptual speech analysis (Sell et al., 1999: 26) was reported to contribute positively in describing cleft type speech characteristics and in rating the nasal resonance of the children assessed. In some cases where difficulties were experienced in describing the speech characteristics, the audio and video recordings were reported to be very helpful as they could listen and watch the video recordings and analyse the speech reliably. The good quality digital audio and video recordings used in the study were appreciated by the participants.

The main issues that were raised, in response to the open ended question, were the time constraints for the use of the Communication Assessment Protocol in the clinical practice and the availability of apparatus for making digital audio and video speech recordings during clinical practice. The average time taken for completing one assessment was 30 minutes for children in Group 1 (0-36 months) and 40 minutes for children in Group 2 (36-78 months). The maximum time taken for completing the communication assessment was 60 minutes. A lengthy assessment of more than 60 minutes may affect clinical applicability especially in a busy clinical context (Zinkin & McConachie, 1995: 107). Although, two participants perceived the assessment of 30 to 40 minutes to be lengthy, the protocol was completed well within a reasonable time of less than 60 minutes. It is most probable that time required for the assessment would reduce with familiarity with the Communication Assessment Protocol.

5.5.2 Speech-language therapists' and audiologists' perceptions shared in the focus group discussion

A focus group discussion was conducted as an extension of the questionnaire to provide an interpretive aid to the findings (Bloor et al., 2001: 9). Topics for discussion and excerpts of representative quotes of the participants are presented in Appendix IX. A Digital Video Disc (DVD) recording of the focus group discussion is also included in the slip of back cover of the thesis. The focus group discussion permitted interaction among participants. In this section the themes identified for discussion, the perceptions of the participants and the principal researcher's interpretation are presented.

Topic One: Overview of the Communication Assessment Protocol

While discussing their general perceptions of the clinical applicability of the Communication Assessment Protocol all participants agreed that it was a complete and useful tool. They considered the protocol complete as areas of assessment included feeding, hearing, general development in addition to the speech-language assessments and they could focus on each area of assessment. They also found it practical, user-friendly, easy to use and appreciated the checklist format for noting their findings. Including parents in the assessment process was considered to be an important aspect of the protocol and this concurs with literature where parents are considered as an invaluable source of information regarding their child's communication (Guralnick, 1997:3; Rossetti, 2001: 94).

The main concern that was voiced by the three participants was the lack of digital audio and video recording apparatus at the various regional hospitals. It is interesting to observe that the participants found the recordings so useful that they were concerned how auditory perceptual speech analysis could be conducted in clinical practice if the apparatus for making high fidelity recordings was not available. Sell (2005: 103), in recognition of the importance of perceptual speech assessment, recommends blind independent analysis of speech data based on high fidelity recordings as the best practice when reporting audit and research outcomes for children with CL/P. Acquiring the high fidelity recording equipment may have important budget implications.

Topic Two: Content and implementation of the Communication Assessment Protocol

Specific aspects of the Communication Assessment Protocol and its implementation in clinical practice were the second topic of the focus group discussion and included: training in conducting the assessments, the contents of the Communication Assessment Protocol and the implementation of the various areas of communication assessments.

- **Training**

The speech-language therapists and audiologists were trained to conduct the communication assessments and they found it to be adequate. The video training and observing the principal researcher conducting assessments were reported to be very helpful in conducting the assessments. Ongoing training, in listening skills for speech-language therapists to standardise approach to auditory perceptual speech assessment and analysis, is recommended (John et al., 2006: 279; Sell, 2005: 118) and contributes to increasing the assessor's reliability in speech analysis.

- **The assessment tracking form**

The participants made positive comments regarding the assessment tracking form. They also expressed their satisfaction on the layout of the tracking form which was attractive due to colour coding of the various assessment areas. The checklist style was reported to be a time saver, as the therapists could simply 'check' their observations. It is important to maintain the same format of the tracking form in clinical practice.

- **Speech elicitation materials**

The participants found the list to be very helpful in eliciting speech from the young children in the sample. The list was the first of its kind, and the only speech elicitation material available in Creole. The need for linguistically relevant speech materials has been emphasized for the speech assessment of young children with CL/P (ACPA, 2007: 6; Eurocran Speech Project, 2000). Therefore, the list in Creole filled an important need in Mauritius and provided linguistically appropriate speech elicitation material to conduct speech assessments.

- **Apparatus for speech recordings**

The digital audio and video recording apparatus was considered to be of high quality by the speech-language therapists and audiologists as they could analyze the children's speech reliably from the high fidelity recordings. The video recordings in particular were appreciated as non-verbal communication could be analysed. High fidelity recordings contribute to the reliability of perceptual speech analysis as random, independent speech analysis based on the recordings can also be used to measure treatment and speech therapy outcomes (Gooch et al., 2001: 61; John et al., 2003: 279; Sell, 2005: 107; Shriberg et al., 2005: 356; Wyatt et al., 1996: 148).

- **Areas of assessment**

The consensus of the speech-language therapists and audiologists was that the Communication Assessment Protocol provided a comprehensive approach to assessment, as all areas relating to communication were included. In addition to the universal parameters for speech evaluation namely, speech resonance, voice, language, hearing (Henningsson et al., 2008: 5; Lohmander-Agerskov & Olsson, 2004: 64-70; Sweeney & Whitehill, 2004) the Communication Assessment Protocol included emergent literacy skills, motor and educational development that provided the therapists conducting assessment a holistic view of the child with CL/P. This may be the reason for the speech-language therapists and audiologists to refer to the Communication Assessment Protocol as 'a complete assessment protocol'. The participants during their completion of the survey questionnaire felt that all the areas included in the communication assessment protocol could not be assessed in one session. Discussion of this issue revealed that the hearing evaluations were time consuming, especially if the child being assessed was not cooperative. However, one of the participants suggested that rapport with the child was an important factor and added that children responded better to a familiar person. Therefore, it was suggested by one of the participants that in clinical practice the Communication Assessment Protocol should be conducted by the therapist who is conducting therapy with the child and that the assessment should be a longitudinal, ongoing assessment process. The ACPA parameters for evaluation of patients with CL/P (ACPA, 2007: 8) also recommend longitudinal assessments.

- **Intervention goals**

The therapists reported that they were able to make referrals, and establish short term and long term intervention goals based on the assessment results of each child obtained from the

Communication Assessment Protocol; this was a positive aspect concerning the clinical applicability of the protocol (ACPA, 2007: 7; Bzoch, 2004: 346; Rossetti, 2001: 88).

In conclusion, the speech-language therapists and audiologists felt that the protocol covered all the areas required for a complete assessment and was a reflection of the content validity, the strong theoretical underpinnings of the Communication Assessment Protocol.

Topic Three: The clinical applicability and the future use of the Communication Assessment Protocol

The third and final topic discussed was the clinical implementation of the Communication Assessment Protocol. The speech-language therapists and audiologists were unanimous in their affirmation that they would use the protocol in the future to assess young children with CL/P. One participant shared that she was using the speech elicitation material for all children referred with speech articulation problems. This comment initiated discussions around the potential application of the Communication Assessment Protocol to assess different types of cases.

The apparatus for hearing evaluations were available in three of the four centres in Mauritius and for the purposes of the study; the tools (for e.g. the digital recording equipment) of detailed assessment of the speech were available. However, the speech-language therapists and audiologists felt that it was important in clinical practice to have access to all these tools for detailed and complete evaluation of the children's speech assessments.

The participants also discussed their experiences and reasons for not completing the assessment in one session. One of the participants voiced the opinion that some children were not easily conditioned for hearing evaluations, whilst another participant was concerned about some children being unwilling to repeat the words. Ideas to overcome these constraints were discussed, for example establishing rapport with the child. The discussion moved on to the implementation stage of the protocol. The participants felt that viewing the video recording of the child's speech sample as a group would facilitate the auditory perceptual speech analysis. But group discussions are not possible as the therapists work in different centres and have to cope with a heavy case load. P3 thought it would be ideal if the therapists could confirm the findings and plan the management as a group '….in an ideal setting'. Perceptual speech assessment is of utmost importance and a complex process corroborative listening for speech analysis is recommended to reduce measurement error (John et al., 2006: 279; Sell, 2005: 116).

The Communication Assessment Protocol was perceived to address an urgent need for access to an assessment tool that has contextual and linguistic relevance. From the discussions of theme three, it was apparent that the speech-language therapists and audiologists were looking forward to apply the Communication Assessment Protocol in the future. This will entail detailed and accurate assessment and early identification of children with CL/P and guide intervention that will improve the overall care of the children with CL/P in Mauritius.

From the converging evidence of the survey results, the focus group discussion and the personal experiences of the principal researcher, it can be concluded that the Communication Assessment

Protocol is suitable for use in the hospital context in Mauritius, and would serve its proposed purpose in early intervention.

5.6 CONCLUSION

The results and subsequent discussion confirm that the three research objectives were achieved. In Mauritius, a description of the characteristics of young children with CL/P and an electronic database are available. The speech-language therapists and audiologists implemented the new Communication Assessment Protocol and confirmed the clinical applicability and acceptability of the protocol

In Mauritius, not all children with CL/P currently benefit from the services of the paediatricians, ENT specialists and dental specialists. However, speech-language therapists and audiologists receive early referrals from the plastic surgeon. This implies that in Mauritius, the speech-language therapists and audiologists are well positioned to implement early identification and management of communication delays/disorders in children with CL/P. Moreover, parents could participate in the assessment process by providing pertinent information concerning their children's history and communication behaviours. Consequently, there is a possibility of an interdisciplinary approach to assessment of young children with CL/P using the Communication Assessment Protocol.

The questionnaire and the focus group session established that the speech-language therapists and audiologists perceived the tool as being practical, comprehensive and clinically applicable.

Moreover, the focus group discussion confirmed that the speech-language therapists and audiologists' favoured the use of the Communication Assessment Protocol in the future.

5.7 SUMMARY

This chapter presented the results of the empirical research conducted to develop a Communication Assessment Protocol for young children with CL/P for use by speech-language therapists and audiologists in the public health sector of Mauritius. Conducting assessments on 80 young children with CL/P tested the possibility of implementing such a protocol for routine clinical use in Mauritius. Speech-language therapists and audiologists were able to identify children with communication disorders and associated problems and to initiate early intervention. Also, based on the early identification of associated problems referrals could be made and management goals planned accordingly. Moreover, they recorded the communication assessment findings in a uniform manner. In the focus group discussion they confirmed the acceptability of the Communication Assessment Protocol for clinical use in Mauritius.

CHAPTER 6:

CONCLUSIONS AND IMPLICATIONS

The aim of this final chapter is to critically evaluate the results of the empirical research, to draw conclusions and to discuss the implications of the research findings. Areas for future research are identified and final comments by the researcher are provided.

6.1 INTRODUCTION

The plight and vulnerability of young children with CL/P and the negative impact of this congenital anomaly on their personal and family life, places responsibility on health care professionals to provide a good level of care for all children with CL/P. The WHO (2002: 96-97) emphasises the importance of research and international collaborations between developed and developing countries to improve cleft care worldwide.

The sub-Saharan African region, including Mauritius, has a population of 130 million children younger than 6 years (Garcia, Pence & Evans, 2007: 11). It is estimated that many of these children have some form of disability with delays/disorders in communication that can seriously hamper their future development (WHO, 2001: 36; http://web.worldbank.org). A physical impairment such as cleft lip and/or palate may lead to disability in the absence of early intervention to prevent or minimize the negative impact of the cleft on the child and his/her family.

The quality of life of children with cleft is dependent on the availability and prioritization of health care resources (Wickenden in Mars et al., 2008: 146). In many developing countries, speech-language therapy and audiology services are either limited to meet the need of large populations or not available at all. Mauritius is a middle income group developing country (http://web.worldbank.org), with a high literacy level (86%) and free health care access. It should be possible to provide better cleft care than the existing services, despite the scarcity of speech-language therapists and audiologists. The existing framework of free access to health and education services can be expanded to offer improved, team coordinated and comprehensive cleft care. However, improving cleft care in Mauritius requires health care professionals to review the existing health care systems to identify gaps or limitations in current cleft care. This should guide and influence policy makers' decisions regarding prioritizing of health services for cleft care.

In contrast to developing countries, developed countries have implemented principles of cleft care based on extensive research evidence. It is well established that comprehensive and interdisciplinary treatment by experienced health care professionals is the key to high quality care of individuals with cleft lip and/or palate (ACPA, 2007: 5; Bzoch, 2004: 52; Mars et al., 2008: 15). However, 'importing' policies on cleft care from developed to developing countries without adaptation to local context of Mauritius may not deliver desired results. The experiences of International Outreach Missions from developed to developing countries support the view that establishing a good cleft care in a developing country requires continuous and sustained levels of attention (Mars et al., 2008: 13). In a developing country, the goal of cleft care should be to

build infrastructure, train personnel and develop a self-supporting and sustainable system of cleft care (D'Antonio & Nagarajan, 2003: 308; Mars et al., 2008: 9).

Improving cleft care may appear straightforward, as cleft anomaly can be corrected surgically. However, surgical repair of the anatomical anomaly alone cannot alleviate the impact of the cleft on the child and his/her family. The affected child may have persistent communication problems despite surgical correction (Reeve, Groce, Persing & Magge, 2004: 170). There may be persistent hearing concerns as well. It is therefore of paramount importance that communication and audiological interventions should fit in with the existing cleft care services to support the child with CL/P and his/her family to adapt to the long-term issues (Sell, 2007: 17). Families in developing countries often have limited knowledge of treatment (for example, the need for early surgical intervention and a multidisciplinary approach to treatment), the pathway of care, including the consequences of clefting conditions (Prathanee et al., 2006: 502).

This study on cleft care in Mauritius, found that existing facilities (the free access to health care, the availability of plastic surgical treatment and the presence of speech-language therapy and audiology services within the public health system) could facilitate the improvement of cleft care. However, prior to the research project, the speech-language therapists and audiologists working in public health sector of Mauritius did not have access to contextually appropriate communication assessment tools for any communication disorders. Moreover, uniform and consistent services could not be provided to young children with CL/P and their families due to the lack of an interdisciplinary approach to assessments in Mauritius.

Figure 6.1 is an overview of discussion of main themes of the concluding chapter.

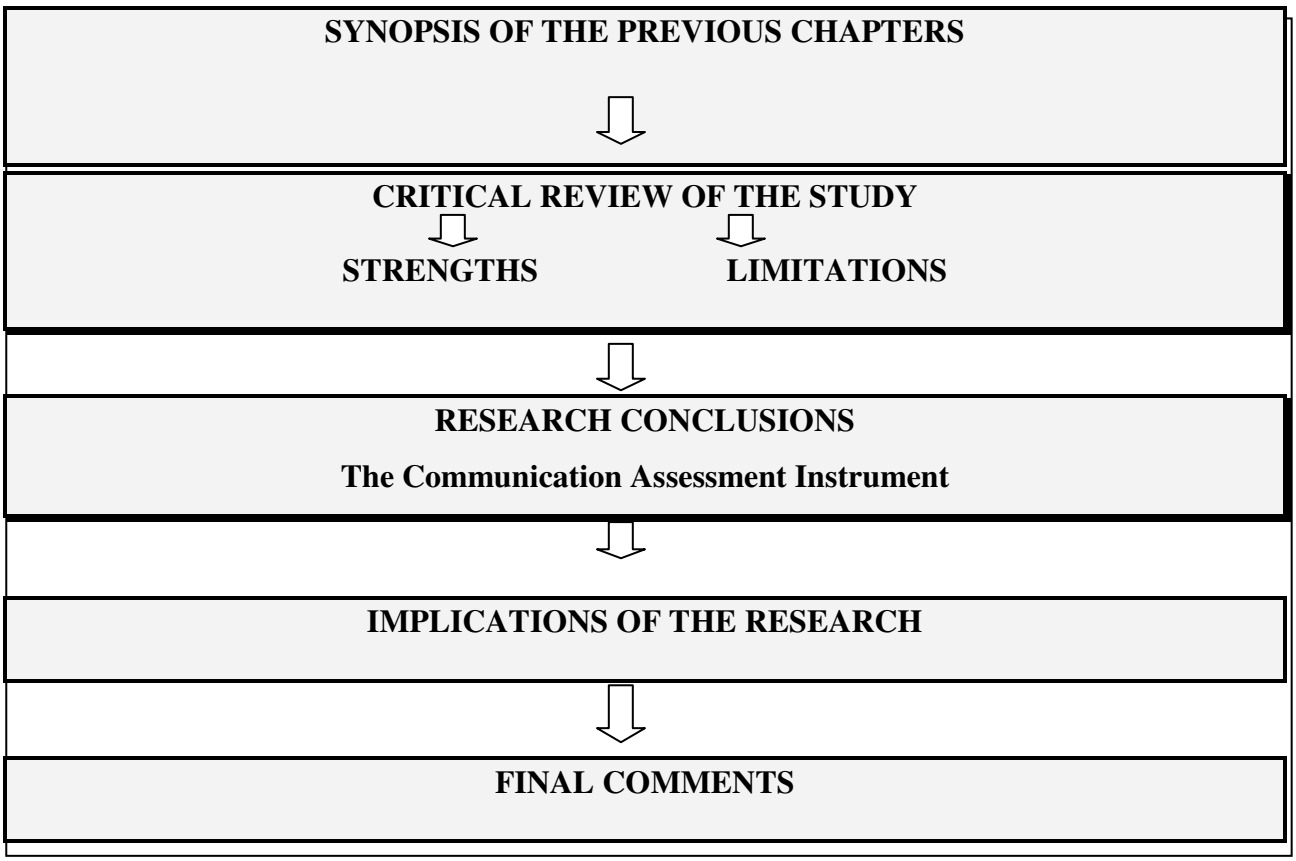

FIGURE 6.1 Presentation of the main themes discussed in Chapter Six

6.2 SYNOPSIS OF THE PREVIOUS CHAPTERS

The first chapter presented an overview of recommended best practice for young children with CL/P in developed countries. The continuum of cleft care from developing to developed countries was also described and the barriers to the provision of an optimal standard for cleft care in developing countries were identified. Mauritius was introduced as the context within which the research would be conducted. An urgent clinical need for the development of an appropriate

assessment instrument and the uniform documentation of the assessment information of children with CL/P was identified as the impetus to address the barriers to improving cleft care in Mauritius.

In Chapter Two, a critical review of the literature on the impact of a cleft on the child with CL/P and his/her family was presented. Research from developed countries on cleft conditions was discussed and provided evidence for the importance of continued and sustained cleft care by an interdisciplinary team of professionals from birth, and at every stage of early communication development of the young child with CL/P. The best practice recommendations for cleft care from developed countries were analysed to identify strategies which could be applied to improve the standards of cleft care in developing countries. A strategy to provide holistic and effective cleft care by speech-language therapists and audiologists by having access to a contextually appropriate assessment instrument for early intervention to young children with CL/P was proposed.

The third chapter focused on the importance of early intervention and the thorough assessment of speech, language and hearing of young children with CL/P to ensure a quality treatment plan. The uniform standard documentation and electronic storage of assessment results was identified as a key strategy to monitor programme effectiveness, measure treatment outcomes and improve quality of cleft care. Access to a linguistically appropriate assessment instrument is a major challenge to speech-language therapists and audiologists working in Mauritius and other developing countries. The framework for a communication assessment protocol (refer to Table 4.8) for young children with CL/P was conceptualized. This was based on an in-depth literature

review and related to the needs of developing countries with limited numbers of speech-language therapists and audiologists. Access to such a generic, comprehensive communication assessment instrument positions speech-language therapists and audiologists strategically to improve cleft care services especially in developing countries where team-based cleft care is not readily available.

Chapter Four provided a detailed description of the methodology used to compile a comprehensive communication assessment instrument and database for young children with CL/P in Mauritius and to test its clinical applicability and acceptability. The research questions that emerged from the clinical experiences of the researcher guided the research design, selection of participants, materials and apparatus as well as the procedures for data collection and analyses.

The participatory action research with a mixed methods research approach was effective in providing descriptive characteristics of the participants and formed the underpinnings of the development of a new assessment instrument with linguistic relevance in Mauritius. A checklist format of the assessment tracking form was created. The speech elicitation materials were prepared in the local languages (Creole, French and English), a pilot study performed, speech-language therapists and audiologists trained in conducting the assessments, and digital audio and video recordings of the speech samples were obtained. This allowed data collection to be uniform in the young children with CL/P selected by the speech-language therapists and audiologists.

The fifth chapter presented the results and interpretation of the empirical research findings. It was possible to provide a clear and detailed description of the characteristics of young children with CL/P and their families based on the data analysis of the sample population. The clinical applicability of the newly developed Communication Assessment Protocol was evaluated by all four participants (speech-language therapists and audiologists working in the public health sector). The 'end users' of the protocol gained hands-on experience in the assessment procedures. The acceptability of the protocol was analysed based on information gained from the focus group discussion by the participating speech-language therapists and audiologists. The implementation of the protocol in a clinical setting of the existing public health care system in Mauritius showed that it is a simple to use assessment tool, has local relevance and envisages ECI for children with CL/P.

6.3 CRITICAL REVIEW OF THE STUDY

A critical review of the study allows reflection on the extent to which the aims of the research were achieved, limitations of the study and how the research design could have been improved for future studies.

6.3.1 Strengths of the study

This was the first study conducted in Mauritius to develop a communication assessment instrument for use by local speech-language therapists and audiologists to improve clinical practice for young children with CL/P. The following strengths were identified:

- Rigorous methodology

A rich data-set was gathered by using the mixed methods approach (Cresswell, 2003: 15) including the participation of speech-language therapists and audiologists who had rapport with the participants (children with CL/P and their families). The trustworthiness of the data gathered (De Vos et al., 2005: 161; Leedy & Ormrod, 2005: 93) was ensured as data collected from the hospital records were complemented by information gained from interviews with parents of the children with CL/P. The research involved all the speech-language therapists in the public health sector as providing a uniform service of agreed upon standard at a national level is important to improve cleft care. Families of the children selected as participants were also included in the assessment procedure to facilitate ECI, by establishing partnerships between speech-language therapists and audiologists, and parents of young children with CL/P.

A description of family characteristics and parental perceptions of feeding, hearing and speech problems in their children with CL/P in Mauritius was documented in a uniform manner. The description served as a framework of essential components to design the database. A varying method of collecting functional data allowed both quantitative and qualitative data analyses which provided a broad description of the characteristics of these children, as well as of the health and cleft care in Mauritius. The use of mixed methodology also allowed the combination of empirical and descriptive precisions in a single study (Johnson & Onwuegbuzie, 2004: 15) thus providing greater insight into a social reality, which allowed for a more comprehensive study (De Vos et al., 2005: 364).

- **Holistic approach to communication assessment**

The Communication Assessment Protocol was designed to encourage comprehensive assessments of the children with CL/P as the cleft condition has a pervasive impact on the feeding, hearing, communication development and speech production of the developing child. The approach to assessment was holistic as it included thorough family and background information of the child being assessed. The Communication Assessment Protocol was comprehensive as it covered many areas of functioning, namely: feeding, hearing, and general development in addition to the speech and language assessments. Furthermore, attention was paid to elements of school readiness of young children with CL/P by including assessments of listening skills and emergent literacy skills. Such a holistic and comprehensive approach to assessment is particularly beneficial in a developing country where the interdisciplinary team approach is inadequate. The speech-language therapist and audiologist often work in isolation and has to play a proactive role in referring the cases requiring assessment by other professionals (for example dental/ENT specialists). The development of the Communication Assessment Protocol also built on the fact that in Mauritius, the audiology and speech therapy services are combined. This allowed for diagnostic hearing evaluations to be part of the protocol.

- **A user friendly Communication Assessment Protocol that was acceptable to the speech-language therapists and audiologists**

The Communication Assessment Protocol was compiled from selected assessment components to suit the local needs, thus reflecting best practice in assessment (ACPA, 2007: 6). The theoretical framework and use of existing protocols and tools to guide the process ensured that the Communication Assessment Protocol reflects current trends in assessments of young children

with CL/P. Moreover, it was compiled from assessments that are used in clinical practice in established centres for the care of young children with CL/P. For example, Section E of the protocol (refer to Appendix VI) was compiled from the Communication Assessment Protocol, Facial Cleft Deformities Clinic, Department of Oro-Maxillo-Facial Surgery, University of Pretoria; and the speech assessment was compiled from the GOS.SP.ASS 98 which is a comprehensive practical tool for clinical and research purposes in the UK (Sell et al., 1999: 26).

The tracking form followed a checklist format (Shipley & McAfee, 2004: 233). Such a format allows all necessary information to be gathered and recorded in a uniform assessment procedure and to facilitate the evaluation and quantification of complex communication behaviours (Leedy & Ormrod, 2005: 185). With the Communication Assessment Protocol, the child's development can be tracked on the same instrument from birth to age 6 years and it covers the most critical period for children with this congenital anomaly.

Furthermore, the complex task of assessment of young children with CL/P by speech-language therapists and audiologists who are inexperienced in cleft care was facilitated and guided by the use of a checklist format of the communication assessment instrument. This addressed one of the main challenges that speech-language therapists and audiologists face in developing countries, namely the lack of specialist knowledge and training in assessment and treatment of children with craniofacial anomalies. Although the speech-language therapists and audiologists may have been inexperienced at the outset of the research, they received training by the principal researcher in conducting assessments of young children with CL/P according to the Communication Assessment Protocol. Moreover, their participation in implementation of the

protocol ensured that they gained experience in the assessment of young children with CL/P and their families.

The speech-language therapists and audiologists were successful in identifying the children with feeding, hearing and communication delays/disorders and children who required in-depth language assessments. A standard speech-sampling protocol is now available for use in Mauritius, in Creole, French and English, to capture cleft type speech errors and to facilitate inter-centre comparisons from an adequate speech sample. The Communication Assessment Protocol may also be used for early communication assessments of young children with risks other than craniofacial disorders. The versatility of the Communication Assessment Protocol was identified by the participants during the focus group discussion.

The reliability of the material for perceptual speech analysis was also established. This was an important step given that instruments for assessment of velopharyngeal functions, such as videofluoroscopy, are not currently available in Mauritius to complement the information derived form auditory-perceptual speech assessments.

- **Contextual sensitivity**

The Communication Assessment Protocol was compiled specifically for the Mauritian context making it culturally and linguistically relevant. The speech materials in Creole and French allowed speech production assessment in the two most commonly spoken languages by the sample population. Added value to the protocol was achieved by reviewing its implementation for the purposes of communication assessment of children with CL/P in the local context, and by

determining its' acceptability by the speech-language therapists and audiologists. The Communication Assessment Protocol was developed for use in a clinical setting and the ecological validity (Morgan et al., 2006: 135) of the assessment procedures was ensured by conducting the assessments in a realistic setting (the hospital context). A fair chance to participate was given to all children with CL/P from the central plastic surgery service within the public health sector of Mauritius.

6.3.2 Limitations of the study

While interpreting the clinical implications of the research findings, account has to be taken of some of the limitations of the present study

- **The Communication Assessment Instrument**

The Communication Assessment Instrument was not suitable for in-depth communication assessments of young children with CL/P as it is a comprehensive screening tool that provides a broad overview of the child with CL/P. For example, if a child was identified with a language delay, further in-depth assessments of semantics, syntax and socio-communicative aspects will be required (Peterson-Falzone et al., 2010: 280; Shprintzen & Bardach, 1995: 169). In this study, priority was given to the development of an assessment protocol for a specific clinical situation, where time constraints do not permit lengthy and exhaustive assessments.

The cross-sectional design did not allow for recording a complete chronology of the children's development. In clinical practice serial assessments are required (ACPA, 2007: 13) to provide

continuity of care and identification of new concerns on a timely basis. A longitudinal research design (Leedy & Ormrod, 2005: 183) in which serial assessments were conducted during follow up visits would have allowed the researcher to describe developmental trends based on assessments at the various stages of development of a child with CL/P from birth to age 6 years. However, the cross-sectional research design is a starting point in a context where no structured and consistent approach to assessment of communication disorders existed before.

- **Research limited to public health sector of Mauritius**

The implementation of the Communication Assessment Protocol was limited to the children with CL/P treated within the public health sector of Mauritius. Neither the children with CL/P who are treated in the private sector nor those who seek help outside the country were included in the study as the research targeted the public health context. Some Mauritian families choose to seek treatment for their children with CL/P in the private health sector and even abroad. In the local context the private sector does not offer a team approach. The children, who are treated abroad, in well established cleft care centres, probably benefit from the team approach offered there. Therefore, the results of this study may not be reflective of the children with CL/P who are treated in the private sector of Mauritius.

Moreover, the number of speech-language therapists and audiologists as participants in the research were limited to four including the principal researcher. However, this is the total number of speech-language therapists and audiologists employed in the public health sector and they all participated in the study. There are six more speech-language therapists and audiologists in Mauritius in the private sector. As the aim of this study was to establish a uniform service in

the public sector, the therapists in the private sector were not included as participants. In the future the Communication Assessment Protocol will be made available to them as a clinical tool. Nevertheless, this study helped to introduce uniform and standard documentation of the communication assessments of young children with CL/P in the public health sector.

- **Researcher bias**

Measures were taken to avoid any form of researcher bias, such as using a self-administered anonymous questionnaire. But as the number of therapists was small (only three besides the principal researcher), anonymity could not be guaranteed. The qualitative part of the study was a focus group discussion in the presence of a facilitator to determine the acceptability of the protocol. Again the speech-language therapists and audiologists may have responded positively (positive bias) to appear in agreement with the protocol for any one or more of the following reasons:

- They were relatively inexperienced in cleft care,
- They were in the presence of the principal investigator who is also their Chief in the established hierarchy of the public health sector in Mauritius

The probable presence of bias in this type of research is acknowledged (Leedy & Ormrod, 2005: 210). The principal researcher was aware of 'researcher bias' and took care not to influence the speech-language therapists and audiologists in any way. Including speech-language therapists from the private sector in future may minimize the positive bias identified in this study.

- **Descriptive nature of the study**

The nature of this study was descriptive (Tetnowski & Franklin, 2003: 156) in order to initiate a clinically and locally applicable communication assessment protocol. To assess the accuracy of a new test, results obtained from the new instrument had to be compared with some other established test(s) viewed as the 'gold standard' in yielding valid results (Maxwell & Satake, 2006: 233). The accuracy of the new Communication Assessment Protocol could not be fully determined as no such assessment protocol existed before to compare assessments of children with CL/P using Communication Assessment Protocol.

Although intervention studies (Kirschner et al., 2000: 2127-2132; Ysunza et al., 2004: 1500) have shown that early surgical intervention improves speech outcome, to the knowledge of the researcher, there are no analytical or interventional studies to show if an intervention such as using a structured and uniform protocol has impact on the outcome for young children with CL/P. The results of the present cross-sectional study may be used to instigate a future interventional study.

The limitations of this research are important to note for clinical implementation of the Communication Assessment Protocol as well as for future research on the communication abilities of young children with CL/P in Mauritius. There is scope for further research to refine and improve the Communication Assessment Protocol.

6.4 CONCLUSIONS

The main aim of the empirical research was achieved with the development of a generic Communication Assessment Protocol for a heterogeneous group of French and Creole speaking children with CL/P (including children with syndromes and sequences) during the crucial early years of their development. It was an innovative response to the need for developing an appropriate assessment instrument that was both locally applicable and acceptable and incorporated the recommendations for best practice in cleft care. The following conclusions were reached based on the empirical research:

Sub-aim One: Description of the characteristics of children with CL/P in Mauritius

Important demographic and clinical characteristics emerged from the descriptions of participants in Phase One of the study. This helped the creation of a database for the registration of cases with craniofacial disorders. The implementation of the Communication Assessment Protocol in a clinical setting of the existing public health care system and the analyses of results showed that favourable conditions exist in Mauritius for early identification of children with communication delays and disorders. Speech-language therapists and audiologists with the participation of parents of the children with CL/P were successful in identifying specific aspects of communication skills development from the neonatal and infancy stages. Furthermore, the principles of assessment from ECI literature (ASHA, 2008: 4; Bagnato et al., 1997: 35; Billeaud, 2003: 142; Rossetti, 2001: 102) and recommendations for assessment of young children with CL/P (ACPA, 2007) were integrated in this holistic assessment protocol.

Sub-aim Two: Compilation and application of the Communication Assessment Protocol for clinical use in Mauritius

The Communication Assessment Protocol followed international guidelines and recommendations for development of a standardised early communication and speech assessments (for example, CHRIB from the University of Pretoria and GOS.SP.ASS from the UK). It was successful in fulfilling its purpose, in Mauritius, to assess children with CL/P and identify those exhibiting communication delays/disorders. Moreover, results of these assessments allowed speech-language therapists to refer children to the various professionals who have specific roles in cleft care. For example, children identified with hearing loss were referred to the ENT specialists for management. As speech-language therapists and audiologists in Mauritius work in the absence of an established interdisciplinary team approach, the Communication Assessment Protocol helped them to face the challenge of conducting assessments in young children with CL/P.

The methodology adopted to test the applicability of this protocol involved the training of the speech-language therapists and audiologists in Mauritius, in the assessment procedures that contributed to consistency and uniformity in assessment procedures. Through participation in each of the three phases of the empirical research a sense of ownership of the assessment protocol was established. This was in line with international recommendations for local capacity building in developing countries (Mars et al., 2008: xi) and for developing contextually, linguistically appropriate protocols (ACPA, 2007: 6).

The Communication Assessment Protocol has immediate value as its implementation was tested and was given positive feedback from the participating speech-language therapists and audiologists from the public health sector of Mauritius, regarding its usefulness as an applicable assessment instrument.

Sub-aim Three: Determining the acceptability of the Communication Assessment Protocol

The Communication Assessment Protocol addressed the identified need to conduct holistic assessments of communication skills from infancy through to preschool age children with CL/P. The communication assessment procedures using the protocol were successfully implemented by the speech-language therapists and audiologists in a clinical situation in the hospital using existing facilities.

In a busy clinical situation, the time taken for assessment is a significant factor in considering the applicability of the tool. The speech-language therapists and audiologists could conduct communication assessments of the young children with CL/P, by using the protocol, within what the participants felt was a reasonable time (40-60 minutes) which added to the acceptability of the protocol for clinical use.

The results obtained from the questionnaire and the focus group session established that the speech-language therapists and audiologists perceived the Communication Assessment Protocol as being practical and acceptable.

Another important aspect of this research study was that an attempt was made to develop a protocol and database within Mauritius itself as opposed to importing or borrowing one from a developed country or relying on an international outreach mission to develop local services. Local speech-language therapists and audiologists developed a communication assessment protocol and stimulus material in three languages to serve the Mauritian population of children with CL/P. The methodology clearly described the process. It may be used by professionals in other developing and developed contexts with adaptations (for example, compiling speech elicitation materials in local language/s) to implement an appropriate Communication Assessment Protocol (refer to Appendix VI).

6.5 IMPLICATIONS OF THE RESEARCH

Research in developing countries should have immediate added value for clinical practice as the resources are limited (Walley et al., 2007: 424). The focus of the empirical research was therefore to contribute to the improvement of cleft care in Mauritius, by addressing the barrier to early communication intervention and the lack of an appropriate communication assessment instrument and a database. Important theoretical and clinical implications that were deduced from the results of the empirical research and recommendations are presented forthwith.

- National register

The present study resulted in the creation of an electronic database for young children with CL/P which in future will serve as a national database of persons with craniofacial anomalies. All children with CL/P should be included in the national register, irrespective of whether they are treated in the public or private health sectors. However, in order to include children being

treated in the private sector participation through legislation (Hammond & Stassen, 1999: 155) or close collaborations between the private and public health sector in Mauritius will be required to register all children born with craniofacial anomalies in the national register. The registry will facilitate the ascertainment of cases with oral clefts to establish health care needs and plan improvement in services. It can also be used to track individual child progress in the system: - vital information that was previously not available in Mauritius. Policy/decision makers within the Government of Mauritius can use the comprehensive information system developed to access information and plan strategies and resources that will be required to improve cleft care in future. The background information that has been documented in a uniform format can form the basis for future epidemiological research.

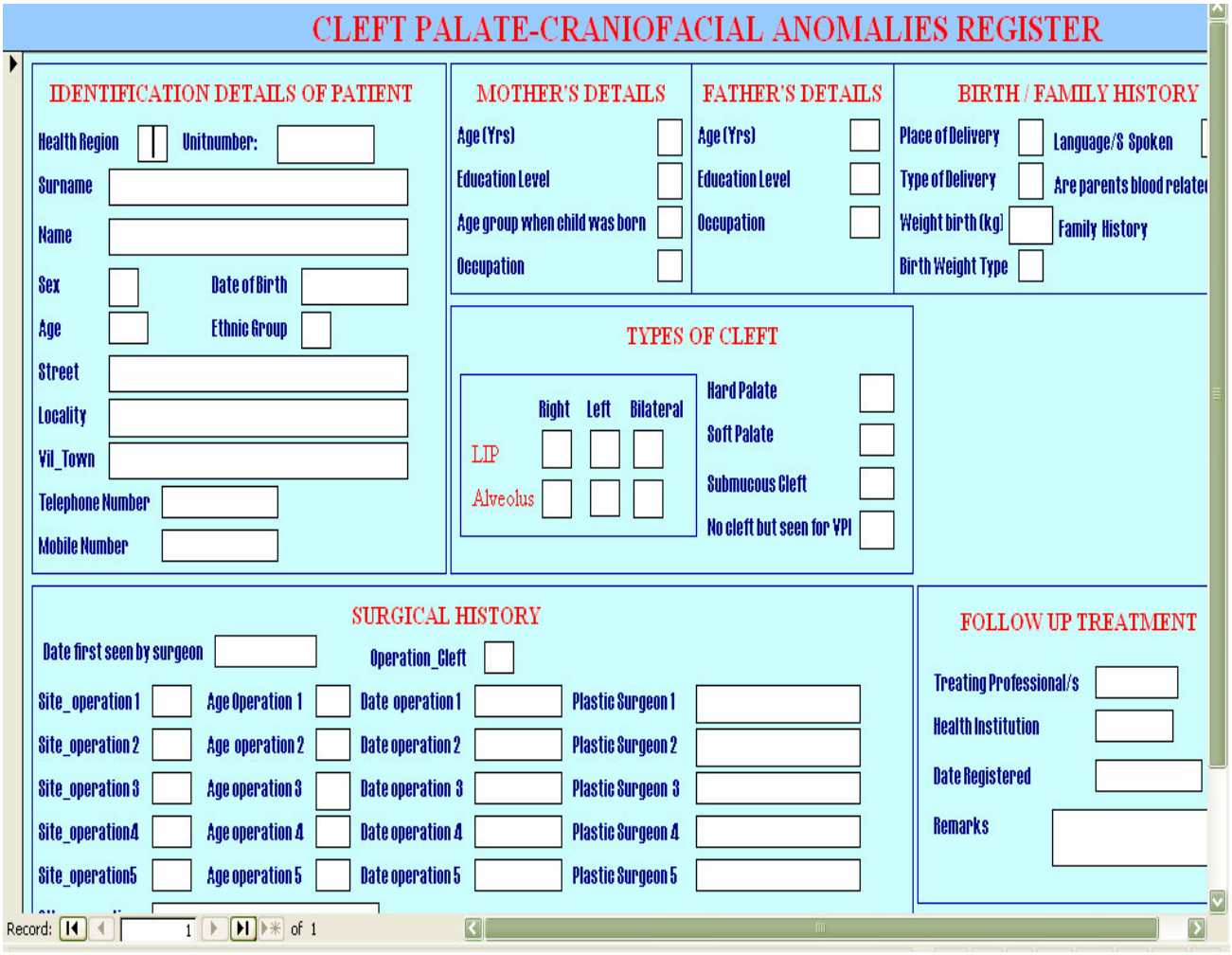

FIGURE 6.2 Sample page from the proposed national register for cleft palate-craniofacial anomalies in Mauritius

The setting up of a national registry is also in line with the WHO (2001b: ix) recommendation for a global registry to facilitate international collaborative research in the field of craniofacial anomalies. The maintenance of records and a database of individuals with CL/P at a national level is an important objective of this study.

- Longitudinal communication assessment: an outline for clinical practice. In the current study, the Communication Assessment Protocol was applied for the assessment of the children with CL/P in two age groups namely younger than 36 months and 36-78 months age groups, in a

cross sectional sample. However, it should be possible to use the Communication Assessment Protocol for the longitudinal assessment and monitoring of the child with CL/P in clinical practice as outlined in Figure 6.3.

The guidelines recommended by the ACPA (2007) for a longitudinal communication assessment plan can be followed in Mauritius. The results of the empirical research indicated that four stages for serial communication assessments could be implemented in Mauritius namely: infancy (younger than 18 months), toddlerhood (~18-36 months), pre-primary school entry level (~36 months) and primary school entry level (~72 months) (refer to Figure 6.3). The Communication Assessment Protocol was developed to conduct such serial assessments. Serial assessments of children have several advantages such as measuring developmental patterns, rates of development and change (Rossetti, 2001: 104). Moreover, serial assessments serve the important purpose of measuring treatment outcomes.

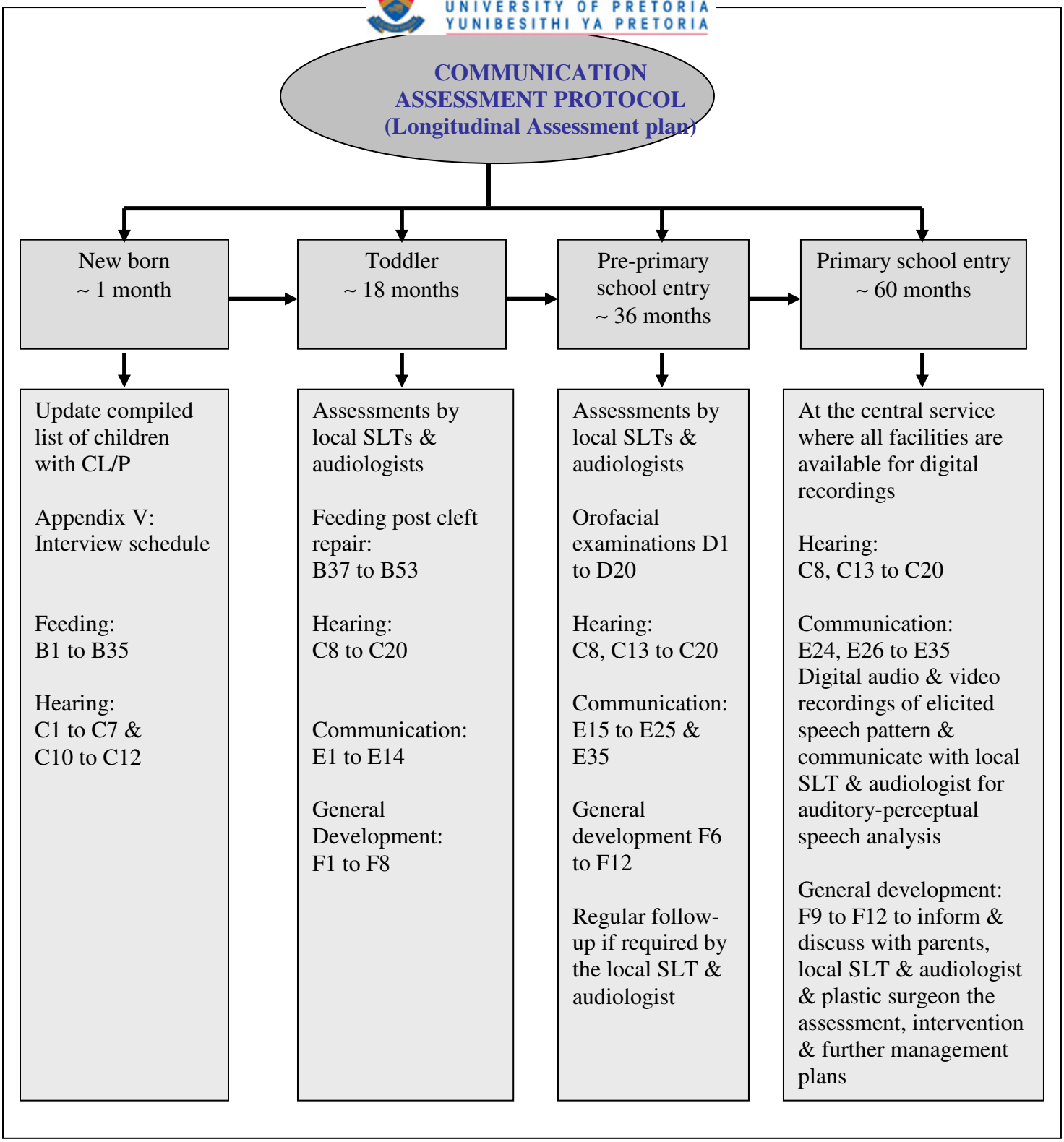

FIGURE 6.3 A plan for longitudinal communication assessments

Legend: For test items refer to Appendix VI; SLT- Speech-language therapist

- Speech elicitation material

In response to the international call for standardised speech elicitation materials (Eurocran speech project, 2000; Henningsson et al., 2008: 4; Hutters & Henningsson, 2004: 456) the speech materials were compiled in three languages namely Creole, French and English so as to be relevant to the Mauritian context. The speech elicitation materials were applicable to the small multilingual community in Mauritius to improve assessments and subsequently improve the quality of care to young children with CL/P. The speech elicitation materials will allow for future participation in outcome studies and international collaborative research. Prior to this research no speech elicitation materials in Creole or French were available in Mauritius, that could be uniformly used by all speech language therapists in the public health sector and resulted in an inconsistent and non-comparable approach to assessments and treatment programmes. A need was identified for normative studies in Mauritius and compiling speech material for use with children with other communication disorders.

- **Team care**

The speech-language therapists and audiologists can play a pivotal role in steering cleft care in Mauritius, towards an interdisciplinary team-based approach. The Communication Assessment Protocol allows the speech-language therapists and audiologists to identify the contributing etiological factors to communication delays/disorders and alert health care professionals of areas of concern in the child with CL/P. The protocol requires input from parents of the children with CL/P and parental involvement can be utilised to increase awareness of ECI and encourage their participation (Rossetti, 2001: 94; Scherer et al., 2008: 27). The clinical implications of team cleft care in the context of Mauritius are conceptualised in Figure 6.4.

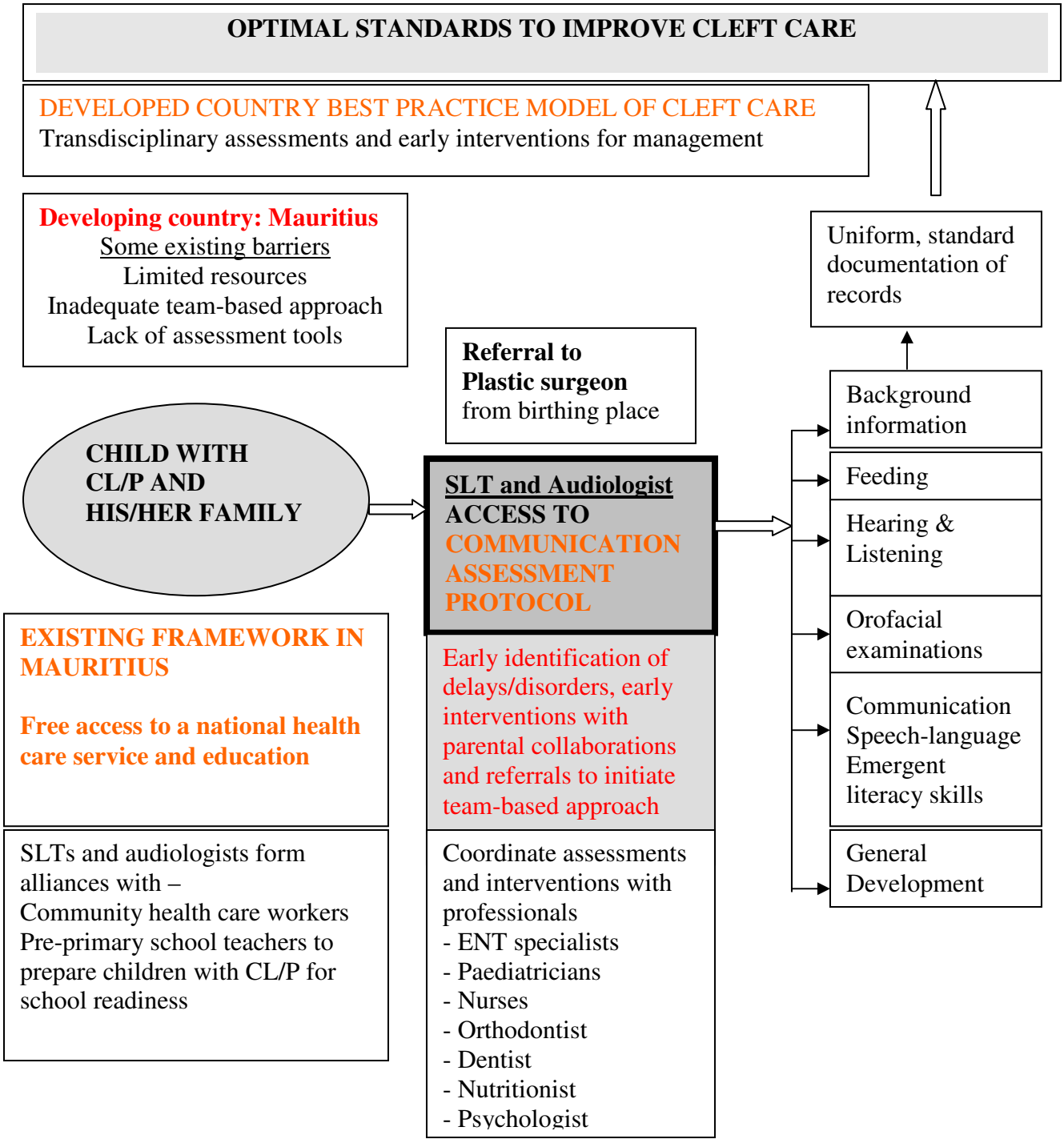

FIGURE 6.4 Clinical implications of the Communication Assessment Protocol

In accordance with practice guidelines for cleft care that recommend an interdisciplinary coordinated team approach to cleft care (ACPA, 2007:7-8; WHO, 2002:142) the Communication

Assessment Protocol fills an urgent need to initiate an interdisciplinary team approach in Mauritius (refer to Figure 6.4). The health care professionals need to liaise, collaborate and coordinate assessments and interventions to meet the optimum standards in cleft care. A holistic view of a child's communication skills can be obtained given the all inclusive, multifaceted nature of the Communication Assessment Protocol. Moreover, such a planned and consistent approach to assessment is necessary and of immediate value in the Mauritian context.

Cleft care in Mauritius can also be expanded by actively involving other available resources, for example community health workers and teachers, to help speech-language therapist deliver cleft care services at community level. In Sri-Lanka, training of community health workers and utilization of their services was developed into a successful service delivery model for individuals with CL/P (Wirt et al., 1990: 172), India (D'Antonio & Nagarajan 2003: 309) as well as in Thailand (Prathanee et al., 2006: 505). The government of Mauritius collaborated with the WHO (1990) to initiate a formal training programme for community health workers. Currently 236 such workers operate within the community to provide home visits for surveys, identification and interventions to persons with disabilities (http://www.afro.who.int/hrh-observatory/country_information/Mauritius.pdf). Speech-language therapists and audiologists can further contribute to training community health workers in the early identification and intervention of communication and hearing disorders in young children with CL/P and their families. Thus, families of young children with CL/P can benefit from services provided by these trained community health workers.

In Mauritius, there has been free access to primary and secondary education since 1977 and since 2005 the Education Act rendered education compulsory until the age of 16 years (Garcia, Pence

& Evans, 2007: 250). The enrolment ratio of pre-primary school in Mauritius is 100% (Garcia et al. 2007: 24). This creates opportunities for speech-language therapists to form new collaborative relationships with teachers as the educational system is an appropriate setting for a collaborative approach to the promotion of language, speech and literacy development and intervention for those children who exhibit delays and disorders.

- **Application of the Communication Assessment Protocol in other contexts**

The participatory action research was conducted in Mauritius and the applicability and acceptability of the Communication Assessment Protocol (refer to Appendix VI) was confirmed. Although the results cannot be generalized to other contexts, the protocol has potential for use along the continuum of developing to developed countries. In contexts similar to Mauritius (middle income economies for example Namibia), where speech-language therapists and audiologists are available, the Communication Assessment Protocol, is a valuable and organised checklist (refer to Appendix VI) approach to assessment. Important information regarding the key areas (feeding, hearing, communication, general development) can be obtained reliably and such information can then form the basis of intervention to help improve care provided to children with CL/P and referrals can be made to other professionals as well. Thus, even speech-language therapists and audiologists who work in schools or in the community and are required to provide therapy for children with CL/P, can access a comprehensive communication assessment protocol. Moreover, the protocol uses parental reports concerning their child's communication that may be useful in alerting them to strengths and weaknesses in their child's communication skills and speech pattern. The high literacy levels of parents in contexts similar to Mauritius, implies that such parents can participate in developing communication skills of

children with CL/P. Speech-language therapists and audiologists may adapt the Communication Assessment Protocol to suit their local needs. The steps followed in developing the speech elicitation materials in Creole and French in this study may be used as a guide to prepare speech elicitation materials for assessment in local language/s.

The Communication Assessment Protocol also has potential for use in contexts where speech-language therapists and audiologists are not available. As suggested by D'Antonio and Nagarajan (2003: 308) existing resource persons may be trained to perform some functions of the speech-language therapists and audiologists in cleft care. The Communication Assessment Protocol has certain sections that could be applied in such circumstances. For example, in resource poor countries where the mortality of children is high due to feeding issues particularly for infants with cleft palate (Amstalden-Mendes, Magna & Lopez, 2006: 332; Mars et al., 2008: 127) the Feeding section (refer to section B, Appendix VI) of the protocol may be used by nursing personnel. Assessment of feeding methods and observations on growth may be helpful in guiding parents regarding some of the cleft palate related feeding issues. Formal training of local resource persons for example teachers and, community health workers, by speech-language therapists and audiologists from cleft teams in developed countries would enable them to perform the speech assessment section as well as basic treatment of cleft palate related speech disorders (D'Antonio, 2002: 34; Sell, 2007: 17).

Thus, the initiation of a team-based approach and expansion through collaboration with available local resources is important for the provision of quality care to young children with CL/P. The envisaged holistic approach whereby the social, medical, psychosocial and pedagogical needs of

young children with CL/P and their families are met is likely to improve and sustain cleft care in Mauritius. Generalizing the results of the Communication Assessment Protocol in developed and developing contexts is also possible with appropriate adaptations of the protocol and training of locally available resources.

6.6 RECOMMENDATIONS FOR FUTURE RESEARCH

Research is a helical process that begins with a problem but the resolution of the problem opens up new problems to be addressed (Leedy & Ormrod, 2005: 7). Despite limited resources there is a significant need and great scope for further research on CL/P in developing countries. The current research has led to the identification of several issues which warrant future research in Mauritius.

- Epidemiological research on Craniofacial Anomalies in Mauritius

The compiled database (national register and assessments) may be used for research on the epidemiology and prevalence of craniofacial anomalies in Mauritius. Epidemiological research is possible through regional and international collaborative research, and setting up a website for the registry (Shaw, 2004: 239). The database is an exciting response to the WHO (2001b: ix) recommendation for a global registry and database recording of craniofacial anomalies to improve the current level of knowledge available on birth prevalence of craniofacial anomalies and their associated international, geographical, ethnic and cultural variations. An epidemiological study would ensure that information is readily accessible for taking preventive measures, planning and allocating appropriate resources to improve cleft care. A major issue in

the descriptive epidemiology of craniofacial anomalies is the identification of ascertainment sources (Wyszynski, 2002: 128). In Mauritius, as 99% of births take place under skilled medical care and the average number of annual births is only between 18000 to 20000 (Central Statistics Office, 2006), conducting epidemiological research on craniofacial anomalies is a feasible research recommendation and would allow Mauritius to participate in the WHO (2002: 41) initiative to improve cleft care globally.

- Evaluation research to determine the effectiveness of the Communication Assessment Protocol for serial assessments

The effectiveness of the Communication Assessment Protocol needs to be verified with a longitudinal/cohort type of research design (Leedy & Ormrod, 2005: 108; Neuman, 2000: 30) for serial assessments. This cross-sectional research study established baseline data per participant that can be utilised to conduct serial assessments on the group of subjects over a period of time. Such a longitudinal study could track the developmental changes of the child with CL/P. A cohort/prospective study (Maxwell & Satake, 2006: 214) over a predetermined time frame can be conducted to determine the effectiveness of implementing the Communication Assessment Protocol on young children with CL/P in Mauritius. Information on a child's development over time could also provide data for treatment/therapy outcome measures that are necessary for evidence based clinical practice (Johnson, 2006: 30).

- Intervention research to initiate the establishment of an interdisciplinary team approach to assessments and interventions of young children with CL/P

Research on the perspectives of other professionals (for example ENT specialists, paediatricians, nurses, teachers) regarding the implementation of the Communication Assessment Protocol also needs to be conducted. The perspectives of all professionals in cleft care is required to ascertain the value of the Communication Assessment Protocol as a resource for describing the children with CL/P and to support the establishment of an interdisciplinary team-based approach to cleft care. The outcomes of the assessment results and the follow-up process need to be evaluated to provide the evidence for such structured assessments. This may be possible by conducting intervention research (Mouton, 2000: 160) using sequential mixed methodology approach. Firstly a descriptive, quantitative, survey research project (Leedy & Ormrod, 2005: 183) is recommended to determine whether the professionals received referrals of children with CL/P following the assessments conducted by the speech-language therapists and audiologists and whether they found the referrals to be appropriate. The latter will require a qualitative research project, focus group discussions (Bloor et al., 2001: 18) aimed at eliciting the perspectives of the concerned professionals in cleft care in Mauritius. Such perspectives are important to facilitate communication among the professionals to offer a coordinated team-based approach to assessments and interventions for young children with CL/P. Next, the opinions and recommendations of important stakeholders (for example parents, health care professionals and teachers) could be sought regarding coordinating cleft care for effective assessments and interventions. De Vos et al. (2005: 394) describe such research as intervention research whereby, repeated 'tinkering' with the intervention helps to ensure that it will produce intended effects.

The aim of this research study to develop a Communication Assessment Protocol and determine its applicability from the perspectives of the speech-language therapists and audiologists in

Mauritius was achieved. Further research to verify its effectiveness for the full range of intended stakeholders (children with CL/P and their families, other health care professionals involved in cleft care) is deemed to be necessary.

The current research that was initiated and conducted in Mauritius took into account international trends and best practice and adapted these to the local context. It also serves as a catalyst for future research efforts in the field of cleft care in Mauritius.

6.7 FINAL COMMENTS

'Knowing is not enough; we must apply. Willing is not enough; we must do'

Johann Wolfgang von Goethe (1749-1832).

This research has established that it is possible for speech-language therapists and audiologists in developing contexts to develop clinical tools for use in their country, in languages which are both applicable and acceptable to the populations they serve. The application of this comprehensive Communication Assessment Protocol and national registry for children with CL/P who are known to exhibit a myriad of communication problems contributes to the goal of making quality cleft care available to all children with CL/P in Mauritius. This research was facilitated by the support of two government institutions in Mauritius namely 'The Mauritius Research Council' and the 'Ministry of Health and Quality of Life'. This reflects the commitment of the government to support research to improve clinical practice. The results of this research may be used to guide future policy towards cleft care in Mauritius.