*International Journal of Health Sciences and Research*
*Vol.10; Issue: 3; March 2020*
*Website: www.ijhsr.org*
*Original Research Article* *ISSN: 2249-9571*

# Language Skills and Cognitive Linguistic Skills in Children with Repaired Cleft Palate

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## ABSTRACT

**Introduction:** Language and cognitive skills in children with Cleft lip and palate (CLP) are not routinely assessed considering the difficulties as articulatory in nature. The aim of the study was to identify cognitive linguistic and language skills in school-age children with early repaired CLP (RCLP) and the variables affecting the same. The objectives were to (1) Investigate the language skills, cognitive linguistic skills and to establish the relationship between the language and cognitive linguistic skills in this population.
**Method:** 17 non-syndromic children with RCLP in the age range of 5-6 years were selected. KLT and computerized CLAP-C were used to assess language and cognitive linguistic skills respectively. The interactions between the subtests were explored.
**Results & Discussion:** The results show that 88 %( 15) of the children with RCLP obtained age appropriate scores while 12 (2) failed to obtain age appropriate scores in KLT. 8% (2) of children in the group scored age appropriately in all domains for CLAP-C. Children performed poorly on CLAP-C compared to KLT. There was a significant correlation between the language skills and cognitive linguistic skill except in the domain memory. Language abilities did not favor memory task probably due to the demand for cognitive mediation required for the same. The difficulty in visual memory is delineated as probable reason for reading difficulties in these children.
**Conclusion:** Results cautions the professionals and parents to look beyond the timing of surgical correction and speech disorder to probe into the linguistic, higher language processing and academic skills of the children with cleft lip and palate.

***Key words:*** Language skills, cognitive linguistic skills, children, repaired cleft palate

## INTRODUCTION

The communication issues in children with cleft lip and palate (CLP) are often discussed with respect to the speech disorder associated with it. Several authors have also attempted to look into the language deficit in children with cleft lip and palate. Language skills especially the expressive language is documented well from early vocalization stages [(1-4)] which often established that these children exhibit delay in speech and language measures compared with the normal peers. Most of the studies have concluded that the children with CLP have less well-developed language skills, [(5)] global cognitive deficit [(6)] and learning deficits. [(7)] Literature also indicates that the deficit in the language disappears by 4-5years [(8)] while few others found that it may persist till 8 years of age. [(9)] There is also evidence in the literature of a subgroup of children with cleft having specific language impairment [(10)] and poor cognitive linguistic pre-skills for academic performance. [(11)]

Studies on language acquisition in children with CLP have always given conflicting findings. The impact of

unoperated (1) or operated cleft (2) on pre-linguistic vocalizations to the language characteristics in adults were addressed in the literature. These studies shows that the children with CLP have fewer consonant inventory preoperatively and even after early surgical correction. Studies on preschool and school going children with repaired cleft palate shows that early language delay persists in school age. There are also studies [(13)] which contradict these findings. Routine examination of language skills in children with cleft lip and palate is often done through screening tests. This gives a chance of missing out the language delays in these children which should be tapped through detailed evaluation. Recent studies have employed norm referenced tests as well as the comparisons with control group using standardized test to evaluate the language skills in these children. Hardin-Jones and Chapman [(5)] found that children with cleft or craniofacial anomalies score well within normal limits for language, though shows deficits when compared to a peer group. They reported that early deficits may no longer be noticed in the later years. Therefore it is very difficult to determine the characteristics of the typical development of language in children affected by cleft. Chapman [(14)] examined the relationship between speech, language and reading skills in 5-6-year-old children with repaired cleft lip and palate. Results from the language test showed a similar performance by cleft and non-cleft children in receptive and expressive language skills. Even children with poor reading skills performed age appropriately on the language test. They assumed that this subgroup of children may be at having a high risk for cognitive-linguistic deficits. Anaraki et al. [(15)] used the norm references Persian version of TOLD-P3 to assess the language abilities of children with CLP between 4-7years. The test assessed in detail the semantics, syntax, spoken language, listening, organizing and speaking abilities in these children. The scores obtained by children with CLP were significantly lower than the normative scores established for typically developing children. The probable reasons delineated were occurrence of recurrent otitis media, mother child interaction, limitations in oral structure at early developmental age etc. The researcher also points out that in line with the findings of Pamplona et al. [(16)] that weakness in one language component may affect the development of others as they may affect the metalinguistic skills itself. Boyce et al. [(17)] compared nonsyndromic children with CLP and a matched control on CELF-4. The results showed that children with CLP scored within the average range. Nevertheless there were certain subtest which showed greater impairment. Various demographic factors were delineated by Morgan et al. [(18)] were considered for discussing these difference. The researchers concludes that cognitive abilities, other demographical details such as the clefting, timing of surgery, languages spoken, early stimulation as factors while studying language. The tests selected should also address areas of impairment so that the differences can be well addressed

There are only a handful of studies (Savitha et al. [(19)]; Deepthi & Pushpavathi [(20)]) which had looked into the speech and language development in children with cleft on Indian context. Deepthi & Pushpavathi [(20)] found the language skills in 3-5 year old children with CLP. They found that 3-5 year old scored significantly poorer on the language test compared to TDC. They also found a developmental trend wherein 3-4 year old showed a greater language delay and 4-5 year old were showing comparatively better language outcome. They attribute this finding to influence of school for this age group. The authors also observed a varying degree deficit in auditory attention, memory and concentration in these children. This factor is again reported in many studies and supposed to be contributing to cognitive linguistic deficits in these children

Cognitive-linguistic disorders refer to problems with attention, memory,

organization, reasoning, and social skills that impact communication. In CLP attempt were done to find out if the cognitive issues in children with CLP were linguistic in nature. [10,12] Broen et al. [12] studied the acquisition of cognitive and linguistic skills in 30 children with CLP till 30 months. Although within normal range the language skills of children with CLP were significantly below the normal peers. Even in cognitive tests, the differences were evident in the linguistic subscales. The study supports the discussions that the cognitive delays in these children are linguistic in nature. The differences in cognitive linguistic skills were ascribed to hearing status in infancy, velopharyngeal dysfunction (VPD), and maternal education.

Attempts were also done to study the brain characteristics in these children. [6, 21,22] Conrad et al. [23-27] in their series of studies observed that children with CLP have neurological soft signs [23] which indicate brain abnormality, reduced visual memory, [25] low auditory memory [26] which may predispose difficulty in reading, mainly in children with isolated cleft palate. This is supported by contemporary investigations have observed that children and adults with CLP have irregular brain structure. They include, smaller brain volumes, with the frontal lobes and certain sub cortical nuclei (caudate, putamen, and Globus pallidus) being most affected. [22] Structural brain abnormalities, including decreased cerebrum and cerebellum volumes, have also been recorded in children with nonsyndromic CLP. In a recent interesting report, Van der Plas et al [28] compared children with right and left sided clefts to a group of controls and reported significantly lower white matter in the cerebrum and cerebellum of boys with right-sided clefts. The authors concluded that right-sided clefts may result in more damage to brain structures than left-sided clefts.

The literature shows that cognitive factors, linguistic components and various variables might interact with each other and weakness in one may affect the development of other. In spite of the studies which indicate the deficits in phonology, language and cognitive issues there are only few studies which investigated relationship between all the parameters to provide link between these parameters. Pamplona et al. [16] found in their study that metacognitive strategies help improve the language skills in children with CLP. The study highlighted the need for looking to cognitive and higher order language processing while assessing these children. Morris & Ozane [10] explained the language delay they observed in children with cleft lip and palate as due to difference in cognitive linguistic maturity. They compared three year old children with cleft palate on receptive language, expressive language and speech. Children diagnosed as having expressive language delay and normal language development at 2 years of age were included as two groups for the study. Standardized procedures for speech and language assessment were employed. In spite of having similar otological management children in the expressive language delay (ELD) group performed poorer than NLD group in terms of both receptive and expressive language. The authors proposed that there might exist a mild difference in cognitive linguistic maturity in children with language delay secondary to cleft.

Overall the literature shows inconsistencies in language outcome and reporting cognitive linguistic in children with CLP. Considering all these the present study was planned to look into the language skill and cognitive linguistic skills in school going children with repaired cleft lip and palate (RCLP). The objectives were to (1) Investigate the language skills in children with repaired cleft lip and palate using Kannada Language Test (KLT) [29] and compare with the normative scores available (2) Investigate the cognitive linguistic skills using computerized Cognitive linguistic assessment protocol for children (CLAP-C) [30] and to compare with the normative scores available (3) To explore the

correlation between language and cognitive linguistic abilities in these children.

## METHOD

17 non-syndromic Kannada speaking children (8 males, 9 females) in the age range of 5-6 years who had undergone cleft palate repair (two flap palatoplasty) before the age of 1.8 years at Bhagwaan Mahaveer Jain hospital by two surgeons were considered as participants for the study. The children with syndromes, neurological or psychological issues were excluded. Audiological evaluation using pure-tone audiometry was done for hearing screening. Children who passed in all the testes were selected for the study. The study was approved by the ethical committee of Bhagwaan Mahaveer Jain hospital and All India institute of speech and hearing.

Demographic details of the children were collected from the parents before recruiting for the study. Since the data was to be compared with the normative data the data characteristics of the tests were referred. All children were screened for the presence or absence of cleft speech errors sand VPD. Language skills were assessed using Kannada language test-KLT (UNICEF, 1990) [(29)] and cognitive linguistic skill using computerized Cognitive linguistic assessment protocol for children (CLAP-C). [(30)]

### Kannada Language test

Kannada Language test [(29)] was developed in 1990 as a part of an UNICEF funded project which is further standardized in 2003. [(31)]

The test is designed to assess the receptive and expressive language age for the syntactic and semantic abilities of children from 3 to 7 years of age. Each section has subsections and there are 3 stimulus item each for receptive and expressive skills.

**Table 1: Subsections of syntactic and semantic categories in KLT [(29)]**

| Semantics | Syntax |
|---|---|
| 1. Naming | 13. Morphophonemic structures |
| 2. Semantic discrimination | 14. Plural form |
| 3. Lexical categories | 15. Tenses |
| 4. Semantic similarity | 16. PNG markers |
| 5. Semantic anomaly | 17. Case markers |
| 6. Semantic contiguity | 18. Conditional clauses |
| 7. Paradigmatic relations | 19. Transitives ,intransitive and causatives |
| 8. Syntagmatic relations | 20. Sentence types |
| 9. Polar questions | 21. Conjunctions and quotatives |
| 10. Antonymy | 22. Comparatives |
| 11. Synonymy | 23. Participle construction |
| 12. Homonymy | |

The test was administered individually in a quiet room with fewer distractions. The child was seated comfortably with the stimulus booklet in a well-lighted position. The stimulus consisted of pictures (line drawings) and verbal instruction for the tasks.

Scoring: Syntax and semantics section (Table 1) of the test were administered. The scoring is made from 0 to 1, where 0 is no response, 0.5 is emerging and 1 is the correct response. The normative scores are available separately for semantics receptive, semantic expressive and semantics total, syntactic receptive, syntactic expressive and syntactic total. The expressive and receptive portion of syntactic and semantic category were totaled to obtain language receptive, language expressive and language total scores. The scores obtained were compared with the standardized scores. [(31)]

### Computerized Cognitive linguistic Assessment protocol for children (CLAP-C)

Cognitive linguistic assessment protocol for children –Kannada [(32)] is a standardized test to assess cognitive linguistic skills in 4- to 8 year old children. The test was revised, restandardised and computerized in 2017. [(30)] The test assess three domains attention, memory, and problem-solving in two modalities auditory and visual mode. The test is standardized for

children of 4 to 8 years of age. This test was used to assess the cognitive linguistic abilities of children selected for this study. The scores obtained were compared with the normative scores. [30] The subcategories of the test in each domain is as given in table 2

**Table 2: Details of tasks in CLAP-C and scores** [30]

| Sl no | Auditory mode | Score | Visual mode | Score |
|---|---|---|---|---|
| I | Attention/Discrimination | | | |
| a) | Digit count test | 5 | Odd one out | 5 |
| b) | Sound count test | 5 | Letter cancellation | 5 |
| c) | Auditory word discrimination | 10 | Visual word discrimination | 10 |
| | Total score | 20 | Total score | 20 |
| II | Memory | | | |
| a) | Digit forward span | 5 | Alternate sequence | 5 |
| b) | Word recall | 5 | Picture counting | 5 |
| c) | Digit backward span | 5 | Story sequencing | 5 |
| | Total score | 15 | Total score | 15 |
| III | Problem solving | | | |
| a) | Predicting the outcome | 10 | Association task | 5 |
| b) | Predicting the cause | 10 | Overlapping test | 5 |
| c) | Compare and contrast | 10 | Mazes | 5 |
| | Total score | 30 | Total score | 15 |

The test was administered individually in a sound treated room. The child was seated comfortably. The stimulus was presented on a laptop. The stimulus in the auditory mode was presented to the child using a headphone and is instructed to listen to it carefully and perform the task. For the visual mode, the recorded instructions were given followed by visual stimulus presentation. The child was instructed to see the stimulus and follow the instruction provided. The clinician supported by repeating or rephrasing the instruction whenever the child failed to understand. Every correct response was scored 1 and every wrong response was scored 0 as per the test protocol. The scores obtained were compared with normative scores available for each subsections. Total scores for auditory attention (AA), visual attention(VA), auditory memory(AM), visual memory (VM), problem solving auditory(PSA), problem solving visual(PSV) were obtained and compared with the normative median scores and standard deviation presented in the study. The total score for attention, memory and problem solving were compared with 95% confidence interval (CI) for median as given in the test scores.

## RESULT

Statistical analysis was done using IBM SPSS 20 software. The outcome variables KLT and CLAP were categorized according to the number of children scored below, within the range and above the test normatives. The KLT scores obtained were compared with normative mean using one sample t- test and the scores obtained in CLAP subtest were compared with the normative median using one sample Wilcoxon's signed rank test. The domain total normatives are given as 95% confidence interval for median. Since the descriptive statistics gives 95% confidence interval for mean for the study the same is compared with 95% confidence interval for median. The interactions between the variables were studied by doing spearman's rank correlation coefficient.

### 1) Kannada Language Test

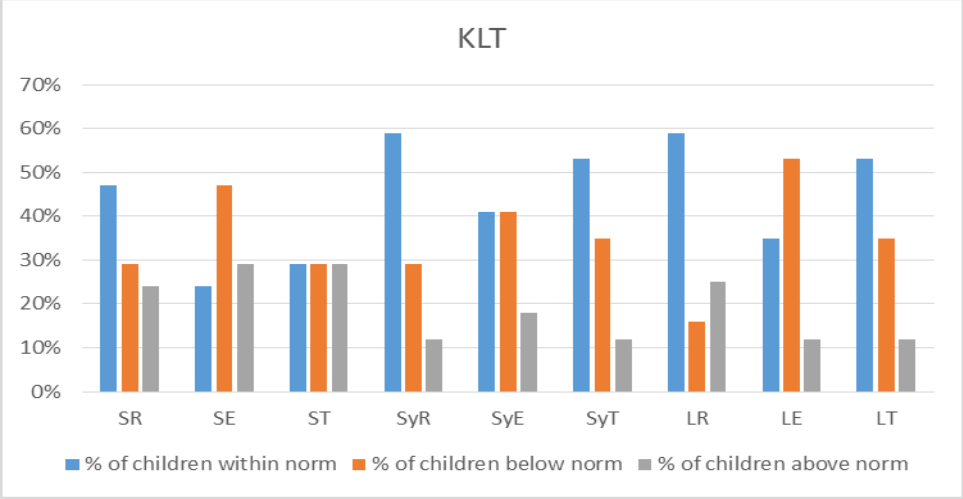
The results show that 88% (15) of the children obtained age appropriate language total (LT) scores while 12% (2) scored below the normative scores in KLT. 88.23% children performed age appropriately in language expression (LE) while 76.47% performed age appropriately in language reception (LR). Children performed better in syntactic tasks than semantics tasks with 88.23% obtained age appropriate score for syntax total (SyT) and

76.5% obtained age appropriately in semantics total (ST). Children scored better on Syntax Reception (SR) than Syntax Expression (SyE) while children performed similarly in Semantic reception (SR) and semantic expression (SE). The outcomes of KLT are summarized as in table below. Percentage children scored age appropriately in each sections of KLT as given in Table 3

**Table 3: Percentage of children scored age appropriately in KLT subsections**

| Sections in KLT | % of children scored age appropriately |
|---|---|
| SR | 76.5% |
| SE | 76.5% |
| ST | 76.5% |
| SyR | 88.23% |
| SyE | 82.35% |
| SyT | 88.23% |
| LR | 76.47% |
| LE | 88.23% |
| LT | 88.23% |

Percentage of children who scored above below and within the range of normative mean and SD as given in graph 1



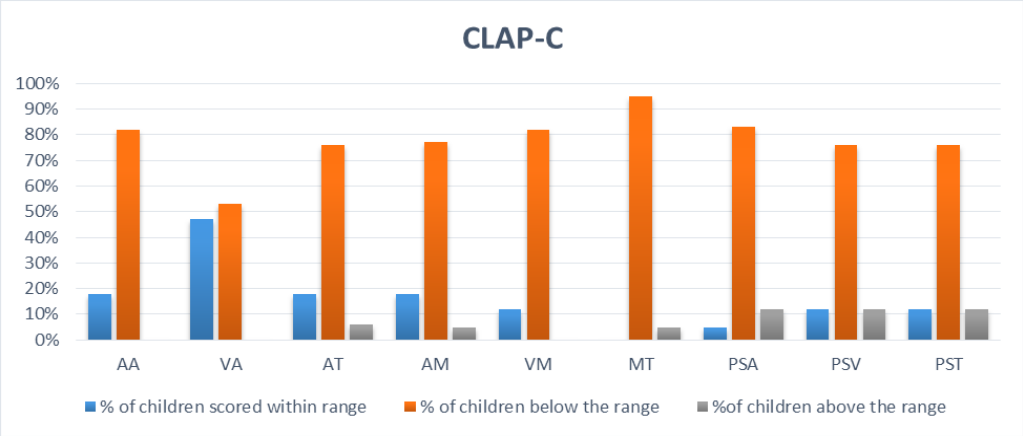

**Graph 1: % of children and scores in Kannada langauge test**

The graph shows that in all the subtest there are a subgroup of children who scored above the mean score though majority scored with the normative range. One sample t test was done to find if there is any significant difference between the scores obtained by the chidren with CLP and the normatives given in the test. The statistical comparison with the normative data shows there is no significant difference between the normative mean score and the scores obtained by children with CLP in the subtest SR(t=1.431,p=0.172), SE(t=0.194, p=0.561), ST(T=1.3,P=0.202), SyE (t=1.8,p=0.08), LE(t=1.34,p=0.197), LT (t=1.8,p=0.08), while the subsection SyR (t=2.18,p=.04), SyT(t=2.18,p=0.04), LR (t=2.18,p=0.04) scores were significantly higher than normative mean score for rural population

**2). Computerized cognitive linguistic assessment protocol for children**

Out of 17 children only 2(12%) children passed in all the subtests of CCLAP. 47.05% children scored age appropriately in Visual Attention (VA) task. 23.52 % scored age appropriately in visual memory(VM) and visual problem solving (VPS). Whereas only 17.6 % scored age appropriately in auditory attention (AA), auditory memory (AM) and auditory problem solving (APS). The scores obtained by each subject in attention domain and the normatives as given in Table 4

Percentage of children scored within, above or below the normative are as given in graph 2




**Graph 2: % of children and scores in CLAP-C**

One sample Wilcoxon sign rank test was done to compare the scores obtained for subtest in each domain to the normative scores of the test. The mean, SD, median, and interquartile range for all the subtests are as given in table 4

**Table 4: Descriptive statistics for CLAP-C subtests**

| Subtests | AA | VA | AM | VM | APS | VPS | AT | MT | PST |
|---|---|---|---|---|---|---|---|---|---|
| Mean | 8.11 | 13.7 | 3.00 | 5.76 | 18.17 | 7.23 | 21.82 | 8.76 | 25.41 |
| SD | 5.75 | 5.88 | 1.93 | 2.99 | 9.44 | 4.99 | 10.26 | 4.32 | 14.11 |
| Median | 7.00 | 14 | 3.00 | 6.00 | 17 | 8 | 23 | 8.00 | 25 |
| Interquartile range | 9.5 | 9.5 | 1.5 | 4.00 | 14 | 9 | 16.5 | 3.00 | 24 |

The scores obtained in the subtests are compared with normative median value of the test. The results shows that the scores obtained by CLP group was significantly less (p=0) than normative median of the test. The median score and the test median as given in the table 5

**Table 5: Median scores for the CLP group compared to normatives**

| Subtests in clap-c | Median score for the CLP group | Median score for normal as in the test |
|---|---|---|
| AA | 7 | 17.5 |
| VA | 14 | 18 |
| AM | 3 | 6 |
| VM | 6 | 11 |
| PSA | 17 | 30 |
| PSV | 8 | 13 |

The confidence intervals for mean of the total scores of the domains were compared and the result shows the interval values are lower than the normative CI for median. 95% confidence interval (CI) for mean is obtained on descriptive statistics and compared with 95% confidence interval for median as in the normative of CLAP test. The results are as in table 6

**Table 6: CI for CLP and normative in domain total score for CLAP**

| 95% confidence interval for mean | 95% confidence interval for median (CLAP) |
|---|---|
| 16.54-27.09 | 33.75-36.11 |
| 6.54-10.98 | 16.48-18.18 |
| 18.15-32.66 | 39.68-43.04 |

The confidence intervals for the domain total were less in the cleft group compared with the test normative.

The third objective of the study was to see if there is any correlation between the scores obtained on KLT compared to CLAP. The raw data shows that only two children scored age appropriately in all subtests in CLAP while 15 passed in KLT. Spearman's rank correlation was done to find if any correlation exist between the language subtests and the domains in CLAP test. Further to see if the test parameters interact between the tests itself. The result showed that LR and LE were significantly correlated (=0.711, p=001). The interactions between linguistic and cognitive linguistic parameters were explored. It was found that LR was significantly correlating with AA ($r_s$ =0.727, p=0.001); VA ($r_s$ =0.615, p=0.009); VM ($r_s$ =0.58, p=0.013); PSA ($r_s$ =0.695, p=.002); PSV ($r_s$ =0.735, p=001). But the

correlation was not significant for LR with AM ($r_s$ =0.438, p=0.078) and VM ($r_s$ =0.458, p=0.065). Similarly LE was significantly correlating with AA ($r_s$ =0.758, p=0); VA ($r_s$ =0.550, p=0.022); PSA ($r_s$ =0.805, p=0.0), PSV ($r_s$ =0.745, p=0.001). There was no significant correlation between LE to AM ($r_s$ =0.357, p=0.159) and VM ($r_s$ =0.434, p=0.082).

Correlation of parameters within the CLAP test as represented in table 7.

**Table 7: Correlation between CLAP-C subtests**

| | | | AA | VA | AM | VM | PSA | PSV | AT | MT | PST |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | AA | Correlation Coefficient | 1.000 | .583* | .608** | .606** | .900** | .813** | .880** | .732** | .849** |
| | | Sig. (2-tailed) | . | .014 | .010 | .010 | .000 | .000 | .000 | .001 | .000 |
| | | N | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 |
| | VA | Correlation Coefficient | .583* | 1.000 | .538* | .746** | .740** | .803** | .849** | .852** | .817** |
| | | Sig. (2-tailed) | .014 | . | .026 | .001 | .001 | .000 | .000 | .000 | .000 |
| | | N | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 |
| | AM | Correlation Coefficient | .608** | .538* | 1.000 | .298 | .587* | .642** | .673** | .635** | .623** |
| | | Sig. (2-tailed) | .010 | .026 | . | .246 | .013 | .005 | .003 | .006 | .008 |
| | | N | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 |
| | VM | Correlation Coefficient | .606** | .746** | .298 | 1.000 | .694** | .624** | .694** | .881** | .697** |
| | | Sig. (2-tailed) | .010 | .001 | .246 | . | .002 | .007 | .002 | .000 | .002 |
| | PSA | Correlation Coefficient | .900** | .740** | .587* | .694** | 1.000 | .849** | .896** | .764** | .967** |
| | | Sig. (2-tailed) | .000 | .001 | .013 | .002 | . | .000 | .000 | .000 | .000 |
| | PSV | Correlation Coefficient | .813** | .803** | .642** | .624** | .849** | 1.000 | .899** | .766** | .926** |
| | | Sig. (2-tailed) | .000 | .000 | .005 | .007 | .000 | . | .000 | .000 | .000 |
| | AT | Correlation Coefficient | .880** | .849** | .673** | .694** | .896** | .899** | 1.000 | .825** | .905** |
| | | Sig. (2-tailed) | .000 | .000 | .003 | .002 | .000 | .000 | . | .000 | .000 |
| | MT | Correlation Coefficient | .732** | .852** | .635** | .881** | .764** | .766** | .825** | 1.000 | .798** |
| | | Sig. (2-tailed) | .001 | .000 | .006 | .000 | .000 | .000 | .000 | . | .000 |
| | PST | Correlation Coefficient | .849** | .817** | .623** | .697** | .967** | .926** | .905** | .798** | 1.000 |
| | | Sig. (2-tailed) | .000 | .000 | .008 | .002 | .000 | .000 | .000 | .000 | . |

The results shows that all other subtests shows a correlation among each other except AM and VM ($r_s$=0.298, p=0.246). The results shows that language skills measured in KLT were not significantly correlated with the memory in CLAP test.

## DISCUSSION

The aim of the study was to investigate the linguistic and cognitive linguistic skills in children with cleft lip and palate and to establish the relationship between both. The first objective of the study was to find if there exist any linguistic deficits in children with CLP. Though 12% of children did not score age appropriate normative score there was no significant reduction in score obtained by children with CLP compared with the normative mean for any of the language subtest or total. On the contrary children scores significantly larger scores than mean normative in the subtests of reception. The results are in consonance with the findings [14,17] that children with CLP score well within average range for a norm referenced test. Though some children with CLP exhibit language delay there may be a significant number of children with non- syndromic cleft palate who may not show a language delay and each child should be evaluated for the affected areas. The result of the study act as a continuum to findings of the authors [20] using the same test on same linguistic group of children of 3-5 years where they found that language delay slowly appears to be disappearing by 4-5 years. This supports the findings [8] that delay in language usually disappears by 4-5 years. The test normative were established in 2003 and the standards of rural population have changed over the years might be the reason for showing a significantly higher performance of children on certain subtests. This needs to be validated by considering a control group for future studies.

The second objective of the study was to compare the cognitive linguistics skills in children with CLP with the

normative. The results shows that children with CLP scored significantly lower than the test normative in all the subtests. This supports the previous findings that the Cognitive linguistic skills are severely affected in children with CLP and there can be difference in cognitive linguistic maturity in these children. [(10)] The findings indicates that the higher language skills which is cognition mediated will be affected in children with CLP though at a behavioral level language skills appears to be mostly within normal limits. Children who scored for few subtests in CLAP-C were found to have scored better in visual modality than auditory modality. Probable reason might be sensory deprivation during early childhood due to unidentified middle ear problems which is common in children with cleft. [(15)] CLAP findings also point towards the possible reason for the existence of learning disability in children with cleft lip and palate. [(7)] The finding [(5,16)] point towards the need for assessing the cognitive and linguistic organizations in these children even when the language is intact.

The third objective of the study was to find the relationship between linguistic and cognitive linguistic skills in children with CLP. The discrepancy between language and cognitive linguistic skills in these children contradict the findings that the differences in cognitive skills in these children can be language based. [[12]] Difference in brain structure is reported in literature which may further contribute to poor cognitive linguistic skill in these children. [[6,16,17]] Poor parental expectation, lack of stimulation, unidentified early otitis media etc. maybe some of the variables contributing to this difference. But it is beyond the scope of the current study to prove the same. Though the present study has not considered all these factors with evidences these findings are attributed as probable reasons in the studies by Broen et al. [(12)] and Anaraki et al. [(15)]

The reviews pertaining to the low scores in the cognitive linguistic subtests led to the following studies. Lemos and Feniman [(33)] in their study found that children with CLP have poor sustained auditory attention. They attributed the findings to unidentified otitis media and anatomical changes of middle ear. Conrad et al [(25, 26)]) found that children with CLP have reduced visual and auditory memory. Richman et al. [(34)] found that the visual memory is most affected in CLP. They attributed the findings to structural changes in the brain and predicted this as reason for reading deficit in these children. The problem solving skills may require understanding of higher linguistic organization. Pamplona et al. [(16)] commented that the higher linguistic organization might be affected in children with CLP. All these findings may apply to the difficulties observed in the present study.

The third objective of the study was to find the relationship between language and cognitive linguistic abilities in these children. It was found that language reception and expression were correlated with all other domain except the subtests in memory domain. The result shows that the type of memory tasks employed in this study which include word recall, digit forward span and digit back ward span for auditory memory; alternate sequence, picture counting, story sequencing for visual memory may not be facilitated by appropriate linguistic skill. The task is more cognition mediated than language mediated. This might be the possible reason for the lack of correlation. Though the other domain showed a positive correlation with the language subtests the linguistic skills were not enough for performing age appropriately in cognitive based language tasks.

Overall findings of the study supports the findings of meta-analysis of 29 research articles [(35)] where they found that cognitive functioning in children with cleft are often affected in a range of domain while language does not show a consistent delay in all cleft types. This also point towards the need for longitudinal

assessments, carefully following up the delays and providing appropriate interventions at the early age, delineating the possible variables including the anatomical changes in brain and documenting the success of these individual post schools training in adulthood.

## SUMMARY & CONCLUSION

Many factors affect the development of linguistic and cognitive linguistic skills in children. There are wide contradictions in the literature regarding the linguistic skills in children with cleft lip and palate. The study aimed to estimate the language deficit and cognitive linguistic skills in school-age children with repaired cleft lip and palate and establish a relationship between them. The study concludes that the early language deficit exhibited as reported in the literature may disappear in more than 50% of school-age children with RCLP. But the deficits in cognitive linguistic functions are found to persist. The report of poor academic performance in children with cleft lip and palate can be substantiated with this finding. The study cautions the professionals to carefully monitoring and addressing these variables on intervention.

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How to cite this article: Aparna VS, Pushpavathi M, Bonanthaya K. Language skills and cognitive linguistic skills in children with repaired cleft palate. Int J Health Sci Res. 2020; 10(3):32-42.

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