CHAPTER III

METHOD OF THE STUDY

The review of related literature has given an insight to the researcher to design her method to collect the necessary data. The method of the study is a mapping technique. It is a statement of the inquiry and the techniques to bring together the facts, analyzing the data and reporting the results. The method adopted to accomplish the objectives of the study is discussed in this chapter. Further testing of hypotheses is also discussed. This chapter includes type of research, sample selection criteria, different tests used and procedure employed for collecting data and analysis of data.

As mentioned in the previous chapter, a total of 20 factors of whose relative contribution to the implant benefit are examined through the following objectives and hypotheses are listed below:

Table 3.1

List of sub-components of factors

<table>
<thead>
<tr>
<th>Child and family related factors</th>
<th>Clinical related factors</th>
<th>Educational related factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Gender</td>
<td>• Cause of hearing loss</td>
<td>• Class in school</td>
</tr>
<tr>
<td>• Father’s occupation</td>
<td>• Age at testing</td>
<td>• Academic achievement</td>
</tr>
<tr>
<td>• Mother’s occupation</td>
<td>• Age at diagnosis of hearing loss</td>
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<tr>
<td>• Father’s education</td>
<td>• Duration of deafness</td>
<td></td>
</tr>
<tr>
<td>• Mother’s education</td>
<td>• Age at using of hearing aid</td>
<td></td>
</tr>
<tr>
<td>• Number of siblings</td>
<td>• Duration with hearing aid</td>
<td></td>
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<td></td>
<td>• Age at implantation</td>
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<td></td>
<td>• Duration with cochlear implant</td>
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<td></td>
<td>• Mode of communication</td>
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<td>• Speech intelligibility</td>
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<td>• Type of training before formal schooling</td>
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<td></td>
<td>• Duration of training</td>
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</table>
3.1 Objectives of the study

Based on the literature discussed, following objectives and hypotheses were framed

1. To compare the Linguistic Skills and Reading Comprehension of children with cochlear implants with standard norms.
2. To examine the relationship between Linguistic Skills and Reading Comprehension in children with cochlear implants
3. To examine the relationship of factors namely, number of siblings, age at testing, age at diagnosis of hearing loss, duration of deafness, age at using of hearing aid, duration with hearing aid, age at implantation, duration with cochlear implant, and duration of training with Linguistic Skills and Reading Comprehension.
4. To study the influence of factors namely, gender, father’s occupation, mother’s occupation, father’s education, mother’s education, cause of hearing loss, mode of communication, speech intelligibility, type of training before formal schooling, class in school, and academic achievement on Linguistic Skills and Reading Comprehension.
5. To study individual cases of high performers and poor performers in Linguistic Skills and Reading Comprehension.

3.2 Hypotheses of the study

Before framing the following hypotheses for the study, it was assumed that children with cochlear implants performance was neither significantly influenced nor significantly related by any of the 20 factors listed in the table 3.1. Therefore, the null hypotheses were framed.
1. There is no significant relationship between Linguistic Skills and Reading Comprehension in children with cochlear implants.

2. There is no significant relationship of factors namely, number of siblings, age at testing, age at diagnosis of hearing loss, duration of deafness, age at using of hearing aid, duration with hearing aid, age at implantation, duration with cochlear implant, and duration of training with Linguistic Skills and Reading Comprehension.

3. There is no significant influence of factors namely, gender, father’s occupation, mother’s occupation, father’s education, mother’s education, cause of hearing loss, mode of communication, speech intelligibility, type of training before formal schooling, class in school, and academic achievement on Linguistic Skills and Reading Comprehension.

3.3 Operational definitions

To convey the explicit meaning, an attempt has been made by the researcher to explain the key terms used in this study.

**Children with or using cochlear implants:**

In this study, children with cochlear implants will include those children who are implanted and who do not have any other additional disabilities.

**Linguistic or Language skills:**

In the present study, it refers to the ability to perform the tasks related to phonology, syntax, and semantics.

*Phonology* refers to identifying and discriminating sounds and includes Phonemic discrimination and expression,
Syntax refers to grammar rules of language and includes morphophonemic structures, Persons Number Gender markers, plural forms, tenses, case markers, Intransitives, Transitive’s causatives, predicative’s, sentence types, conjunctives, quotations and comparatives, participle constructions, conditional clauses, and

Semantics refers to meaningfully using words and sentences and includes semantic discrimination and expression.

Reading Comprehension:

It refers to the ability to comprehend and respond to the questions about a story passage presented in the form of stimulus to the child. Those questions are related to literal comprehension which refers to answering direct questions, reorganization which refers to answering indirect questions, and inferential comprehension refers to using one’s own thinking and experiences to answer the questions.

Cause of hearing loss:

It refers to the suspected reason which might have caused hearing loss in a child with hearing loss in the present study.

Age at testing:

It refers to the chronological age of the child with cochlear implant at the time of administering Linguistic profile test and Kannada Reading Comprehension test.

Age at diagnosis of hearing loss:

It means the age of the child at which child was diagnosed or identified with hearing loss by an authorised doctor.
Duration of deafness:

It refers to the length of the time the child had suffered deafness without any formal diagnosis by an authorised doctor.

Age at using of hearing aid:

It refers to the age of the child at which an appropriate hearing aid suitable to the child was fitted by an authorised audiologist.

Duration with hearing aid:

It means the length of the time the child was using the hearing aid fitted to him in his day to day life.

Age at implantation:

It refers to the age at which cochlear implantation surgery was done to the child and cochlear implant device was fitted.

Duration with cochlear implant:

It means the length of time the child had been using the cochlear implant device in his day to day life.

Mode of communication:

It refers to the way to communicate, in the present study it specifically refers to using oral way or speech, and oral way as well as sign language to communicate.

Speech intelligibility:

It means the speech clarity in children with cochlear implants i.e., how clearly others are able to understand the speech of children. In the present study, it was divided into three categories for the purpose of assessing children: Good, if children speech is like any other normal hearing speaking child except for few sounds;
Average, if children speech is neither very clear like normal hearing speaking child nor very poor to understand, and below average, if children speech is very poor to understand most of the time.

**Type of training before formal schooling:**

It refers to any form of training attended by the child with cochlear implant before getting admission into a regular school. However, the difference between the categories i.e., *early training* refers only to listening training and speech language therapy whereas *early training and special school* refers to training in listening through cochlear implant, speech language therapy, and also training in educational concepts such as pre-academics (reading, writing, and mathematics) with pre-education concepts( for e.g. basic concepts in environmental sciences etc).

**Duration of training:**

It means the length of the time the child with cochlear implant had attended any form of training before getting admission into a regular school for normal hearing children.

**3.4 Variables of the study**

Linguistic Skills consisting of three aspects namely, phonology, syntax, and semantics, Reading Comprehension and 20 factors listed in table 3.1 are the variables under study.

**3.5 Procedure of the study**

For the present study, both Quantitative and Qualitative methods were used and the study is descriptive in nature. The study was conducted in two extensive stages as follows.
Stage 1 Selection of participants: It consisted of selecting the participants as per the inclusion criteria using purposive and snowball sampling techniques. It includes sampling procedure, inclusion criteria for selecting participants, description of participants and the tests.

Stage 2 Data collection: It involved collecting the necessary data by administering standardized tests on the participants, description of the tests, and procedure for data collection.

3.6 Sampling Procedure

As mentioned earlier, in India the rate of cochlear implantation is quite low due to many reasons and the major reason being cost involved. Therefore, to fit the purpose of the study, purposive sampling technique was used to choose the sample based on the inclusion criteria. In this regard, two clinics, two institutes and one early intervention school working in the area of children with cochlear implants were contacted. From them, sixty three children details were obtained. Using snowball sampling technique, a list of additional five children was obtained from parents.

In total, a list of 68 children with cochlear implants was obtained. To find out as to whether these 68 children can be included in the study as per the inclusion criteria, each child was contacted over phone to obtain their details. Among them, four had invalid contact numbers, 31 did not satisfy the inclusion criteria hence were not eligible to be included as sample, five expressed their unwillingness to participate in the study, therefore, out of total 68 children, 40 were not included and the remaining 28 children who satisfied the inclusion criteria were included. Accordingly, appointments were taken from their parents as per their convenience for data collection. Repeated calls were made to remind and confirm the appointment dates and timings. The researcher visited the house of each child personally to collect
the necessary data for the study. Locating each child’s home address was very challenging and time consuming. Travelling took major time to reach the children. In case of some children, researcher had to travel to remote and interior places to locate the houses of children. During the data collection, when tested for intelligence, one of the inclusion criteria, three children were found to be below average. Hence, finally for the study, data was collected from 25 children with cochlear implants.

3.7 Participants

Children with cochlear implants were selected as sample for the study based on the following inclusion criteria:

1. Children diagnosed with severe to profound hearing loss.
2. Unilaterally implanted
3. Chronological age range: 6 to 11 years
4. Average or above average intelligence
5. No reported physical or sensory additional disabilities
6. Use of cochlear implant at least for one year
7. Native speakers of Kannada
8. Medium of instruction at school is English
9. Language chosen for training after implantation for one year is Kannada
10. Geographically living in Mysore and Bangalore cities in the state of Karnataka, India.
11. Studying in regular schools along with normal hearing children.

3.8 Description of participants

Twenty five pre-lingual profound children with hearing impairment (15 boys and 10 girls) age ranging from 6 to 11 years (mean age 7.8 years) participated in this
study. They were diagnosed with severe to profound bilateral hearing loss before 36 months of age. Among 25 children, only three children had acquired hearing loss and the remaining 22 had congenital hearing loss i.e., by birth. The suspected cause of hearing loss was unknown in 11 children, hereditary and consanguinity in eight children and caused by infectious diseases and other reasons like delay in birth cry etc in six children. As is routine practice, all these children were fitted with bilateral conventional Behind the Ear Model hearing aids. Later, they were recommended for cochlear implant. All 25 children had unilateral implants. The children were implanted between the age of 1 and 7 years (mean age at implantation 4.1 years). They had been using their implants for more than one year (mean duration of implant use 3.1 years). All children had early training. Eighteen of them attended special preschool for children with hearing impairment. Their main mode of communication was oral mode but two children also used sign language. Only one child had deaf parents and all other 24 children had hearing parents. For inclusion as a sample of the study, a normal IQ was essential, as measured by Raven’s progressive coloured matrices (Raven, 1986). The data of children is clearly depicted in the following table 3.2.
Table 3.2

Data of 25 children with cochlear implants

<table>
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<th>S.No</th>
<th>Gender</th>
<th>Cause of hearing loss</th>
<th>Age at Testing (years)</th>
<th>Age at diagnosis of hearing loss (months)</th>
<th>Duration Of Deafness (years)</th>
<th>Age At hearing Aid (years)</th>
<th>Duration with Hearing Aid (years)</th>
<th>Age At implantation (years)</th>
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</table>
3.9 Description of the Tests

For the purpose of this study, prior to administering the tests, researcher had to consider the influence of cultural, linguistic factors, and impact of hearing impairment on life of the participants of the study. Consequently, keeping all these in mind, in order to measure Intelligence, Linguistic Skills and Reading Comprehension, three standardized tests namely, Colour Progressive Matrices test, Linguistic Profile test, and Kannada Reading Comprehension test were selected respectively. All the tests used were standardized with a normal-hearing population and yielded standard scores. Another principal reason for using especially these Linguistic profile test and Kannada Reading Comprehension Test for testing children with cochlear implants is to bring to the forefront the complex items in language and reading and accordingly advocate for planning intervention programs to remediate these specific problematic areas.

Colour Progressive Matrices (CPM): For testing non-verbal intelligence in children with cochlear implants, Colour Progressive Matrices, henceforth referred as CPM developed by Raven (1986) was used (Appendix III).

Justification for selecting CPM: This test was selected as it is widely accepted and can be easily administered. As indicated in the manual, this test can be used for children from 6 to 11 years. This test is a non-verbal test. And this test can be used with children, whatever their nationality, education or physical condition. This test was administered on the sample only to determine their eligibility as per the inclusion criteria to participate in the study. The CPM covers the broad possible range of mental ability.
Components in CPM: Colour Progressive Matrices consists of three sets of diagrammatic puzzles displaying change in dimensions serially. Each puzzle has a missing part, which the child taking the test has to find among the choices provided. This test consisted of 36 problems divided into three sets (A, A_B, and B) with each set having 12 problems. These three sets provide three opportunities to take hold of the method of thought essential to solve the problems and assess the child’s capacity for intellectual activity stage by stage.

Administration procedure of CPM: This test was administered in the present study individually to each child in a noise-free room which was away from distractions. To fill up the missing part in the puzzle, the child was clearly instructed to identify the appropriate puzzle from the six options provided below the main puzzle. Prior to administering the actual test, the researcher gave few examples to make the child understand. If required, parents help was also taken to make the child understand. Child was instructed either to identify the appropriate picture by saying the number assigned to it or point out to the appropriate picture in whatever way the child felt comfortable. Simultaneously, the number assigned to the appropriate picture identified by the child was entered in the scoring sheet by the researcher. All the three sets were completed at a single time without any breaks but instructions were repeated before beginning a new set. On an average, it took approximately 15 minutes for each child to complete the test.

Scoring procedure of CPM: The raw scores were computed for each child by assigning one mark for one correct answer and zero mark for incorrect answer by looking at the answer keys provided in the CPM test manual. For all the three sets combined, a total score was obtained. For each set, the total score was obtained for each child. Then from the manual according to normal score composition table,
expected scores were obtained. Discrepancies were calculated between the obtained scores and expected scores. If discrepancies were either -1, 0, or +1, then according to the chronological age of the child, percentile points were obtained. The grades of intelligence and the related interpretation were obtained from the Manual.

**Linguistic Profile Test (LPT)**: To test linguistic or language skills in children with cochlear implants, Linguistic Profile Test, henceforth referred as LPT in Kannada developed by Karanth (1980) was used (Appendix IV). The test can be used for children from the age range of 6 to 15 years. The test is basically designed to measure participant’s receptive and expressive language. It can also be considered as an achievement test as it shows the extent of language acquisition. The mean and standard deviation of the test was collected in two different time phases, initially it was collected for Grade I (6+ years) to Grade V (10+ years) and at a later stage for Grade VI (11+ years) to Grade X (15+ years). Thirty children for each age group were selected as a sample based on criteria such as they should be healthy normal children with no physical or sensory disabilities, Kannada as their native language, studying in Kannada medium, and belonging to middle socio-economic status. Therefore, 300 children responses on the test items were collected. They were tested on all the test items individually. The data recorded were tabulated and the mean and standard deviation of LPT scores for each age group were computed. Further, Newman/Keul’s Range test was used to find the significant differences between the means. Hence, this test norm were useful for comparing the performance of different samples with the various age levels and also to find out the age level at what the sample performs. The author of the test was contacted personally and permission was sought to use the test for the study. After getting the permission from the author, the test was used by the researcher.
**Justification for selecting LPT:** There were three strong reasons to select this test, first being it is a very comprehensive test consisting of all important components of language. The second reason being the test is “regional and culture fair” that is appropriate to be used for the present study as it is developed in Karnataka in Kannada language. The third reason is, the test is standardized and has norms as discussed.

**Components in LPT:** In total, the test consisted of 306 test items and maximum score is 300.

**Phonology** includes totally 76 test items and maximum score is 100 divided into

1. *Phonemic discrimination* with 24 test items and maximum score being 48, it means discriminating based on sound production by listening to sounds.

2. *Phonetic expression* with 52 test items and maximum score being 52, it means producing correct sounds by mouth and *Running speech* includes only transcription, it includes a small passage.

**Syntax** a branch of linguistics which studies word structure and grammar includes totally 130 test items under 11 sub categories and maximum score is 100.

1. *Morphophonemic structures* 20 test items and maximum score 10, it means identifying correct or incorrect words based on morphemes.

2. *Plural forms* 10 test items and maximum score 5 refers to discriminating singulars and plurals.

3. *Tenses* 10 test items and maximum score is 5, it means discriminating past, present or future tense.

4. *Person Number Gender markers* 20 test items and 10 score they together mean a grammatical category to identify and discriminate the
first person, second person and third person (e.g. I, You, She, they etc) along with grammatical category used for singular, plural, dual etc (e.g. she walks, they walk) and it also includes a grammatical category used for discriminating masculine/feminine classes.

5. **Case markers** 10 test items and 10 score, they mean a grammatical category used to identify the syntactic relation between words in a sentence.

6. **Transitive’s, intransitives, and causatives** 10 test items and 10 score, they generally mean a verb which can take a direct object (e.g. She saw a cat) and a verb which cannot take a direct object (e.g. She saw).

7. **Sentence types** 10 test items and 10 score, they refer to simple, declarative and interrogative sentences etc.

8. **Predicative’s** 10 test items and 10 score, refers to appropriate grammar connection or usage (e.g. that cat small is incorrect, that cat is small is correct).

9. **Conjunctives, comparatives and quotations** 10 test items and 10 score, they mean that which connects both the meaning and the construction of sentence elements and comparisons among them.

10. **Conditional clauses** 10 test items and 10 score, the mean to express conditions (e.g. if unless).

11. **Participle constructions** 10 test items and 10 score, it means a word derived from a verb and used as an adjective (e.g. smiling face).
**Semantics** refers to meaningful use of words and sentences. It includes totally 12 sub categories.

1. **Semantic discrimination** 15 test items and 15 maximum score, refers to discrimination based on nature of characteristics of group (e.g. discriminating between colours and body parts).

2. **Semantic expression** 85 test items and 85 maximum score, refers to express words or sentences meaningfully which includes.
   a) **Naming**, it refers to saying the names, 20 test items and 20 score.
   b) **Lexical category**, they refer to things that belong to same group, 15 test items and 15 score.
   c) **Synonyms** are meanings, 5 test items and 5 score.
   d) **Antonyms** are opposites, 5 test items and 5 score.
   e) **Homonyms** it means giving alternate meanings to the same words, 5 test items and 5 score.
   f) **Polar questions** refers to the system of positive or negative found in language (Yes or No, e.g. happy vs. unhappy), 10 test items and 10 score.
   g) **Semantic anomaly** means that which contradicts facts (e.g. sun rises in the west), 5 test items and 5 score.
   h) **Paradigmatic relations** it refers to set of relationship with other units (e.g. potato – vegetable, apple – fruit), 5 test items and 5 score.
   i) **Syntagmatic relations** it refers to the relationship between the constituent (e.g. Milk – white, sky – blue), 5 test items and 5 score.
j) **Semantic contiguity** relationship defining noun and verb (e.g. seed – plant), and 5 test items and 5 score.

k) **Semantic similarity** refers to inherent relationship between the items (e.g. lesson to be read, food to be eaten) 5 test items and 5 score.

Totally consisting of 100 test items and maximum score is 100, and Discourse includes only transcription of the subject matter for older children. This test consisted of close-ended tasks and open-ended tasks across phonology, syntax and semantics as follows

**Close-ended tasks**, in which children were required

- To point to the appropriate picture or objects in response to a verbal prompt by the researcher,
- Repeat the words after the researcher,
- Comprehend a passage and answer related questions,
- Listen and identify the grammatical errors in words, phrases, sentences and respond as either correct or incorrect,
- Verbal response to the object and pictorial prompts etc

**Open-ended tasks** in which the child had

- To list the names of animals for one minute,
- Matching and filling in the missing information etc

For all children, uniformly for some items in the test, functional words or daily usage words were used to make the child understand instead of using the conventional text-based Kannada language (for e.g. instead of ‘meju’ meaning table, directly ‘table’ was used)
Administration procedure of LPT: This test was also administered individually to each child in a noise-free room which was away from distractions. After CPM, a small break of 10 minutes was given to the child before administering this LPT test. Instructions were given to the child for each task separately under phonology, syntax and semantics based on the nature of test items such as close-ended and open-ended tasks. The researcher gave few examples wherever required to make the child understand. If necessary, parents help was also taken to make the child understand. Each child was given a test booklet so that they can see from the test booklet what the researcher was asking. Child was instructed either to identify the appropriate picture or object or point out or say correct or incorrect by listening or by looking into the test booklet. Simultaneously, the responses of the child were entered in the scoring sheet by the researcher. Instructions were repeated before beginning a new task and whenever the child required. On an average, it took approximately 45 minutes for each child to complete the test.

Scoring procedure of LPT: The raw scores were computed for each child by assigning one mark for one correct answer for all the test items except for phonemic discrimination two marks for correct answer and for Morphophonemic structures, plural forms, tenses, and PNG markers half a mark for correct answers and zero mark for incorrect answers as per the instructions given in the LPT test manual. The total score was computed and as per the chronological age of the child, age-equivalent norms i.e., mean standard norms were noted and were compared with the obtained scores for each sub-component of LPT: phonology, syntax and semantics and the overall total was calculated for a maximum score of 300 for each child separately.

Kannada Reading Comprehension Test (KRCT): For testing Reading Comprehension in children with cochlear implants, Kannada Reading Comprehension
Test, henceforth referred as KRCT developed by Ramaa (1984) was used (Appendix V). As a part of standardization, initially the selected eight passages ranging from simple to complex which were selected from popular children literature suited to children studying in grades I through grade IV were tried out on a small sample of children studying in all the grades from I through IV of primary schools and modifications were made accordingly. Later, final try out of these passages was done on a representative sample of 120 children who were selected from three government and two private schools studying in grade I through grade IV, based on the assumption that children attending these schools vary with respect to the parent’s educational standard, the help offered by their parents to improve their reading performance as well as the type of teaching methodology to which they are exposed to at schools. Among these 120 children, 25 belonged to Grade I, 25 belonged to Grade II, 30 belonged to Grade III, and 40 belonged to Grade IV. For establishing the validity, a pre-try out and experts opinion was carried out. Additionally, a percentage of children of all the four grades (I through IV) passed in each question for every passage was calculated separately (difficulty indices). Items for which there was a gradual increase in the frequency of children passed in different grades were selected and others were rejected. The selected items were rescored and grade norms in the form of arithmetic means were developed on the same sample as given in the following table 3.3.

Table 3.3

<table>
<thead>
<tr>
<th>Grades</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean scores</td>
<td>9</td>
<td>15</td>
<td>24</td>
<td>28</td>
</tr>
</tbody>
</table>
The test is administered by exposing the child to the eight stories from simple to complex based on the grade. At the end of each story, certain number of questions was given. The child is expected to read the passage loudly, correctly and comprehend the story to answer the questions. While answering, the child was allowed to see the passage but not to read out the sentences directly from the passage as answers to particular questions. These stories were divided as per the grade wise i.e. ranging from 1st to 4th grade. Each grade has two stories. Therefore, this test was administered up to the grade where in the child is studying, rather than the chronological age. This is reasonable for children with hearing impairment as most of them would start their education on reading compared to hearing children at a slightly later age. Therefore, matching on grade equivalent gives a better clue of the genuine Reading Comprehension development than matching on chronological age.

**Justification for using KRCT:** There were three main reasons to use this test, first the test is “regional and culture fair” that is appropriate to be used for the study as it was developed in Karnataka in Kannada language. The second reason is comprehensive and consists testing of three important aspects of reading namely literal comprehension, reorganization and inferential of the ideas and information explicitly stated in the story passages through a variety of questions. *Literal comprehension* means to identify ideas and information that are clearly and directly stated in the passage, *Reorganization* means to analyze, and/ or organize ideas or information which are clearly and indirectly stated in the passage, and finally *inferential comprehension* means to use the ideas and information that are clearly stated in the passage and for making hypotheses on the basis of one’s intuition and personal experiences. The third reason being the test is basically developed for primary school children, is standardized and has norms as discussed, and child is
allowed to read at his own pace. The author of the test was contacted personally and permission was sought to use the test for the study. After getting the permission from the author, the test was used by the researcher.

**Components in KRCT**: It consists of eight story passages ranging from simple to complex for children studying in grades I through grade IV. Each grade has two stories. In total, this test had seven questions related to literal comprehension (e.g. from passage 1, with whom was the dog?), 18 questions related to Reorganization (e.g. from passage 2, Why did the dog wave its tail?), and 25 questions related to inferential comprehension (e.g. from passage 3, what was the mistake done by the boy?). Therefore, totally the test consisted of 50 questions for eight passages.

**Administration procedure of KRCT**: This test was also administered individually to each child in a noise-free room which was away from distractions. After LPT, a small break of 10 minutes was given to the child before administering this KRCT test. Only for those children who could answer the questions given in the passages for practice, KRCT test was administered. After the child read one story passage, questions pertaining to that particular passage were asked immediately one after the other. The child was expected to answer orally and not in writing. Responses were considered correct if they matched with the key, irrespective of the sentence structure. On an average, it took 30 minutes approximately to complete the test.

**Scoring procedure of KRCT**: The raw scores were computed for each child by assigning one mark for one correct answer for all the questions and zero mark for incorrect answer as per the instructions given in the KRCT test manual. The total score was calculated for all the answers. As per the grade of the child, grade-equivalent norms i.e., mean standard norms as mentioned in the table 3.3 were compared with the obtained scores.
3.10 Procedure of Data collection.

First and foremost, parents of eligible children with cochlear implants were contacted over phone and appointment was taken on a convenient date and time for both the parents as well as the researcher. Simultaneously, researcher tried to familiarize herself with the test materials and administration procedures which involved using different materials and entering the data in an organized format as demanded by the standardized tests used for the study. The experts and authors were contacted to learn the administration of CPM, LPT and KRCT. The researcher has tried out the tests to be used by practically administering the test on two typically hearing children. This pre-try out has helped researcher to organize the test materials and scoring sheets in a systematic order. Accordingly, the researcher gained confidence in administering the tests and entering the data.

The researcher visited each child’s home at the stipulated time. Before beginning the test, rapport was build with the parents and the purpose of the study was explained. When they felt comfortable, researcher requested for a noise-free room in their home without any disturbance for administration of the test. Consent form (Appendix I) was handed over to be signed by the parents. Case history form (Appendix II) was also given to the parents requesting to fill in the details. As the parents filled the case history form, researcher developed rapport with the child with cochlear implant. Before beginning the administration of tests, instructions were given very clearly to the child as mentioned earlier. Even during the testing process, any doubts of children with cochlear implants were clarified and examples were given if required. If the child still needed help, parents help was taken.

As mentioned earlier, the tests were administered in the following order, first, CPM was administered that took on an average 15 minutes for the children to
complete the test, second LPT was administered that took on an average of 45 minutes to complete and finally KRCT was administered that took on an average of 30 minutes to complete. In order to avoid the mental fatigue that might affect the performance of the child, frequent 10 minutes breaks were given in-between the tests. Surprisingly, most of the children did not want any breaks as they were excited to know what was next. Administration of tests was made interesting wherever possible by the researcher using different materials namely picture cards, laptop to record their speech etc. Reinforcement was given to each child after completing the test. After the administration of tests, researcher interacted with the parents to know about their journey from the stage where child was identified as hearing impaired till the present stage of children studying in regular schools along with hearing children. Researcher filled the missing data in case history form that took approximately another 30 minutes. Totally, researcher has spent approximately two hours time in each child’s home. The administration of the tests on all twenty eight children was completed within the duration of 50 days.

3.11 Statistical Analysis.

In order to achieve the objectives and to test the hypotheses of the study, non-parametric tests were used as the sample size was small in number and also due to the absence of normal distribution curve. They are as follows

a. Descriptive statistics were calculated for factors mentioned in table 3.1.

b. Frequencies and percentages were calculated for all the 20 factors with respect to above performers and below performers as compared with standard norms in Linguistic Skills and Reading Comprehension.
c. In order to examine the relationship between Linguistic Skills and Reading Comprehension as well as factors such as number of siblings, age at testing, age at diagnosis of hearing loss, duration of deafness, age at using of hearing aid, duration with hearing aid, age at implantation, duration with cochlear implant, and duration of training, spearman’s correlation coefficient was computed.

d. In order to examine the influence of factors such as gender, mother’s occupation, mode of communication, speech intelligibility, and type of training before formal schooling, Mann-Whitney U test was used.

e. In order to examine the influence of factors such as father’s occupation, father’s education, mother’s education, cause of hearing loss, class in school, and academic achievement, Kruskal-Wallis one way ANOVA test was used.