

**EFFICACY OF HEARING AND USAGE
IN CHILDREN**

REG. NO. M9519

AN INDEPENDENT PROJECT SUBMITTED AS PART
FULFILMENT OF FIRST YEAR M.SC. (SPEECH AND HEARING)
TO THE UNIVERSITY OF MYSORE,
MYSORE.

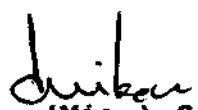
ALL INDIA INSTITUTE OF SPEECH AND HEARING :
MYSORE - 570 006
MAY 1996.

**Dedicated to
DHANYA**

CERTIFICATE

This is to certify that this Independent Project entitled :
"Efficacy of hearing aid usage in children" is the bonafide work
in part fulfilment for the First Year M.Sc. (Speech and Hearing)
of the student with Reg. No. M9519.

Mysore
May 1996


Dr. (Miss) S. Nikam
Director
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Mysore - 6.

CERTIFICATE

This is to certify that this Independent Project entitled :
"Efficacy of hearing aid usage in children" has been prepared
under my supervision and guidance.



Handwritten signature of Dr. (Miss) S. Nikam in cursive script.

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Mysore
May 1996

DECLARATION

I hereby declare that this Independent Project entitled :
"Efficacy of hearing aid usage in children" is the result of my own study under the guidance of Dr. (Miss) S. Nikan, Prof, and Head of the Department of Audiology, All India Institute of Speech and Hearing, Mysore and has not been submitted earlier at any University for any other Diploma or Degree.

Mysore
May, 1996.

Reg. No. M9519

ACKNOWLEDGEMENTS

I am greatly indebted to **Dr. (Miss) S. Nikan**, Prof. and Head of the Department of Audiology, All India Institute of Speech and Hearing, Mysore, for her valuable guidance through out the project.

My heartfelt thanks to **Dr. (Miss). S. Nikan**, Director, All India Institute of Speech and Hearing, Mysore, for allowing me to undertake this project.

My sincere thanks to **Mrs. Manjula** and **Mrs. Vanaja** for their valuable and timely help at each stage of this study.

I thank Dr. Basavaiah RIE, Mysore for providing answers to my statistical queries.

I thank the library staff for providing me with the necessary books and journals.

My parents : **Who** have always been there to support and encourage me.

Chickku : Not everybody is lucky enough to have a lovable sister and a wonderful and supportive friend all rolled into one.

Pradeep : Thank you for being a great friend.

Swapna : We can cry and laugh and be happy together.

Bindu and **Skeena** : You among the best of gifts in my life.

Thanks for all my friends at AIISH who has helped me throughout this project.

Kiran : Thank you for your encouragement and bits of advice which has always pulled me through.

Last but not the least, I thank '**Precision Computers**' for their efficient work.

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INTRODUCTION

Human Communication is action,
It is culture, it is history of man,
It is the fabric of all societies
Its absence negates man's existence

Toubbch (1973)

Hearing impairment is one of the most handicapping condition which interferes with effective communication. This is especially true of children where the hearing impairment has profound influence on the child's - psychological development, educational achievements and vocational or economic future. Even mild moderate hearing loss will distort and retard the hearing impaired child's development of speech and language. The early, appropriate and supervised use of hearing aid is probably the single most important therapeutic tool we have to assist these children (whose condition is not surgically or medically correctable). (Ross, 1970).

Viewed historically a transition has occurred in aural rehabilitation. The first ten years of this century had shown an extensive reliance on visual modality as well as manual communication. In the 1940's and 1950's there was a transition towards the increasing use of amplification, though the high technology of today was not available then. In the present era amplification has made a great impact.

The amplification system used by the aurally handicapped can be divided into those that can be worn on person and the desk type. The personal devices are further divided into air conduction and bone conduction aids. Under the air conduction aids we have the body level hearing aid, behind-the-ear, spectacle type, in-the-ear type, and in-the-canal type. Under the bone conduction aid we have the body-level and spectacle type. In the desk type we have the hard-wire-systems and frequency modulated systems (F.M system) which are widely used.

Since we are dealing with body-level hearing aids in this study, we shall consider this in detail. It has the following parts (1) Mic (2) Amplifier (3) Power-supply enclosed in a case attached to the body (4) External receiver (5) Cord which attaches the body of the hearing aid to the receiver. As with the other instruments this has its own merits and demerits.

No matter how carefully the aid is chosen, the usefulness depends on the acceptance of the aid, knowledge about the aid, management and adjustment to the aid and above all the adequacy of the instrument.

Hearing aid is a delicate device that is susceptible to unwanted changes in the sound handling properties - failure to amplify the sound, intermittent sound etc. Hence the individual should be aware of this and should have the knowledge to correct these dysfunctions which in turn increases the efficacy of usage.

A daily checking procedure involving the following should be carried out

I. Make a visual inspection of the aid and the mould

a) Are the switches in the recommended positions on-off switch, volume control, tone control Mic, telecoil switch.

b) Are the battery contents clean and do they make appropriate contact with the battery?

Is the battery insulated properly?

Does the compartment close appropriately?

Does the battery have sufficient voltage to operate?

c) Is the earmold appropriate? Is the sound channel free of dust and cerumen?

Is the receiver mold coupling secure and tight?

d) Are the cord connections secure?

Is the insulation material on the cord intact?

II. Listening to the hearing aid.

a) Turn the hearing aid on and listen carefully as the gain control is rotated. Are there any jumps in the loudness?

Is there a static noise while the wheel is rotated?

Does the gain control wheel turn easily?

- b) Set the hearing aid at the user level and listen to determine if speech sounds are distorted? Hold the hearing aid in various positions and determine if position has an effect on performance.
- c) Shake the cord and see if it produces intermittent performance or static noise.
- d) Check for acoustic feedback.

Care of the hearing aid should be emphasised along with instructions for hearing aid usage and repair.

In the case of young children the monitoring of hearing end is carried out by parents, teachers or speech - language pathologists. Some children take a long duration to adjust to the hearing aid. They often cannot report changes in the hearing aid functioning. How early the child does this will again increase the benefits derived from the hearing aid.

Kamalini Pillai (1985) investigated certain aspects of hearing aid usage in children using a questionnaire. These being the usage of hearing aid in varying situations, the process of putting on and removing the aid, switching and adjusting the controls and cleaning the mold. Results have shown that while most of the children know a part of the process of putting an and removing the aid, a majority have to be taught things like switching on the aid, fixing mold to the receiver etc. Very few were reported to clean the mold themselves.

The present study aims at studying,

- 1) The extent to which children are able to operate, take care and maintain their hearing aids. This was correlated with
- 2) the number of years of hearing and usage
- 3) the intelligence

Justification for this study :

This study aims at studying the extent to which children are able to operate, take care and maintain their hearing aids, this being correlated with number of years of hearing aid usage and intelligence. Kamalini Pillai (1985) investigated some of these aspects and there has been no similar study since then. Hence there is need to investigate the present status regarding this particular aspect. This inturn would help use to improve the counseling procedures.

METHODOLOGY

The present study aims at evaluating the maintenance and usage of hearing aids by the body-level-hearing aid users. This inturn is expected to provide an insight into the need for stressing on hearing aid care and maintenance during counseling.

Fifty hearing impaired children consisting of 27 males and 23 females were included in the study. All of them were evaluated and were prescribed body-level hearing aids by audiologist. These children were either attending therapy at a speech and hearing center or had come for re-evaluation during the period 1/2/96 to 31/3/96.

They were in the age range 2 years to 12 years. The mean age was 4.6 years and the median 5.7 years. The duration of hearing aid usage ranged from 1 month to 6 years.

This group was heterogeneous with regard to the type and degree of hearing loss. The type of hearing loss was SN or mixed and the degree varied from moderate to profound loss.

Questionnaire :

The questionnaire chosen for the study contained items regarding the usage and maintenance of hearing aid. There was a total of 31 questions under four categories

- I. Duration of hearing and usage.
- II. How independent is the child in using the hearing aid.

III. How well can your child take care of his/her hearing aid.

IV. What is your opinion on the following.

These questions were taken mainly from HA-4 questionnaire that was developed by the Department of Audiology (AIISH) A few modifications were made which the investigator found was relevant to the topic under study.

These modified questions were evaluated by 2 qualified audiologists. The questions were further modified based on their suggestions.

PROCEDURE :

The questionnaire was administered on the parents of hearing impaired chosen for the study. They were provided adequate information regarding the purpose of this study direct administration of the questionnaire was carried out.

Information regarding intelligence quotient was collected from their respective files.

Statistical Analysis :

Descriptive Statistical Analysis was carried out to tabulate the data. They were represented as the percentage of responses for each of the items under study. ANOVA was applied to study the relation between number of years of hearing aid usage and efficacy of usage. Product-moment coefficient of correlation was used to correlate the efficacy of hearing aid usage with intelligence quotient.

RESULTS

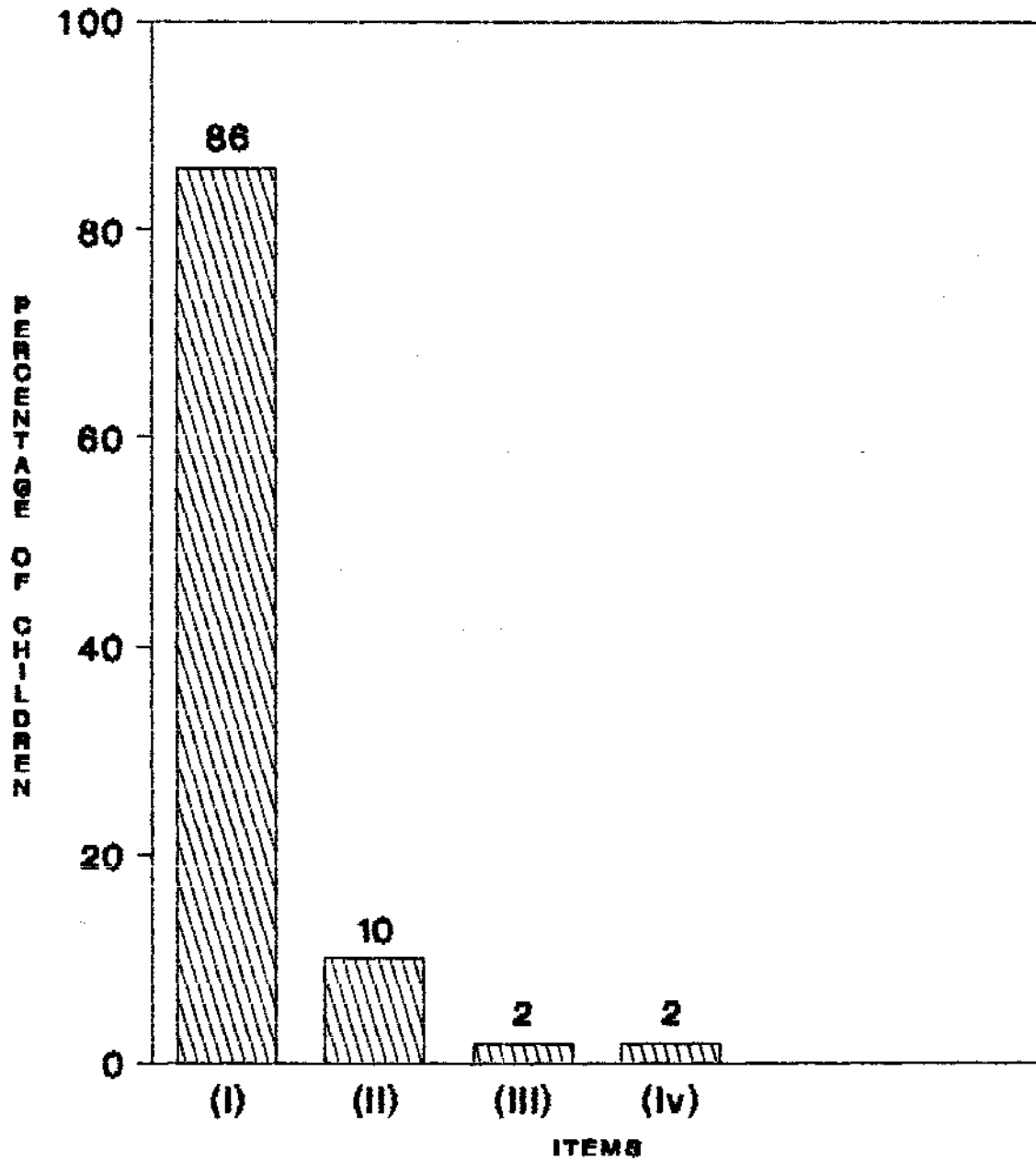
The questionnaire was tabulated using descriptive statistics. Percentage analysis was used to tabulate the data. ANOVA was used to correlate the efficacy of usage with the number of years of hearing aid usage. Product-moment coefficient of correlation was used to correlate the efficacy of hearing aid usage with intelligence quotient.

I. Duration of hearing aid usage

- 1) Since when has your child been using the hearing aid.
The duration of hearing aid usage varied from 1 month to 6 years.
- 2) For how long does your child wear the hearing aid in a day?

	Options	Number	Percentage
i)	Wears the hearing aid throughout the day	43/50	86%
ii)	Wears the hearing aid for 2-3 hours at a stretch	5/50	10%
iii)	Wears for an hour at a stretch	1/50	2%
iv)	Allow to put it on but removes immediately	1/50	2%
v)	Does not wear at all	0/50	0%

**Fig 1: Duration of hearing aid usage
(in a day)**



(i)-Wears it throughout the day;(ii)-Wears for 2-3 hrs; (iii)-Wears for an hr at a stretch; (iv)-Removes immediate

II. How independent is your child in using the hearing aid.

3) Does your child know what a harness is?

Options	Number	Percentage
Yes	43/50	86%
No	7/50	14%

Those children who did not know what a harness is; had been using the hearing aid for less than 1 year.

4) does your child wear the harness on his/her own.

Options	Number	Percentage
Yes	34/50	68%
No	16/50	32%

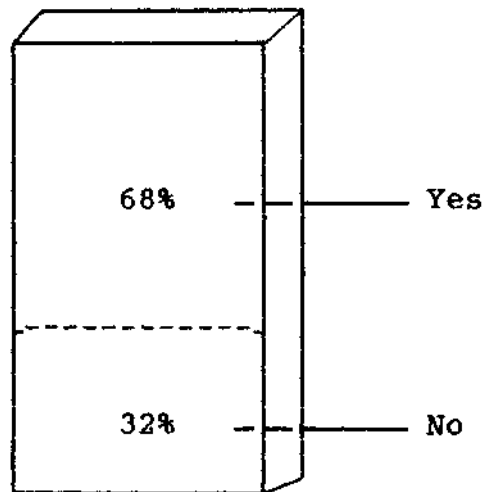


Fig 3 : Wears own harness

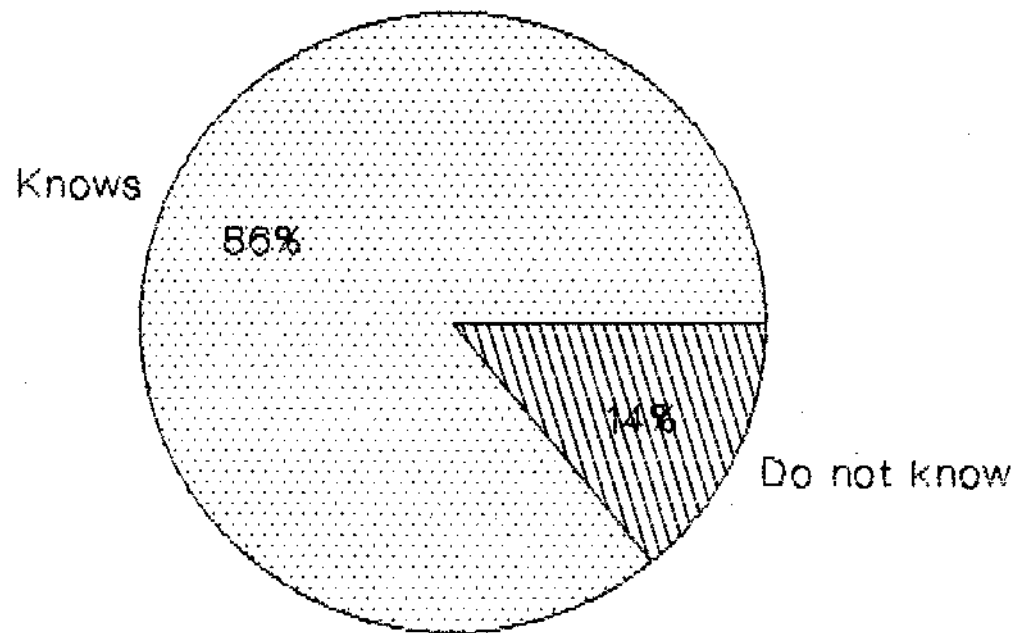


Fig 2 : Knowledge regarding what a hearing aid is

The children who could not wear the harness on their own were below 2 1/2 years of age.

5) Does your child wear the hearing aid on his/her own or does he/she need help?

Options	Number	Percentage
Yes	34/50	68%
No	16/50	32%

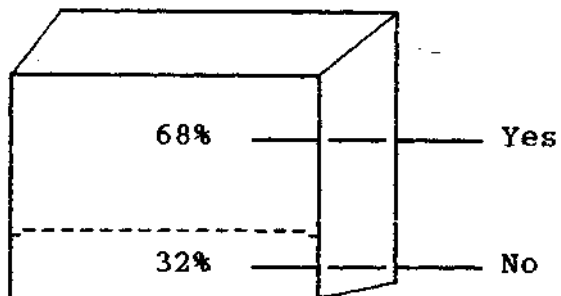


Fig 5 : Wears own hearing aid

The children who could not wear the hearing aid on their own were below 2 1/2 years of age.

6) Does he/she know about the volume control.

Options	Number	Percentage
Yes	26/50	52%
No	24/50	48%

The Children Who knew about the volume control had used the hearing aid for a period of at least 3 1/2 years.

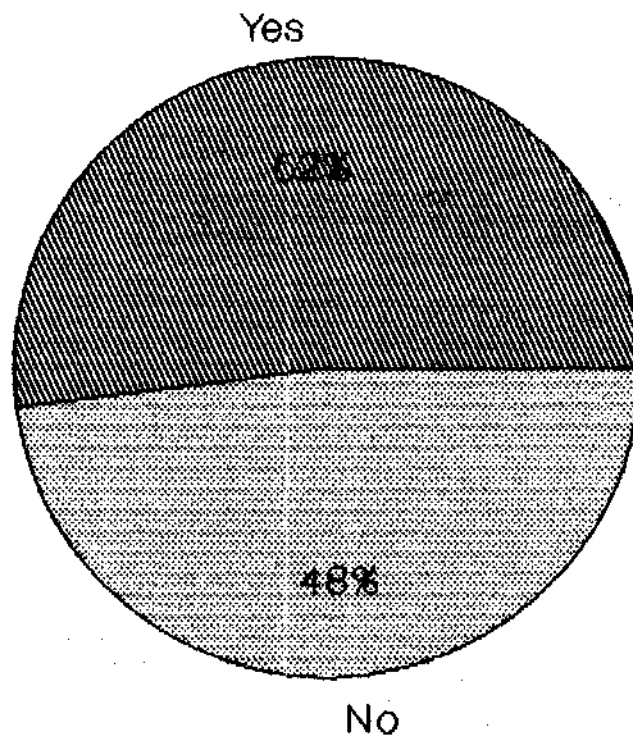


Fig 5 : Knowledge about Volume Control

7) Does your child set the volume control to,

Options	Number	Percentage
i) Recommended level	21/50	42%
ii) Higher level	11/50	22%
iii) Lower level	2/50	4%

Those children who could set the volume control to the recommended level had used the hearing aid for a period of 4 years and above. One of them who had used the hearing aid for 1 year, two of them who had used for 2 - 2 1/2 years and one of them who had used the hearing aid for 3 1/2 years, could also set the volume control to the recommended level.

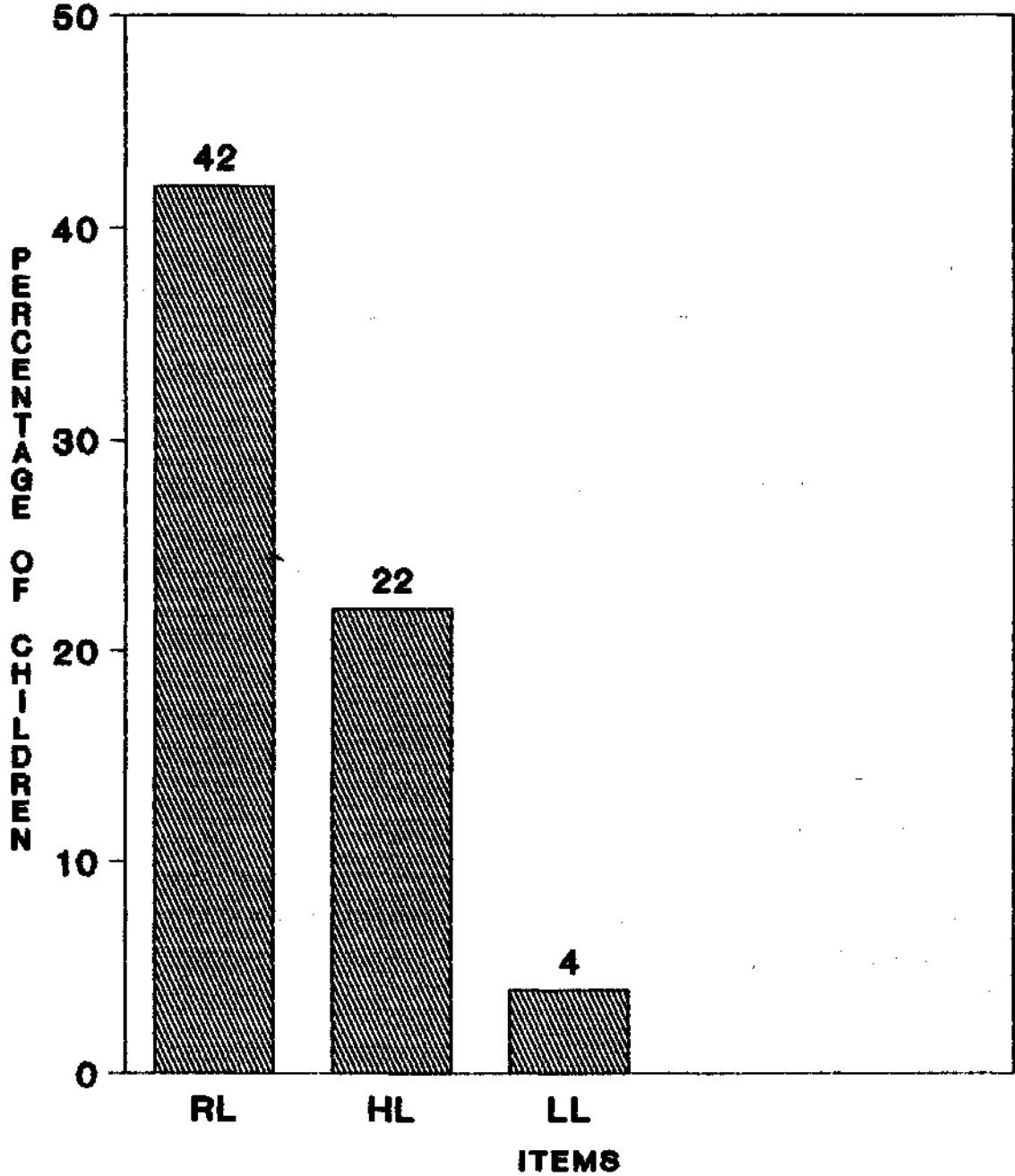
8) Is your child aware of the tone control setting.

Options	Number	Percentage
Yes	13/50	26%
No	37/50	74%

The awareness regarding tone control setting did not show any consistent relation with the number of years of hearing aid usage, age or the intelligence quotient.

9) Have you noticed your child setting the tone control to a particular position?

Fig 6 : Setting the Volume Control



HL - Recommended Level;
HL - Higher Level,
LL - Lower Levels

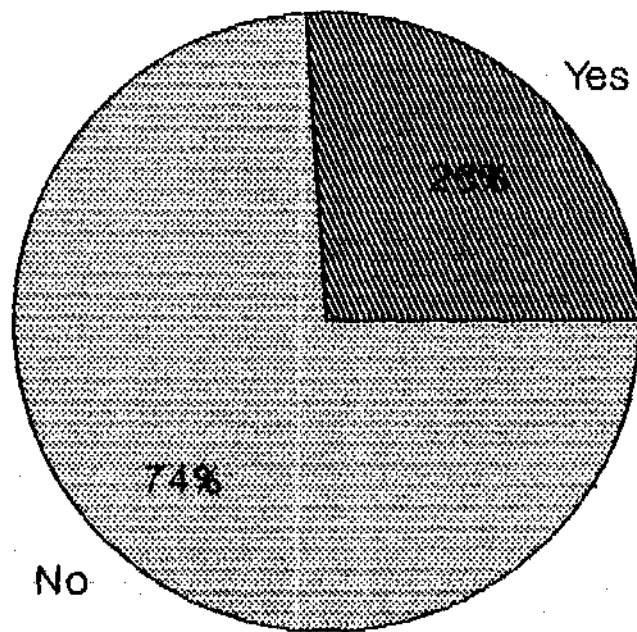


Fig 7 : Awareness of tone control setting

Options	Number	Percentage
Yes	13/50	26%
No	37/50	74%

Those children who were aware of the tone control setting were found to set it to a particular position.

10) If yes, is this to

Options	Number	Percentage
i) Recommended position	11/13	84%
ii) Other position	2/13	15%

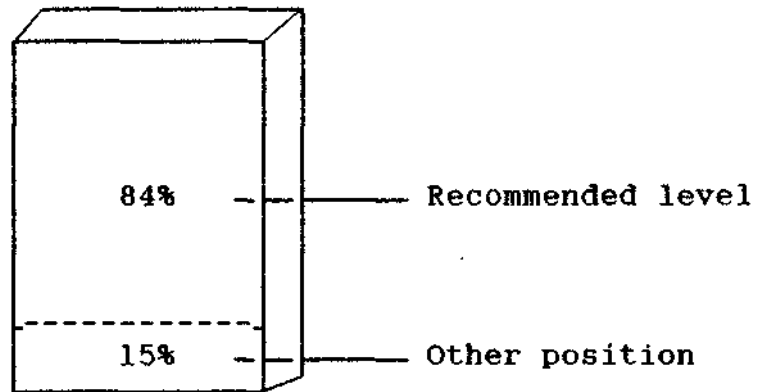


Fig 9 : Specific setting of tone control

Among those children who could set the tone control, 84 percent could set it to the recommended position.

11) Does your child do the following while wearing the hearing aid.

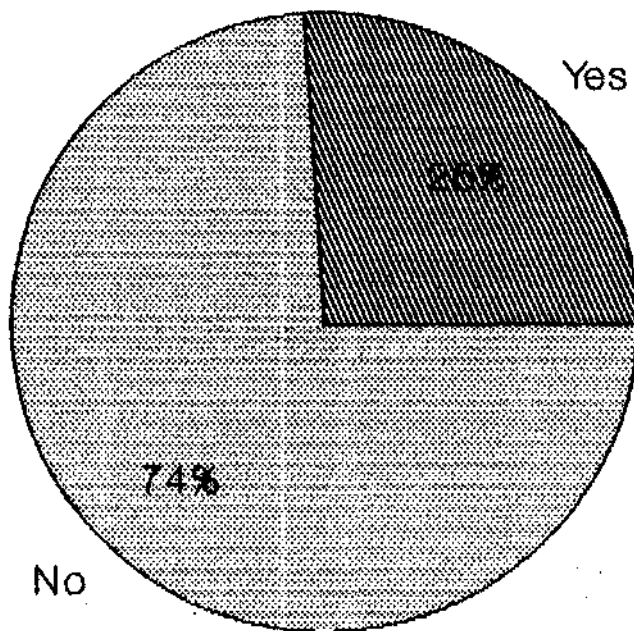


Fig 8 : Setting the tone control

(i) Open and close the battery compartment.

Options	Number	Percentage
Yes	30/50	60%
No	20/50	40%

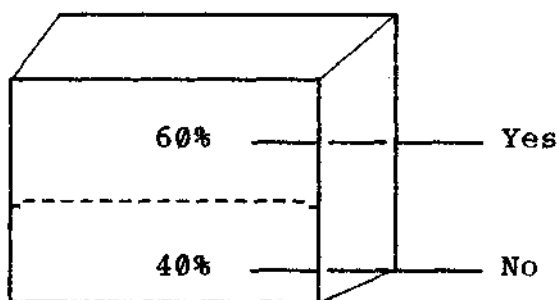


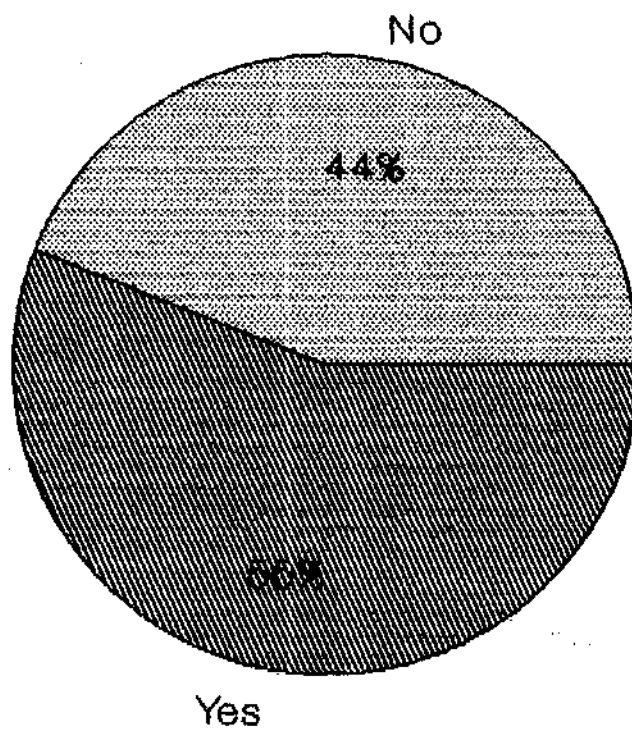
Fig 10 (i) : Opening and closing the battery compartment

All children above the age range of 3 1/2 years were able to open and close the battery compartment. Five children in the age range of 2 1/2 - 3 1/2 were also able to open and close the battery compartment.

ii) Insert the battery properly, i.e, +ve against positive and -ve against negative.

Options	Number	Percentage
Yes	28/50	56%
No	22/50	44%

Children above 5 years of age were able to insert the battery properly. In the younger age group, no correlation was



(ii)
Fig 11: Insertion of battery

found between the age, number of years of hearing aid usage and intelligence quotient.

iii) Fix the earmold to the receiver.

Options	Number	Percentage
Yes	36/50	72%
No	14/50	28%

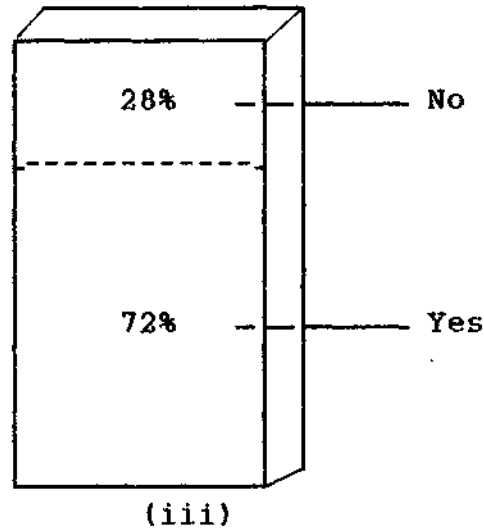
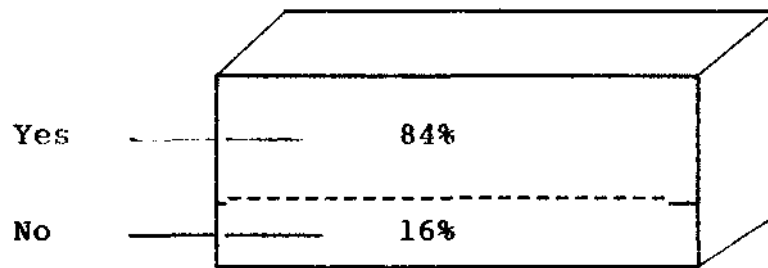


Fig 12 : Fixing the earmold to the receiver

Children who had used the hearing aid for 3 years and above were able to fix the earmold to the receiver. Two children who had used the hearing aid for 1 1/2 years, three of them who had used for 2 1/2 years could also fix the mold to the receiver; correctly.

iv) Insert the mold in the ear.

Options	Number	Percentage
Yes	42/50	84%
No	8/50	16%



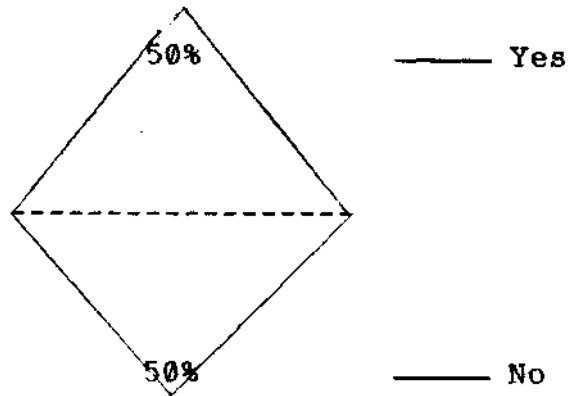
(iv)

Fig 13 : Inserting the mold in the ear

All the children whose duration of hearing aid usage was below 6 months and 4 children whose duration of hearing aid usage was 1 year - 1 1/2 year were unable to insert the mold in the ear.

v) Connect the cord to the hearing aid and receiver appropriately.

Options	Number	Percentage
Yes	25/50	50%
No	25/50	50%



(v)

Fig 14 : connecting the cord appropriately

Children who had used the hearing aid for over 3 years were able to connect the cord to the hearing aid appropriately.

vi) Insert the dust cover

Options	Number	Percentage
Yes	8/8	100%
No	0/8	0%

It was found that a majority of the children studied did not use the dust cover for the hearing aid. Among those who used the dust cover all of them could insert the dust cover appropriately.

vii) Switches on the hearing aid.

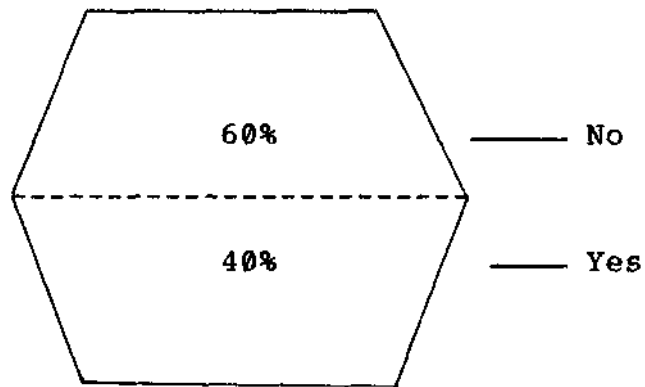
Options	Number	Percentage
Yes	41/50	82%
No	9/50	18%

Those children who could not switch on the hearing aid, no correlation was found with the number of years of hearing aid usage, age and intelligence quotient.

12) While using the hearing aid, does your child

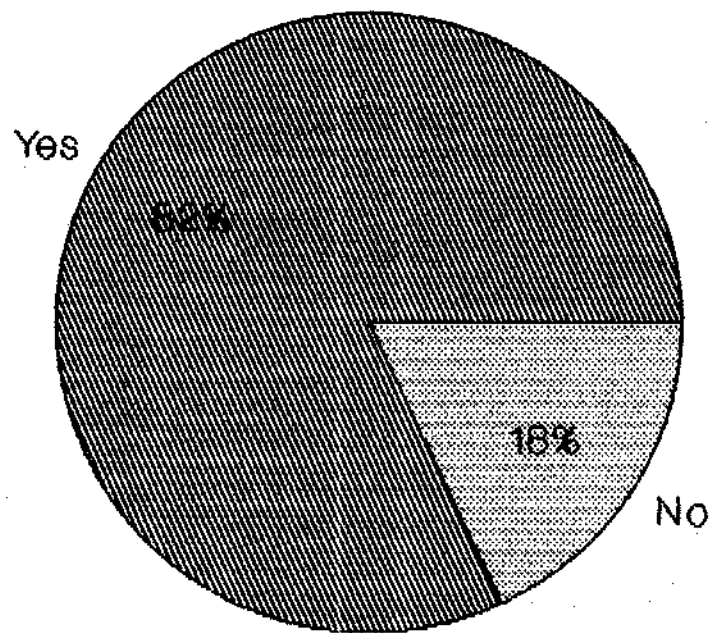
(i) Increase or decrease the volume control depending on his/her requirement.

Options	Number	Percentage
Yes	20/50	40%
No	30/50	60%



12 (i)

Fig 16 : Increasing and decreasing the volume control according to requirement



11 (vii)
Fig 15 : Switching on the hearing aid

Majority of the children could not vary the volume control according to the requirement. Those who had used the hearing aid for more than 4 1/2 years were able to do this. In the younger age group results were scattered.

(ii) Turns down the volume control when hears a very loud sound

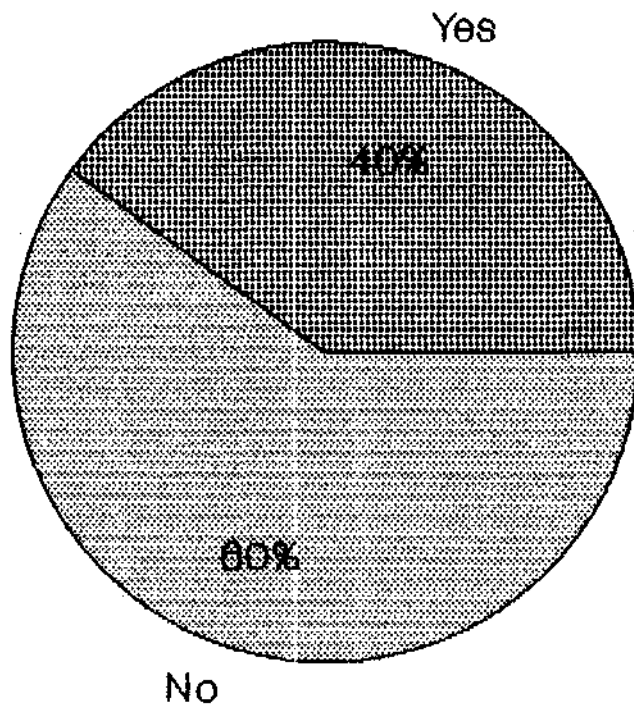
Options	Number	Percentage
Yes	20/50	40%
No	30/50	60%

Those children who could vary the volume control according to their requirement were able to reduce it when there was very loud sound.

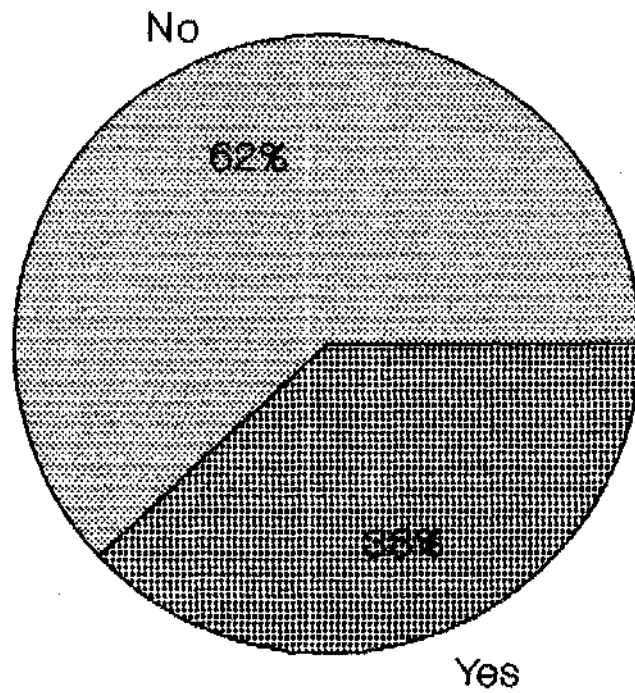
(iii) Turns down the volume control when there is noise? (Market Place/vehicle sd)

Options	Number	Percentage
Yes	19/50	38%
No	31/50	62%

This did not show any relation with the number of years of hearing aid usage, age and the intelligence quotient of the children.



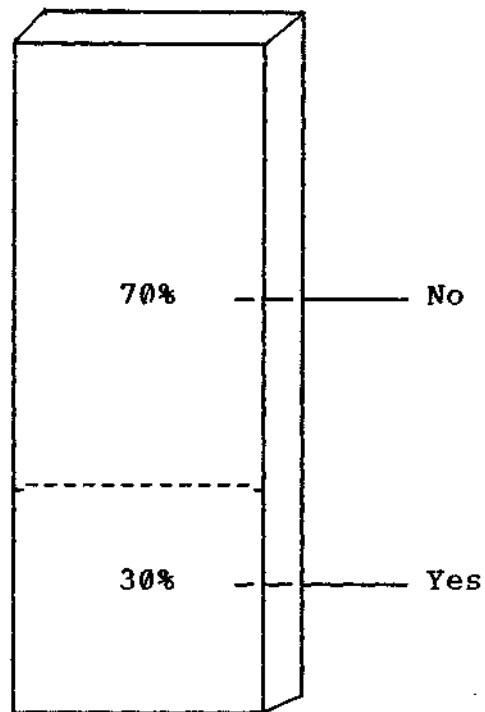
12 (ii)
Fig 17 : Turning down the volume control
in response to loud sound



12 (iii)
**Fig 18 : Turning down the volume control
in response to noise**

iv) Turns down the volume control when there is squeal.

Options	Number	Percentage
Yes	15/50	30%
No	35/50	70%



(iv)

Fig 19 : Turning down the volume control in response to squeal

All the children who had used the hearing aid for a period of over 4 1/2 years were able to turn down the volume control when there was squeal. One child who had used the hearing aid for 2 years and two children who had used it for 3 years could turn down the volume control when there was squeal.

(V) Increase the volume control when he/she doesn't hear any sound/when sound is weak.

Options	Number	Percentage
Yes	20/50	40%
No	30/50	60%

All children who had used the hearing aid for a period of 4 1/2 years, three of them who had used for 4 - 4 1/2 years, two who had used for 3 - 3 1/2 years and one child who had used for 2 1/2 years could increase the volume when there was no sound.

13) Does your child do the following while removing the hearing aid.

(IT Turns down the volume control

options	Number	Percentage
Yes	22/50	44%
No	28/50	56%

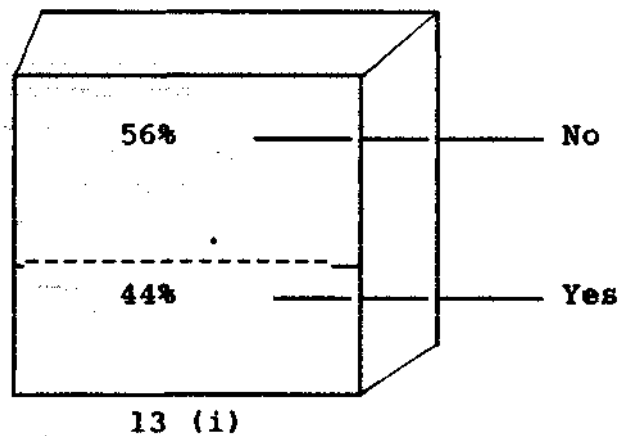
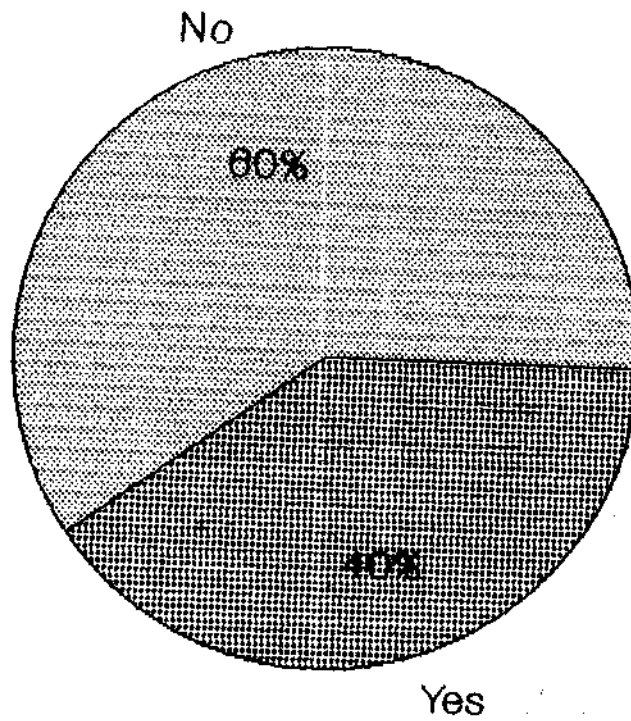


Fig 21 s Turning down volume control

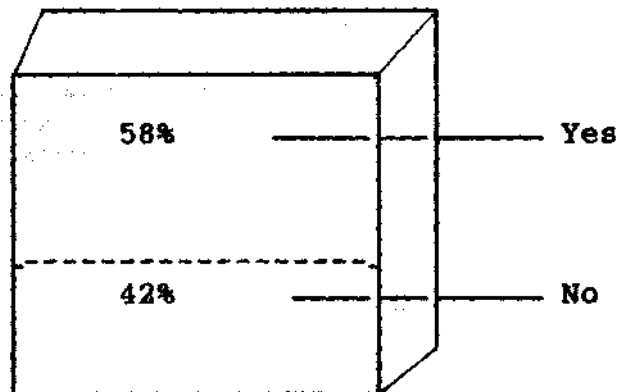


(v)
Fig 20 : Increasing the volume control
when sound is weak

All the children who had used the hearing aid for over 4 1/2 years, five of them who had used for 3 1/2 - 4 1/2 years, three of them who had used for 3 - 3 1/2 years, and one each who had used for 2 years and 1 1/2 years could turn down the volume control.

(it.) Switches off the hearing aid

Options	Number	Percentage
Yes	29/50	58%
No	21/50	42%



13 (ii)

Fig 22 : Switching off the hearing aid

All children who had used the hearing aid for over 3 years and one each who had used for 2 1/2 years, 2 years and 1 1/2 years could switch off the hearing aid.

(iii) Removes the mold from the ear.

Options	Number	Percentage
Yes	44/50	88%
No	6/50	12%

Those children who could not remove the mold from the ear, three of them were in the age range of 2 - 2 1/2 years and three of them were using the hearing aid for a period of 1-3 months.

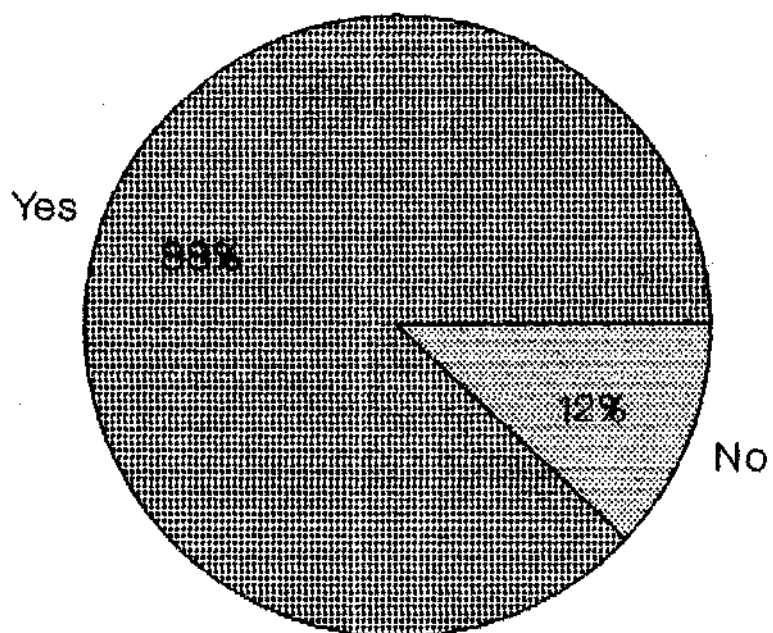
(iv) Removes the hearing aid from the harness.

Options	Number	Percentage
Yes	44/50	88%
No	6/50	12%

Among those children who could not remove the hearing aid from the harness four of them were in the age range of 2 - 2 1/2 years and two of them had been using the hearing aid for a period of 1 month.

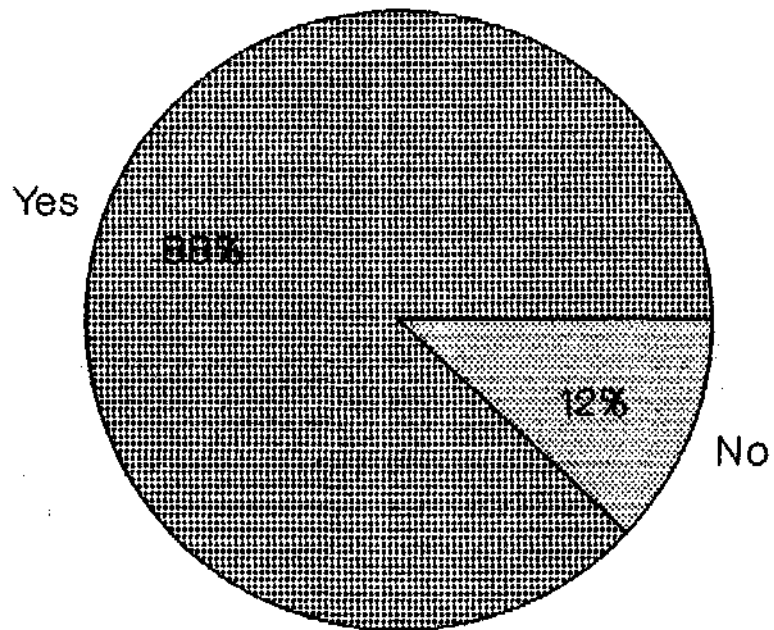
(v) Removes the battery

Options	Number	Percentage
Yes	25/50	50%
No	25/50	50%

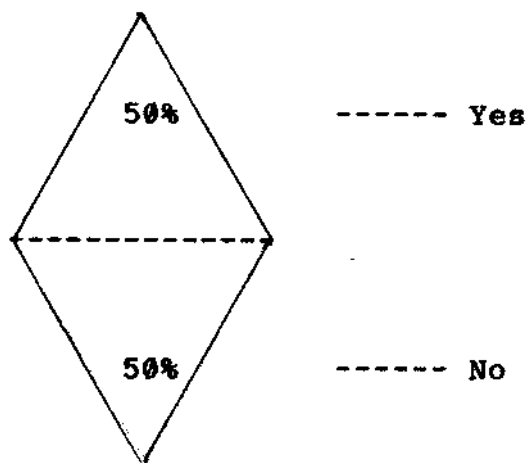


(iii)

Fig 23 : Removing the mold from ear



13 (iv)
Fig 24 : Removing the hearing aid from harness



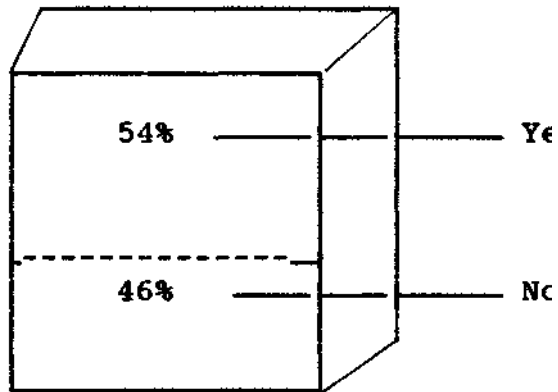
(V)

Fig 25 : Removing the battery

Children above 5 1/2 years of age and those who have used the hearing aid for more than 3 1/2 years were able to remove the battery.

(vi) winds the cord carefully and loosely round the hearing aid.

Options	Number	Percentage
Yes	27/50	54%
No	23/50	46%



13 (vi)

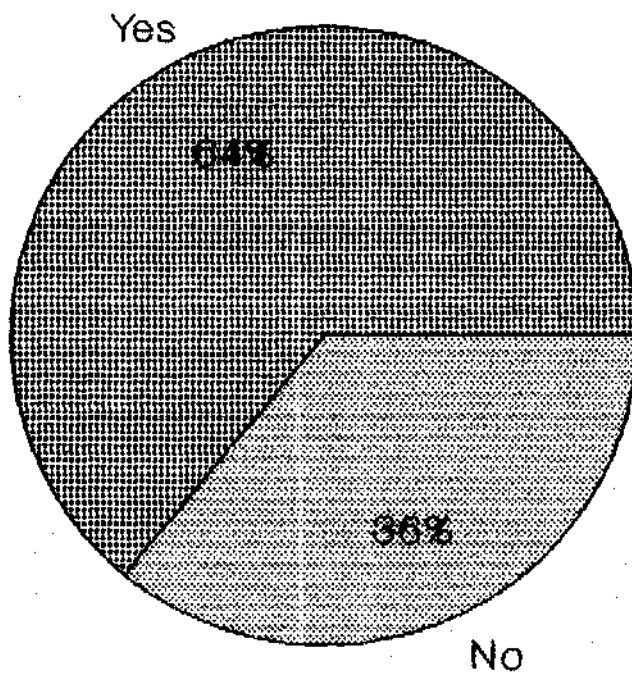
Fig 26 : Winding the cord loosely and carefully round the hearing aid.

Children below 2 1/2 years of age could not wind the cord carefully and loosely round the hearing aid. Four children in the age range of 2 1/2 - 3 1/2 years could not wind the cord carefully and loosely round the hearing aid.

vii) Replace the hearing aid carefully inside the box.

Options	Number	Percentage
Yes	32/50	64%
No	18/50	36%

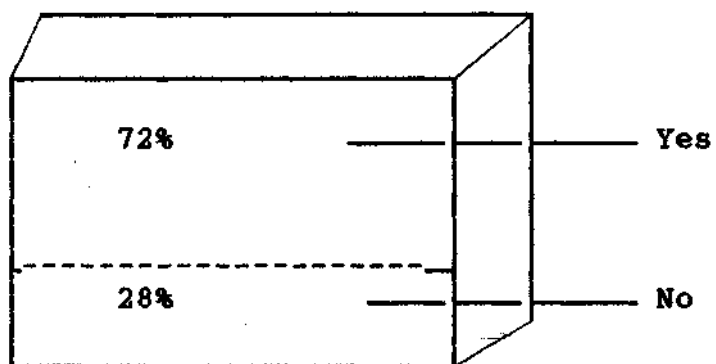
Children below 3 years of age and 3 children in the age range of 2 1/2 - 4 years could not replace the hearing aid inside the box.



(vii)
**Fig 26 : Replacing the hearing aid
inside the box**

(viii) Removes the harness.

Options	Number	Percentage
Yes	36/50	72%
No	14/50	28%



13 (viii)

Fig 27 : Removing the harness

Children below 3 1/2 years of age could not remove the harness on their own. One child, 6 years of age also reports that, she could not remove the harness.

14) Does your child indicate correctly when the hearing aid is not working?

Options	Number	Percentage
Yes	38/50	70%
No	12/50	24%

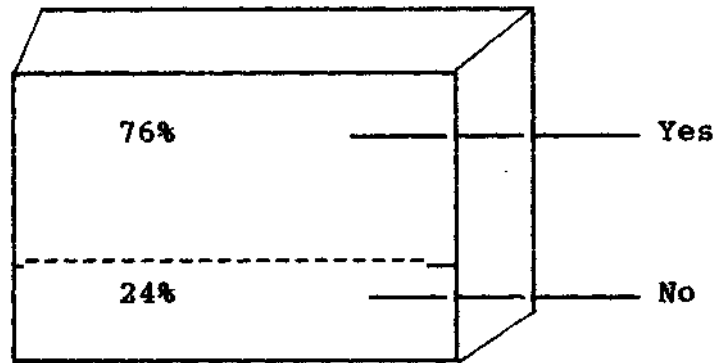


Fig 28 : Indicating correctly when the hearing aid is not working.

Children who had used hearing aid for less than 1 year, one child who had used for 1 1/2 year, two of the children who had used for 1 1/2 - 2 years and one child who had used for 2 1/2 year could not correctly indicate when the hearing aid stopped working.

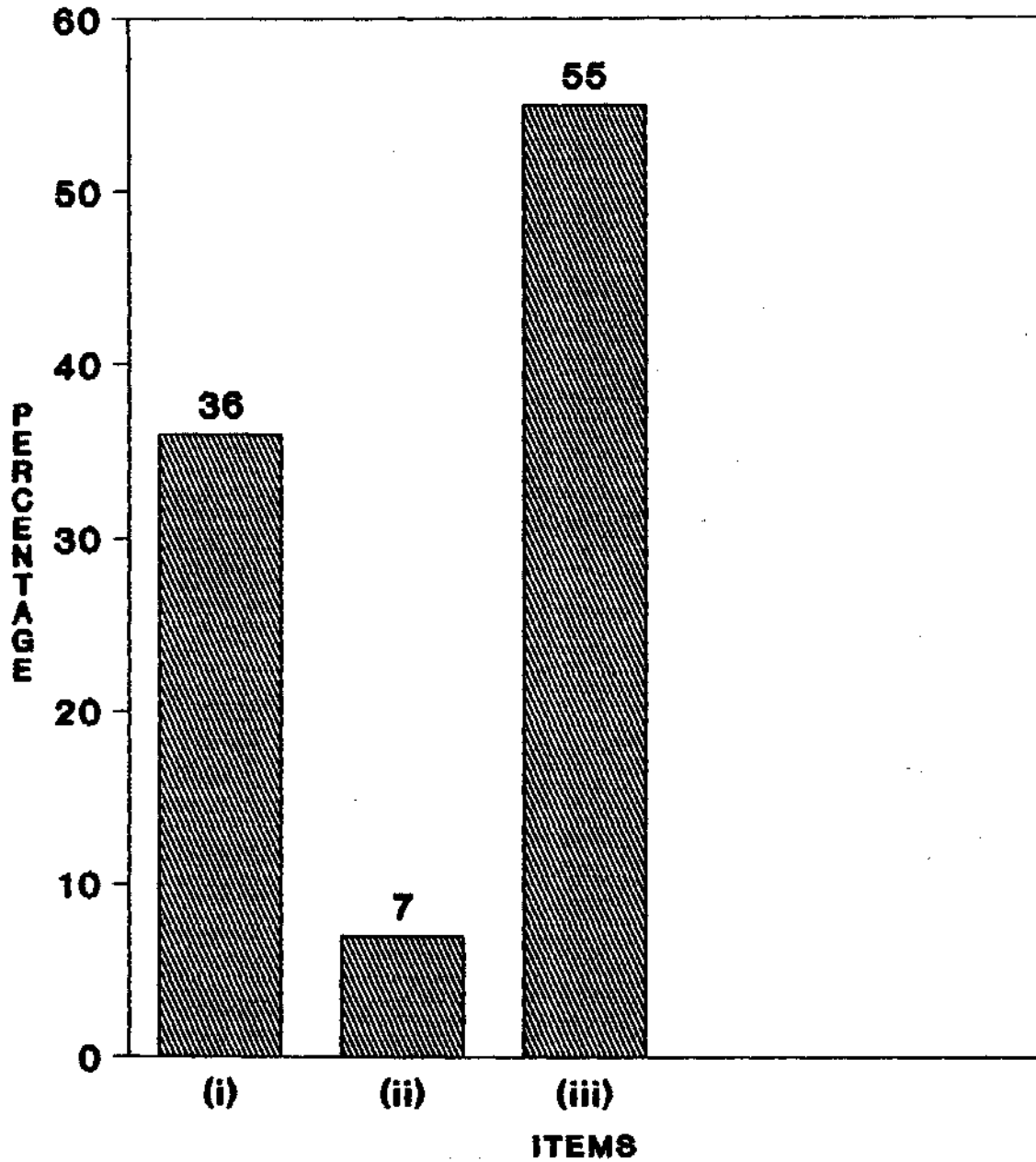
15) If yes, how does he/she do this.

Options	Number	Percentage
i) by gesture	14/38	36%
ii) Removes and keeps the hearing aid	3/38	7%
iii) through speech	2/38	5%

16) If yes, does he/she report of

Options	Number	Percentage
i) No sound	30/38	78%
ii) Intermittent sound	3/38	7%
iii) Sound only in one receiver	5/38	13%

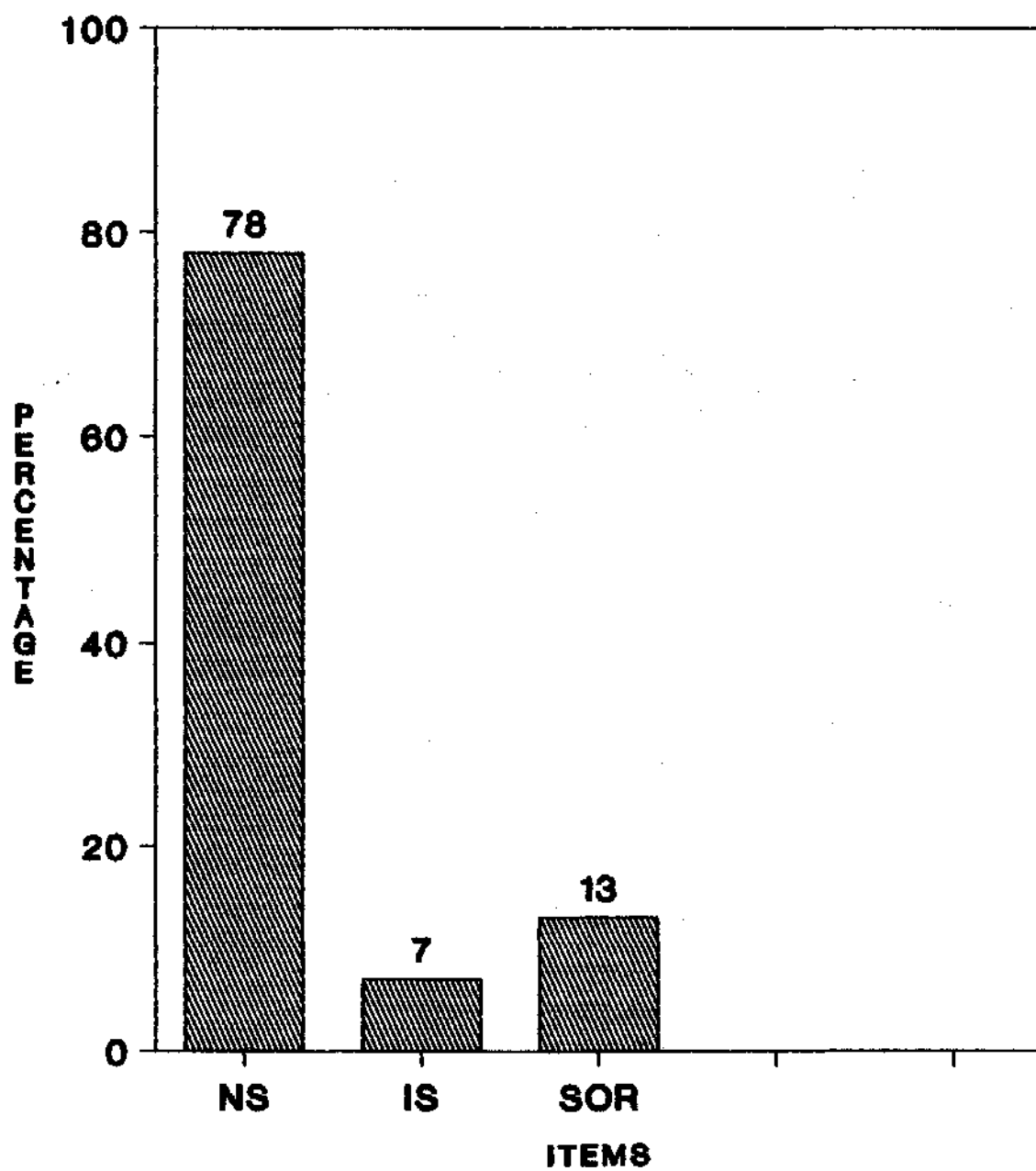
Fig 29 : Mode used for indicating the hearing aid is not working



(15)

(i) - Gestures; (ii) - Removing the aid
(iii) - Speech

Fig 30 ; Specificity in reporting the working of a hearing aid



(16)

NS - No Sound; IS - Intermittant Sound
SOR - Sound in only One Receiver

17) If your child is using 2 hearing aids does he/she correctly recognise when one of them stops functioning.

Options	Number	Percentage
Yes	12/19	63%
No	7/19	36%

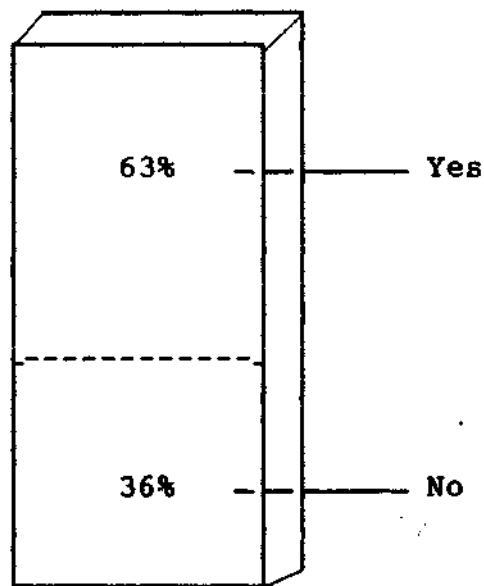


Fig 31 : Recognising when one of the aids stop working.

Those children who could not recognise correctly when the hearing aid stops functioning belonged to the younger age group. It would have been better if information regarding the duration of binaural hearing aid usage was available

18. Does your child put the hearing aid to 'T' position while using a telephone

Options	Number	Percentage
Yes	0/50	0%
No	50/50	100%

None of the children selected for the study, were found to use the 'T' position while using telephone. This aspect needs to be stressed upon during counselling.

19. Does your child identify his/her own hearing aid if more than one person is using the hearing aid at home.

Options	Number	Percentage
Yes	10/19	53%
No	9/19	47%

Among the 19 children, who had other hearing aid users at home 53 percent could identify their own hearing aid. The specific criterion used by these children were not studied.

20) Does your child purchase the battery for the hearing aid on his/her own.

Options	Number	Percentage
Yes	14/50	28%
No	36/50	72%

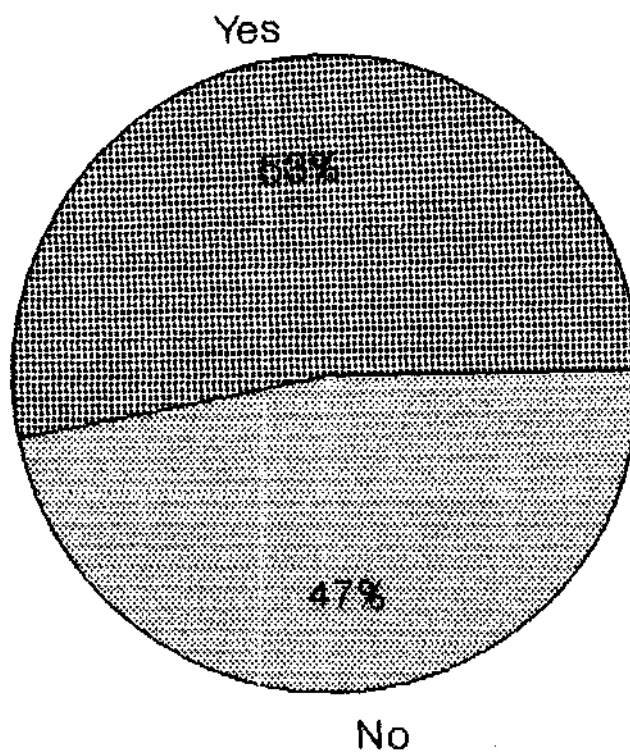


Fig 32 : Identifying ones own hearing aid

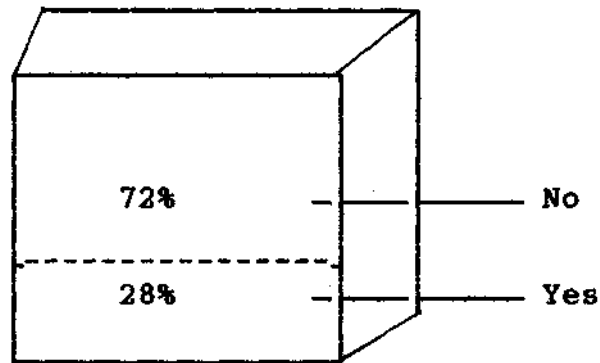


Fig 33 : Purchasing battery on ones own.

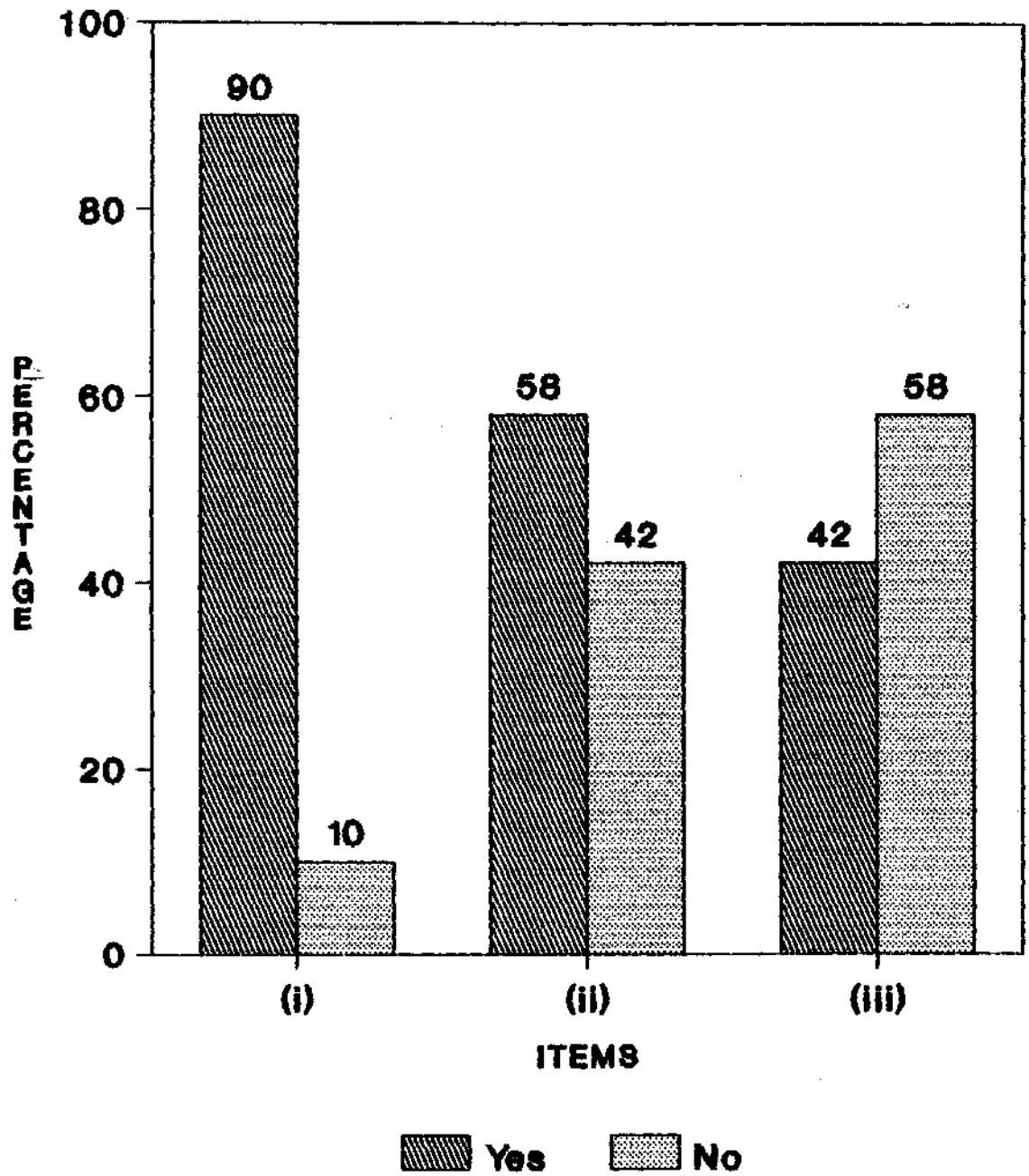
Children above the age of 6 years could purchase the battery on their own for the hearing aid.

21) Does your child know when the hearing aid is to be removed?

	Options	Number	Percentage
i) While taking both	Yes	45/50	90%
	No	5/50	10%
ii) When sleeping	Yes	29/50	58%
	No	21/50	42%
iii) When it rains	Yes	21/50	42%
	No	29/50	58%

Those children who did not know that hearing aid is to be removed while taking bath, had used the hearing aid for less than 8 months. With respect to removing the aid while sleeping and raining, the children who had used the hearing aid for less than 1 year had poorer performance; while among the other groups the performance was scattered.

**Fig 34 : Knowledge regarding when the
ald is to be removed**



22) Does your child know that hearing aid is not to be placed on or near electric gadgets.

Options	Number	Percentage
Yes	0/50	0%
No	50/50	100%

While counseling the case this aspect needs serious attention as the results indicate that none of the children were aware of this.

23) Does your child handle the hearing aid carelessly - chewing the cord, throwing the aid?

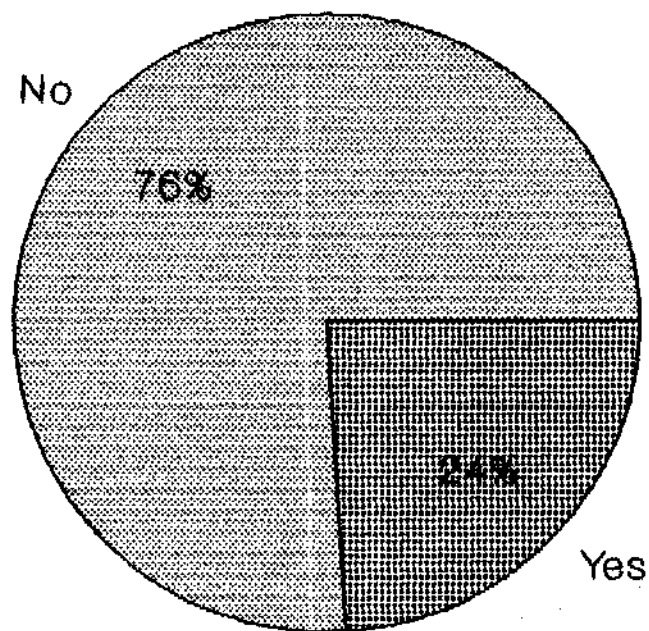
Options	Number	Percentage
Yes	12/50	24%
No	38/50	76%

Children above 3 1/2 years of age were careful in handling the hearing aid.

24) If yes, what have you done for the same.

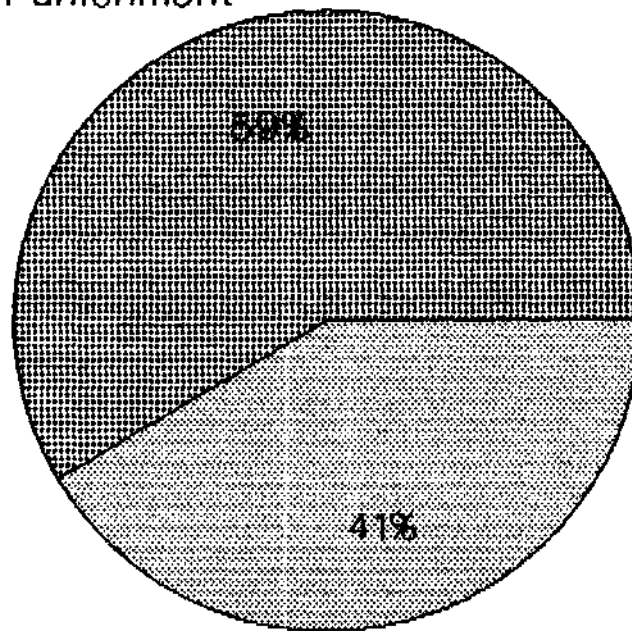
The parents handled the children in two ways.

Strategy used by parents	Number	Percentage
(i) Punishment	7/12	58%
(ii) Explanation	5/12	41%



(23)
Fig 36 : Careless handling of hearing aid

Punishment



Provide explanation

(24)

Fig 36 : Parental Responses

25) Does your child clean the mold on his/her own without being asked.

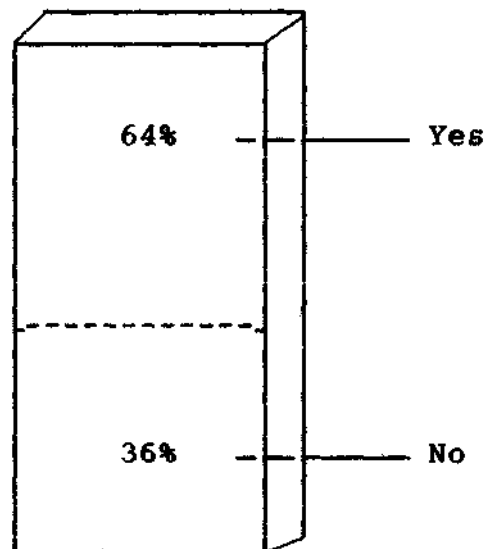
Options	Number	Percentage
Yes	19/50	28%
No	36/50	72%

All the children who had used the hearing aid for over 4 1/2 years and two children who had used the hearing aid for 4 - 4 1/2 years were able to clean the mold on their own without being asked.

26) Does he/she do the following.

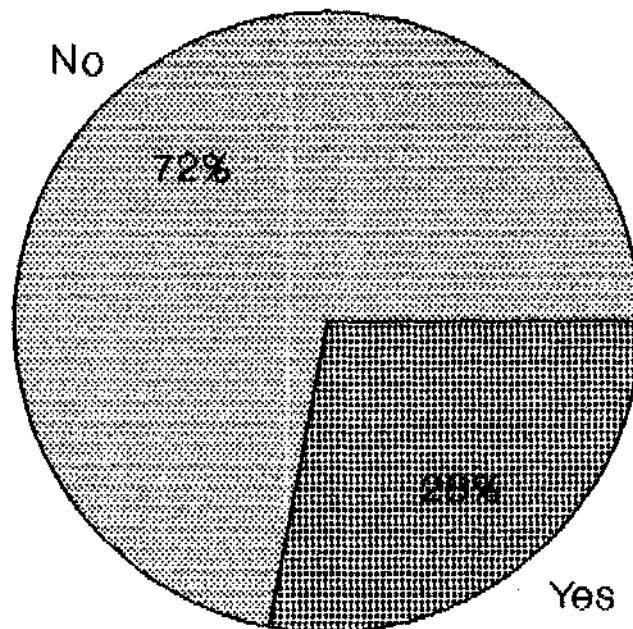
(i) Removes the receiver from mold

Options	Number	Percentage
Yes	32/50	64%
No	18/50	36%



26 (i)

Fig 38 : Removing the receiver from mold.



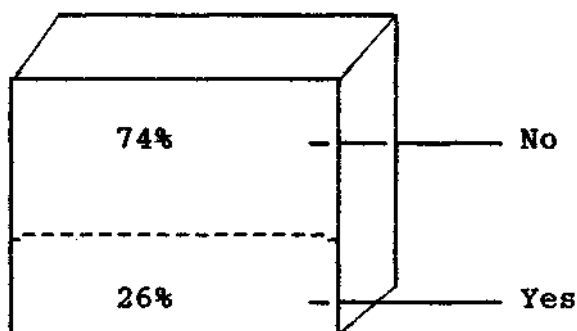
(26)

Fig 37 : Clean the mold on his/her own

Children who had used the hearing aid for less than 1 1/2 years, two children who had used the hearing aid for 1 1/2 - 2 years, three children who had used it for 2 - 2 1/2 years and two children who had used for 2 1/2 - 3 years could not remove the receiver from mold.

(ii) Prepares lukewarm water.

Options	Number	Percentage
Yes	13/50	26%
No	37/50	74%



26 (ii)

Fig 39 : Preparing lukewarm water

Majority of the children could not prepare lukewarm water. Among those who could do this were girls of the older age range (above 7 years). A few children in the younger age group could also do this.

(iii) Cleans the mold

Options	Number	Percentage
Yes	15/50	30%
No	35/50	70%

Majority of the children could not clean the mold by themselves. Those who could do this varied widely in their age, number of years of usage of hearing aid and intelligence quotient.

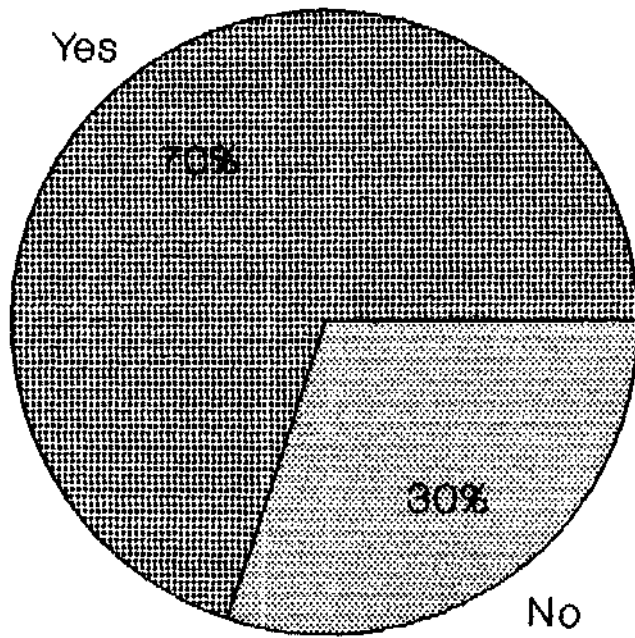
(iv) Snaps the mold on the receiver.

Options	Number	Percentage
Yes	21/50	42%
No	29/19	58%

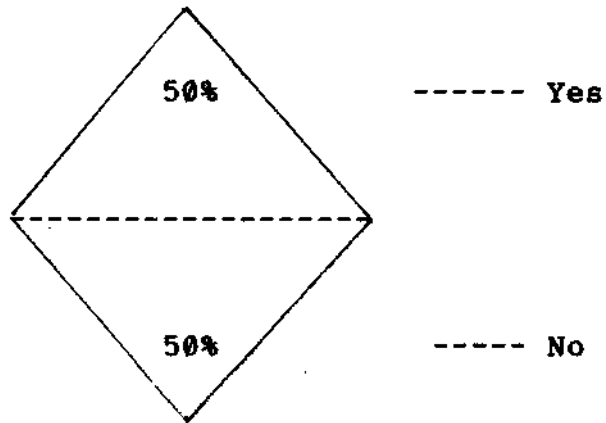
Majority of the children could not snap the mold on the receiver. No relation was found between the number of years of usage, age and intelligence quotient of the child and the ability to carry out this activity.

27) Does your child wear the hearing aid to school?

Options	Number	Percentage
Yes	25/50	50%
No	25/50	50%



26 (iii)
Fig 40 : Cleaning the mold



(27)

Fig 41 : Wearing hearing aid to School

Those children who were attending school were reported to wear the hearing aid to school.

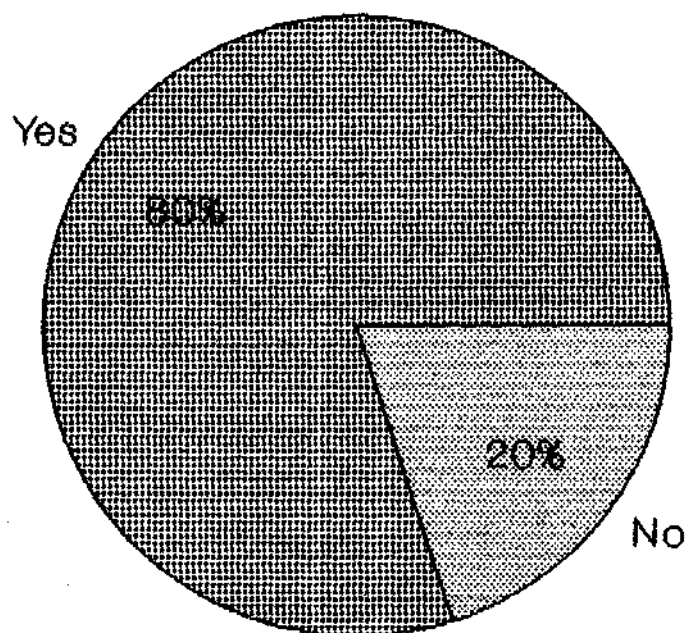
28) Does your child take care of hearing aid and protect from being damaged by other children?

Options	Number	Percentage
Yes	40/50	80%
No	10/50	20%

The younger age group of 2 years - 3 years were the ones who could not take care of their hearing aid.

iv) What is your opinion of the following.

29) Do you think that it is better that your child is taught to wear the hearing aid on his/her own?



(28)
Fig 42 : Taking care of the hearing aid

30) Do you think that your child should learn to take care of and maintain the hearing aid.

Results show that all parents (100%) felt that the child should learn to wear the hearing aid and to take care and maintain hearing aid on his/her own.

31) If your child has not learn the above mentioned are you willing to

Options	Number	Percentage
i) Teach on your own	40/50	80%
ii) Teach after consulting a specialist	10/50	20%
iii) Others	None	

Though majority of the parents were willing to teach on their own, others were willing to teach after consulting a specialist. One of them opined that both of these should be done simultaneously.

The next aim of the study was to correlate the extent to which children are able to operate, take care, maintain the hearing aid with the number of years of hearing aid usage. ANOVA was used for the same. It was found that the value was significant at 0.01 level indicating that number of years of usage is a variable affecting efficiency of hearing aid usage.

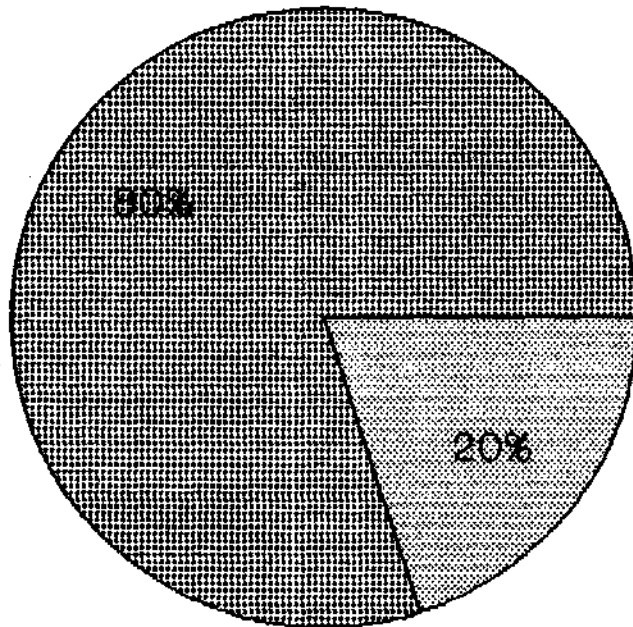


Fig 43 : (31)
Parental Opinion

No. of years of hearing aid usage		No. of children
0	6 months	4
6 months	- 1 year	4
1.0 year	- 1.5 year	3
1.5 year	- 2.0 year	3
2.0 year	- 2.5 year	4
2.5 year	- 3.0 year	6
3.0 year	- 3.5 year	4
3.5 year	- 4.0 year	5
4.0 year	- 4.5 year	5
4.5 year	- 5.0 year	4
5.0 year	- 5.5 year	5
5.5 year	- 6.0 year	3

The final aim was to correlate the extent to which children are able to operate, take care, maintain the hearing aid with the intelligence quotient. Product-moment coefficient of correlation was used and the results showed high positive correlation of 0.89. Hence intelligence quotient is a significant factor in deciding the efficacy of hearing aid usage.

I.Q. range	Efficacy
70 - 79	41.29%
80 - 89	44.82%
90 - 99	45.56%
100 - 109	68.40%

DISCUSSION

There are not many studies reported in literature regarding the efficacy of hearing aid usage in children. The present study aims to study this particular aspect.

The first aspect studied was the duration of hearing aid usage. 86% of the subjects reported that they wore the hearing aid throughout the day. This high percentage of hearing aid usage indicates increased awareness regarding the usage of amplification. 14 percent of the children reported of varying degrees of duration of hearing aid usage. This could be because they have not attained sufficient adjustment to amplification system or their expectation from the hearing aid is more than the actual benefit provided. The next aspect studied was children's awareness of what a harness is 14 percent of them did not know what a harness was. This could be because they were beginning hearing aid users and also since they were placing the hearing aid in the shirt pocket.

The next aspect investigated was whether the children were able to wear the harness on their own 32 percent of them who could not do this were below 2 1/2 years of age and also the parents were unwilling to allow the to carry out this task.

With regard to the knowledge about the volume control, 52 percent knew about the functioning of the volume control while 48 percent were unaware of this.

Regarding the manipulation of volume control, 42 percent of them were found to set the volume control to the recommended position. 22 percent were found to set it to the higher level; This could be due to the lack of adequate auditory o/p from the recommended settings or the cells were weak. 4 percent of them were found to set the volume control to a level lower than the recommended level. This could be due to the increased auditory o/p received at the recommended level.

The next aspect studied was with regard to the effective usage of volume control. 60 percent of them were unable to vary the volume control according to the requirement. This could be due to lack of awareness regarding the functioning of volume control or due to lack of adequate auditory input from the hearing aid which was being used.

With respect to the awareness of the tone control settings, 74 percent of the children were unaware of this. This could be because tone control settings are not manipulated in daily life situations, to the extent to which volume control is being manipulated.

Regarding the opening and closing of battery compartment and inserting the battery appropriately it was found that the children in the older age group performed better than the younger children. Fixing the earmold to the receiver, inserting the mold in the ear and connecting the cord to the hearing aid appropriately were related to the period of hearing aid usage.

All those children who used the dust cover for their hearing aid could insert it appropriately. 18 percent of the children could not switch on the hearing aid. This could be because they haven't learnt this task which could be due to the lack of opportunity.

The next aspect studied was with regard to the removal of hearing aid. 44 percent of them could turn down the volume control and 58 percent could switch off the hearing aid when it is to be removed. This was found to be related to the duration of hearing aid usage. Few of the children who could carry out this task with lesser duration of hearing aid usage could be due to the training received at home in carrying out these tasks. 88 percent of the children could remove the mold from the ear. This could be due to the simplicity of the task involved. 12 percent of the children could not remove the hearing aid from the harness. This could be because they belonged to the younger age group and also they had been using the hearing aid for a short duration (of < 1 year) . 50 percent of them were found to remove the battery while the other 50 percent could not do this. This also could be due to the young age of the children and also due to the lack of knowledge regarding the manipulations of battery compartment. Winding the cord carefully and loosely round the hearing aid, replacing the hearing aid carefully inside the box and removing the harness were found to be easier for the older age group than the younger age. This could be related to the adequate motor skill required for the task and the availability of opportunity to carry out this task.

It was found that 76 percent of the children could correctly indicate when the hearing aid stopped functioning. While 24 percent could not do this. This could be related to the duration of hearing aid usage as well as the availability of auditory clues to the child. 36 percent of them indicated that hearing aid is not functioning by gestures, 55 percent used speech and 7 percent was found to remove and keep the hearing aid aside. This could be related to the mode of communication frequently used by the child. 78 percent of the children reported of no sound, 7 percent reported of intermittent sound and 13 percent that of sound in a single receiver. This indicates that only a small percentage of them were specific in their responses. From the above findings, it can be implied that effective monitoring of the hearing aid is required to ensure the maximum benefit from the hearing aid. Its best if the child is able to monitor his/her own hearing aid.

Patrick and Arlie Adam ('84) suggested routine monitoring by parents, teachers, audiologists and the child to confirm peak hearing aid performance. **Coleman C72)** monitored the hearing aids worn by 25 preschool hearing impaired children during a school year and found that 40% - 50% were unsatisfactory. They report of gross frequency response changes in the hearing aids.

Thus it becomes necessary to teach the children to monitor the hearing aid to ensure the maximum benefit from the hearing aid.

Among those children using 2 hearing aids 63 percent could correctly recognise when one of them stopped functioning. This could be related to the duration of binaural hearing aid usage, the degree of hearing loss in each ear, and the amount of auditory input received.

With respect to the usage of 'T' position none of them used this setting. This could be due to lack of knowledge regarding the positioning of hearing aid while using 'T' position and also the telephone being not used at home. This is one of the important areas to be stressed in counselling.

With respect to identifying ones own hearing aid, 53 percent could identify this own hearing aid. It would have been interesting if this aspect was studied in detail as to what are the criterion used by children to identify their own hearing aid.

With respect to purchasing the battery for the hearing aid 78 percent could not do this while 23 percent could do this. This could be due to the lack of opportunity and the younger age of the children.

90 percent of the children knew that the hearing aid is to be removed while taking bath, 58 percent knew that its to be removed while sleeping and 42 percent while going out in the rain. Better responses with respect to bathing and sleeping could be because these are daily activities and hence child learns faster.

It was found that none of the children knew that the hearing aid is not to be placed on electric gadgets. It was observed that parental knowledge regarding this aspect was also limited. This could be the main reason why the children were unaware of this.

24 percent of the children were found to handle the hearing aid carelessly. This could be attributed to the behavioural problems, temper tantrums and also inadequate adjustment to the hearing aid. Luterman ('74) suggested that the quality of maintenance of child's hearing aid may reflect the parents acceptance of youngster's hearing loss. This in turn helps in predicting the hearing aid usage (Clarke and Hovarth '79).

With respect to cleaning the mold on their own it was found that only 28 percent could do this. 78 percent could not do this. This could be due to younger age and inadequate opportunity for carrying out this activity.

64 percent were found to remove the mold from the ear, 26 percent could prepare lukewarm soap water, 30 percent could clean the mold and 42 percent could snap the mold to the receiver correctly. The small percentage of responses obtained for these items could be because they rely more on parents for cleaning the mold.

As for wearing the hearing aid to school, all the children attending school were reported to wear the hearing aid to school. This is a very high percentage of response. Northern Etal ('72) reported regarding hearing aid usage that 81 percent of preschoolers and 67 percent of elementary schoolers wore hearing

aid. In the present study we have obtained better responses regarding hearing aid usage by school going children. This is indicative of a very good awareness regarding the usage of hearing aid.

With respect to taking care of the hearing aid, 80 percent were found to take care of their hearing aid and protect it from being damaged by other children.

It was reported that effective hearing aid usage by children was related to the parental attitude towards the hearing aid and hearing impairment (Clark and Hovarth '79). In the present study it was noticed that all parents had the opinion that it is better that the children are taught to wear the hearing aid on their own and that they should learn to take care and maintain the hearing aid. 80 percent of the parents wanted to teach children by themselves, 20 percent thought that it is better that it is taught after consulting a specialist.

When IQ was correlated with the efficacy of usage of hearing aid, using the product-moment coefficient of correlation a high correlation of 0.89 was obtained. This shows that efficacy of hearing aid usage is directly related to the intelligence of this individual.

When the number of years of hearing aid usage was correlated with efficacy, using ANOVA a high significance was obtained. This shows that the efficacy of hearing aid usage varies with the number of years of hearing aid usage.

Role of counseling in the efficacy of hearing aid usage has been widely recognised. Adequate guidance given to the parents regarding, the hearing aid usage in turn improves the efficacy of usage of hearing aid by the child. Brooks ('81) reported that the percentage of under users can be reduced by counselling. Thus its important to recognise the significance of various aspects considered in this study and apply them effectively in the counseling sessions for the parents of the hearing impaired.

SUMMARY AND CONCLUSION

The aims of the present study was to evaluate the efficacy of hearing aid usage in children who were recommended body level hearing aids. This was further correlated with the number of years of hearing aid usage and the intelligence.

The data was collected using a questionnaire and direct interview was used.

Fifty hearing impaired children who were using body level hearing aid was used for the present study. Their age ranged from 2 years to 12 years. The mean age was 4.6 years and the median was 5.7 years. The statistical procedure used were percentage, Product Moment Coefficient of Correlation and ANOVA.

Based on the result the following conclusions can be drawn.

I. Duration of hearing aid usage :

Results are indicative that 86 percent of the children used the hearing aid throughout the day. The duration of hearing aid usage varied from 6 months to 6 years.

A small percentage of them wore the hearing aid from shorter duration. This could be due to the interactive effect of number of years of hearing aid usage as well as intelligence quotient.

II. Independence is using the hearing aid :

Except for manipulating the volume control and tone control more than fifty percent of the children were independent in using the hearing aid. This could be due to lack of awareness on part of the parents regarding the effective manipulation of volume control; due to which the children are unable to carry this out.

Usage of 'T' position has not been reported by any. This could be because they do not use telephone at home and also the lack of awareness regarding the correct usage of this.

III. Maintenance of the hearing aid :

Most of the children take care of their hearing aid on their own. The major areas where they lag is in cleaning the earmolds. This could be because most of the mothers do not allow them to do this by themselves. None of them were aware that the hearing aid is not to be placed on electric gadgets. This could be one of the major areas where counseling is required.

IV. Parental Opinion :

All the parents felt that children should learn to take care of and maintain their hearing aids. Most of them opted for teaching these on their own while a small percentage reported that the best way to go about this is to consult a specialist.

RECOMMENDATIONS

- 1) Parents should be consulted regarding the varying aspects of hearing aid care and maintainance.
- 2) Children should be included in the counselling sessions for the hearing aid care and maintainance as this increases the efficacy of hearing aid usage.
- 3) Regular follow-up programmes should be advised during counselling.
- 4) Camps on hearing aid care and maintainance should be conducted.
- 5) Further survey can be carried out on the parental attitude influencing the efficacy of hearing aid usage in children.

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APPENDIX

Dear Parents/Guardians,

We are sure that you would be interested in knowing about the hearing aid your child is using. We have here, a set of questions which would help to assess the same. If your child has already learnt quite a lot, you can be sure that the hearing aid is safe with him/her, and he/she can handle it to receive the maximum benefit from the instrument. But if he/she is still a long way to go you may start teaching him/her now.

Instructions

We have here a set of 31 questions put a ' ' against your choice. For those question which require a longer answer, space is provided.

Name of the hearing aid user

Age/Sex

Case no.

Provisional diagnosis

IQ

Name of the person answering

Relationship of this person to the hearing aid user

How many hearing aids does he or she use?

What type of cord does he/she use?

What type of receiver does he/she use?

I. Duration of hearing aid usage

1) Since when has your child been wearing the hearing aid?

Months/years

2) For how long does your child wear the hearing aid in a day?

i) Wears the hearing aid throughout the day. Yes/No

ii) Wears the hearing aid for 2-3 hours at a Yes/No stretch.

iii) Wears the hearing aid for an hour at a Yes/No stretch.

- iv) Allows to put on the hearing aid but removes it immediately. Yes/No
 - v) Does not wear the hearing aid at all Yes/No
- II. How independent is your child in using the hearing aid?
- 3) Does your child know what a harness is? Yes/No
 - 4) Does your child wear the harness on his/her own? Yes/No
 - 5) Does your child wear the hearing aid on his/her own or does he/she need help? Yes/No
 - 6) Does he/she know about the volume control (i.e., turning the volume to higher position increases the volume and turning it down reduces the volume)? Yes/No
 - 7) Does your child set the volume control to
 - i) recommended level Yes/No
 - ii) higher level Yes/No
 - iii) lower level Yes/No
 - 8) Is your child aware of the tone control setting? Yes/No
 - 9) Have you noticed your child setting the tone control to a particular position? Yes/No
 - 10) If yes, is this to
 - i) the recommended position Yes/No
 - ii) other positions Yes/No
 - 11) Does your child do the following while wearing the hearing aid?
 - i) Open and close the battery compartment Yes/No
 - ii) Insert the battery properly i.e., +ve against positive and -ve against negative Yes/No
 - iii) Fix the earmould to the receiver Yes/No
 - iv) Insert the mold in the ear Yes/No
 - v) Connect the cord to the hearing aid and receiver appropriately. Yes/No

- | | | |
|---|--|--------|
| vi) | Inserts the dust cover. | Yes/No |
| vii) | Switches on the hearing aid | Yes/No |
| 12) While using the hearing aid, does your child : | | |
| i) | Increases or decreases the volume control depending on his/her requirement | Yes/No |
| ii) | Turns down the volume control when he/she hears a very loud sound | Yes/No |
| iii) | Turns down the volume control when there is noise (vehicle sound/Market place) | Yes/No |
| iv) | Turns down the volume control when there is squeal. | Yes/No |
| v) | Increases the volume control when he/she does not hear any sound/when the sound is weak. | Yes/No |
| 13) Does your child do the following while removing the hearing aid? | | |
| i) | Turns down the volume control | Yes/No |
| ii) | Switches off the hearing aid | Yes/No |
| iii) | Removes the mold from the ear | Yes/No |
| iv) | Removes the hearing aid from the harness | Yes/No |
| v) | Removes the battery | Yes/No |
| vi) | Winds the cord carefully and loosely round the hearing aid | Yes/No |
| vii) | Replace the hearing aid carefully inside the box. | Yes/No |
| viii) | Removes the harness | Yes/No |
| 14) Does your child indicate correctly when the hearing aid is not working? | | |
| 15) If yes, how does he/she do this: | | |
| i) | by gestures | Yes/No |
| ii) | removes and keeps the hearing aid | Yes/No |
| iii) | through speech | Yes/No |

- 16) If yes, does he/she report of
- i) no sound Yes/No
 - ii) intermittent sound Yes/No
 - iii) sound only from one receiver Yes/No
- 17) If your child is using and hearing aids, does he/she correctly recognise when one of the aids stop functioning and report accordingly? Yes/No
- 18) Does your child put the hearing aid to the 'T' position, while using a telephone? Yes/No
- 19) Does your child identify his/her own hearing aid if more than one person is using the hearing aid at home? Yes/No
- 20) Does your child purchase the battery for the hearing aid on his/her own? Yes/No
- III. How well can your child take care of his/her hearing aid. Yes/No
- 21) Does your child know when the hearing aid is to be removed?
- i) when taking bath Yes/No
 - ii) when sleeping Yes/No
 - iii) when it rains Yes/No
- 22) Does your child know that the hearing aid is not to be placed on electric gadgets and does this accordingly? Yes/No
- 23) Does your child handle the hearing aid carelessly- chewing the cord, pulling the cord, throwing the aid? Yes/No
- 24) If yes, what have you done for the same?
- 25) Does your child clean the mold on his/her own without being asked? Yes/No
- 26) Does he/she do the following
- i) Removes the receiver from the mold Yes/No
 - ii) Prepares lukewarm soap water Yes/No

- | | | |
|------|---|--------|
| iii) | Cleans the molds | Yes/No |
| iv) | Snaps the mold on the receiver | Yes/No |
| 27) | Does your child wear the hearing aid to School? | Yes/No |
| 28) | Does your child take care of the hearing aid and protect it from being damaged by other children? | Yes/No |
| IV. | What is your opinion of the following : | |
| 29) | Do you think it is better that your child is taught to wear the hearing aid on his/her own? | Yes/No |
| 30) | Do you think that your child should learn to take care and maintain the hearing aid? | Yes/No |
| 31) | If your child has not learnt the above mentioned are you willing to: | |
| i) | Teach on your own | Yes/No |
| ii) | Teach after consulting a specialist | Yes/No |
| iii) | Any others | |

Thanking you,