4. RESULTS AND DISCUSSION

The main of the present study was to analysis of auditory neuropathy and related audiological profile:

The sample consist of 730 SNHL children within age range of 0-12yrs. Out of 730 SNHL children 371 were female & 359 were male. Mean age of study group was 2.9 yrs and SD age was 2.24yrs.

Sample divided intofour groups:

- 0-3yrs
- 3-6yrs
- 6-9yrs
- 9-12yrs

The main objectives of the study were to determine prevalence rate of ANSD, related etiologies and audiological profile.

The data obtained was tabulated and statistically analyzed for the following:

- Determine prevalence rate of auditory neuropathy spectrum disorder in children.
- Determine the related etiologies.
- Determine the audiological profile of children with auditory neuropathy.

Based on these objectives, three hypotheses and four sub hyopthesis were formulated and the findngs of the present study are discussed below with reference to each hypothesis.

Statistics

- Descriptive statistics were calculated for testing the initial objectives and hypotheses.
- Pearson product moment correlation and *t*-test were employed to test the hypotheses mentioned in objective no three.
- All hypothesis were tested at a significant level of 0.05.

4.1 There will be no significant prevalence rate of auditory neuropathy spectrum disiorder.

Hypothesis testing: To determine whether the prevalence rate of auditory neuropathy is significant or not, descriptive statistics were calculated. Results concluded that out of 730cases with SNHL, (5%, n=39) showed significant diagnostic characteristics of ANSD such as preservation of cochlear microphonics and OAE, absent/elevated ABR and MEMRs, poor speech recognition scores and elevated audiometric/free-field/BOA thresholds. Out of 39 (46%, n=18 were male and 53.8%, n =21 were female. Distribution of 39 children with ANSD separately for girls & boys showed in [Figure-3.1].

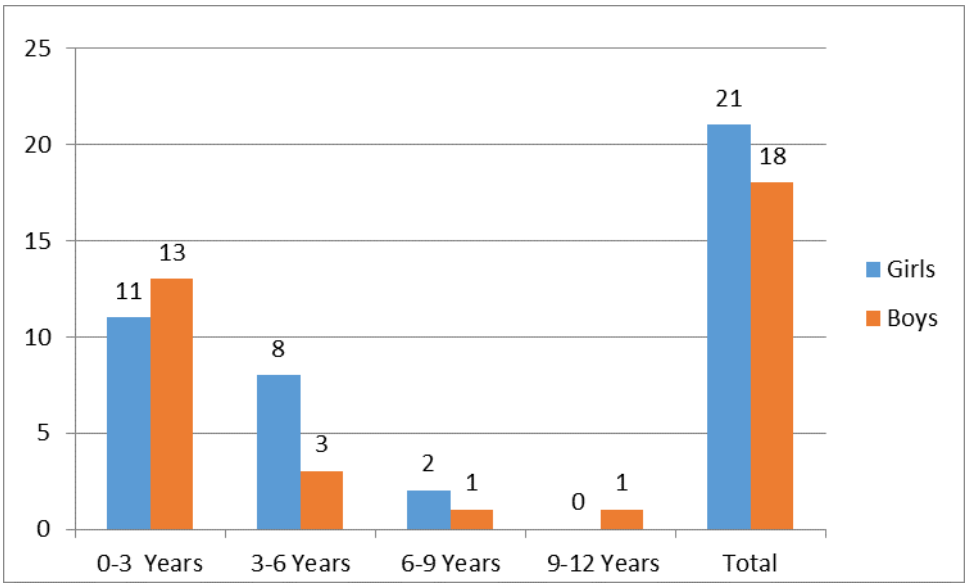

Figure-3.1: Showing distribution of 39 children with ANSD separetaly for girls and boys (n = 39).

The prevalence of auditory neuropathy has been reported with high variance. **Rance et al (1999)** found twelve infants with AN, which translates to a prevalence of 0.23% or 11% of children with SNHL. **Tang etal (2004)** conducted research at Hong Kong reported prevalence rate 2.44 %. **Kothe et al (2006)** reported prevalence of 0.94%. **Lofti et al (2007)** conducted research, they found 13 students with auditory neuropathy who comprised 1.55% (CI 95%: 0.71 - 2.38%) of the students with hearing impairment. 81 children aged 6-12 years who attended one school for the deaf were screened for indications of auditory neuropathy by **Lee et al (2001).** Children found to have consistent otoacoustic emissions were given a full diagnostic audiological test battery. Out of 81 children they found 2 children with ANSD. **Duman et al (2008)** also conducted study on 75 severe hearing loss deaf school students and reported 3 cases (4%) with AN.

The study was base on children up to 12 years old. The results have been obtained from a group of children over 3 yrs of period. (5%, n=39) revealed auditory

neuropathy out of 730 SNHL children.On the basis of obtained results; i.e. thers is significant/high prevalence rate of ANSD.

4.2 There will be no much etiologies associated with ANSD:

Hypothesis Testing: To determine the related etiologies associated with ANSD descriptive statitcs were calculated. Results showed that Out of 39, (84.6%, n=33) children had related etiological factors and medical history.

i. 11 (28%, n =39) children showed history of neo-natal jaundice and admitted to neonatal intensive care unit for certain period of time.
ii. 9 (23.07%, n = 39) children had related history of delayed birth cry and low birth weight.
iii. 1 (2.5%, n = 39) of the children diagnosed with Friedreich's.
iv. 6 (15.38%, n = 39) children had history of recurrent pneumonia and seizure before diagnosis of hearing loss.
v. 3 (7.6%, n = 39) had history of birth hypoxia/seizure which further diagnosed with delayed mile stone and cerebral palsy.
vi. 2 (5%, n = 39) of the children has congenital hydrocephalus; lumbar puncture was done on the 12th day of child's age.
vii. 1 (2.5%, n = 39) of the children reported with G6PD.

Rest 6 (15.38%, n=39) subjects didn't reported any significant clinical and medical history.

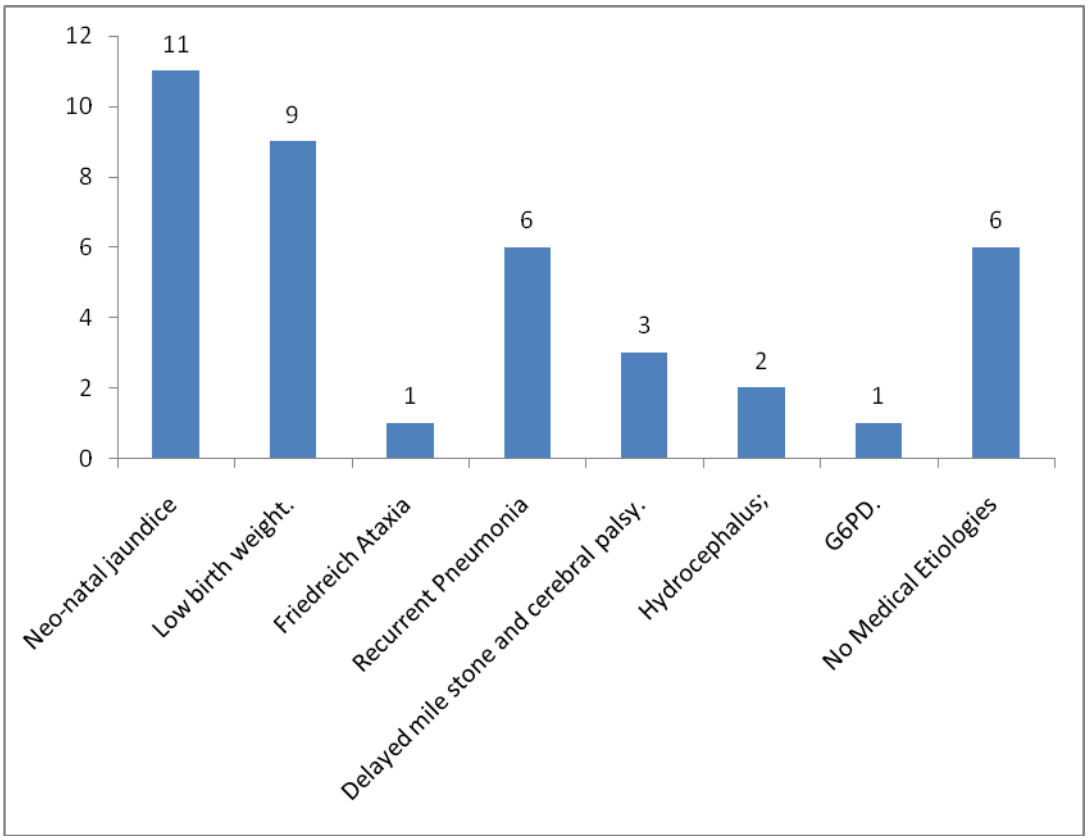

Fig 3.2 Showing related etiologies associated with ANSD children

Deltenre et al. in their study had reported three children with early onsets and major neo-natal illnesses without any BAEP neural component who all retained isolated cochlear microphonic potentials as well as click-evoked OAEs. Berlin et al (1993) described three patients having AN as part of Charcot-Marie-Tooth disease, a hereditarysensori-motor neuropathy.Spoendlin etal (1974) described the temporal bones of two individuals with Friedreich's ataxia. Berg et al. (2005) conducted universal newborn hearing–screening program in which ANSD profile was evaluated with the following factors: gender, gestational age, ototoxic drug regimen, low birth weight, hyperbilirubinemia, hydrocephalus, low Apgar score, anoxia, respiratory distress syndrome, pulmonary hypertension, interventricular hemorrhage, multiple birth, seizure activity, and family history. He reported out of 477 infants, one hundred fifteen (24.1%) of the infants failed the ABR in 1 or both ears and passed OAEs bilaterally.

Present study showed out of 39 children with ANSD, (84.6%, n=33) children had related etiological factors and medical history. Only (15.38%, n=6) cases had no neonatal complications and any significant medical history. Based on obtained results hypothesis 4.2 is rejected.

4.3 For comparison of audiological findings of children with ANSD

4.3.1 There will be no significant difference in between the audiological profile of children with ANSD and children with SNHL.

To test this hypothesis, several independent sample *t*-tests were performed to find out the differences between children with ANSD and children with SNHL, the obtained results were provided in table 4.1-a.

Table 4.1-a-: Disorder wiz descriptive statistics and t-tests for all variables.

Variables	**Disorder type**	**Mean**	**SD**	***t***
PTAR_250HZ	ANSD	66.28	17.69	-2.79**
	SNHL	76.67	15.06	
PTAR_500HZ	ANSD	79.87	19.55	-2.72**
	SNHL	91.03	16.59	
PTAR_1KHZ	ANSD	91.54	18.50	-1.59 ^{NS}
	SNHL	97.95	17.12	
PTAR_2KHZ	ANSD	97.82	15.97	-1.64 ^{NS}
	SNHL	103.46	14.43	
PTAR_4KHZ	ANSD	101.79	14.26	-2.12*
	SNHL	107.82	10.62	
PTAR_8KHZ	ANSD	97.44	8.80	-1.12 ^{NS}
	SNHL	99.23	4.80	

PTAR_AVG	**ANSD**	**89.76**	**16.79**	**-1.57** [NS]
	SNHL	**95.65**	**16.32**	
PTAL_250HZ	ANSD	68.85	16.00	-2.98**
	SNHL	78.59	12.72	
PTAL_500HZ	ANSD	81.28	13.46	-2.68**
	SNHL	89.10	12.29	
PTAL_1KHZ	ANSD	89.74	16.66	-2.89**
	SNHL	99.23	11.90	
PTAL_2KHZ	ANSD	100.00	14.23	-2.35*
	SNHL	106.54	10.01	
PTAL_4KHZ	ANSD	105.00	11.92	-2.32*
	SNHL	110.51	8.80	
PTAL_8KHZ	ANSD	98.46	4.32	-0.55 [NS]
	SNHL	98.97	3.84	
PTAL_AVG	**ANSD**	**90.35**	**14.04**	**-2.05***
	SNHL	**96.46**	**12.16**	
SAT_R	ANSD	82.69	14.86	-1.53 [NS]
	SNHL	87.69	13.90	
SAT_L	ANSD	82.56	14.41	-2.16*
	SNHL	89.10	12.29	
DPR_2KHZ	ANSD	7.97	5.41	20.11**
	SNHL	-17.64	5.83	
DPR_3KHZ	ANSD	6.79	6.16	20.73**
	SNHL	-18.59	4.53	

DPR_4KHZ	ANSD	4.59	6.00	15.86**
	SNHL	-17.49	6.29	
DPR_5KHZ	ANSD	4.46	6.11	19.69**
	SNHL	-18.33	3.86	
NFR_2KHZ	ANSD	-12.92	5.35	6.04**
	SNHL	-20.26	5.37	
NFR_3KHZ	ANSD	-12.26	7.77	6.35**
	SNHL	-21.26	4.23	
NFR_4KHZ	ANSD	-15.08	4.61	4.07**
	SNHL	-19.41	4.79	
NFR_5KHZ	ANSD	-13.26	6.88	5.51**
	SNHL	-20.69	4.86	
SNRR_2KHZ	ANSD	21.31	6.43	15.78**
	SNHL	2.62	3.66	
SNRR_3KHZ	ANSD	20.85	5.69	16.46**
	SNHL	2.67	3.90	
SNRR_4KHZ	ANSD	20.38	6.62	14.39**
	SNHL	1.92	4.52	
SNRR_5KHZ	ANSD	18.79	6.46	13.42**
	SNHL	2.36	4.10	
DPL_2KHZ	ANSD	8.10	5.60	20.65**
	SNHL	-16.97	5.12	
DPL_3KHZ	ANSD	7.31	6.38	20.73**
	SNHL	-18.03	4.19	

DPL_4KHZ	ANSD	4.95	6.11	17.58**
	SNHL	-17.69	5.23	
DPL_5KHZ	ANSD	5.10	5.42	20.80**
	SNHL	-18.00	4.32	
NFL_2KHZ	ANSD	-13.56	4.89	5.39**
	SNHL	-19.72	5.20	
NFL_3KHZ	ANSD	-12.28	7.66	5.70**
	SNHL	-20.36	4.43	
NFL_4KHZ	ANSD	-15.44	4.49	4.33**
	SNHL	-20.00	4.81	
NFL_5KHZ	ANSD	-14.46	4.45	5.55**
	SNHL	-20.28	4.81	
SNRL_2KHZ	ANSD	22.38	6.87	15.72**
	SNHL	2.74	3.70	
SNRL_3KHZ	ANSD	22.10	5.65	17.65**
	SNHL	2.33	4.12	
SNRL_4KHZ	ANSD	20.97	6.83	15.23**
	SNHL	2.31	3.47	
SNRL_5KHZ	ANSD	19.67	6.16	14.90**
	SNHL	2.28	3.90	
df = 76, * = $p < .05$, * *= $p < .01$, ^{NS} = $p > .05$.				

The obtained results for PTA showed that, for right ear, children with ANSD did not obtained significantly higher scores than children with SNHL on PTAR_AVG.

Additionally, more detailed analyses revealed that, children with ANSD obtained significantly lower scores than children with SNHL on PTAR_250HZ, PTAR_500HZ, PTAR_4KHZ. Furthermore, for left ear, children with ANSD obtained significantly lower scores than children with SNHL on PTAL_AVG. Additionally, more detailed analyses revealed that, children with ANSD obtained significantly lower scores than children with SNHL on PTAL_250HZ, PTAL_500HZ, PTAL_1KHZ, PTAL_2KHZ, and PTAL_4KHZ.

Furthermore, the obtained results for DOAPE, for both ears, children with ANSD obtained significant scores than children with SNHL on all frequencies of distortion product, noise floor, and signal to noise ratio. Based on obtained results; i.e. there is significant difference between the audiological profile of children with ANSD and children with SNHL from table 4.1-a; it can be concluded that the hypothesis no 4.3.1 is rejected.

4.3.2 There will be no significant sex difference in between the audiological profile of children with ANSD and children with SNHL.

Table 4.2-b: Sex wiz descriptive statistics and t-tests for all variables.

Variables	SEX	Mean	SD	*t*
PTAR_250HZ	Male	74.05	18.02	1.27^{NS}
	Female	69.15	16.16	
PTAR_500HZ	Male	86.08	19.48	0.28^{NS}
	Female	84.88	18.52	
PTAR_1KHZ	Male	95.14	17.18	0.18^{NS}
	Female	94.39	18.91	
PTAR_2KHZ	Male	101.22	12.88	0.31^{NS}
	Female	100.12	17.48	
PTAR_4KHZ	Male	105.27	11.11	0.30^{NS}
	Female	104.39	14.37	
PTAR_8KHZ	Male	99.46	4.68	1.34^{NS}
	Female	97.32	8.67	
PTAR_AVG	Male	94.16	15.09	0.73^{NS}
	Female	91.39	18.15	
PTAL_250HZ	Male	73.65	15.12	-0.04^{NS}
	Female	73.78	15.40	
PTAL_500HZ	Male	85.54	13.27	0.22^{NS}
	Female	84.88	13.67	
PTAL_1KHZ	Male	95.14	12.28	0.36^{NS}
	Female	93.90	17.48	

PTAL_2KHZ	Male	104.46	10.59	0.79 NS
	Female	102.20	14.32	
PTAL_4KHZ	Male	107.43	8.55	-0.25 NS
	Female	108.05	12.54	
PTAL_8KHZ	Male	99.19	2.77	0.97 NS
	Female	98.29	4.95	
PTAL_AVG	Male	95.10	11.16	1.06 NS
	Female	91.88	15.12	
SAT_R	Male	87.57	11.52	1.38 NS
	Female	83.05	16.62	
SAT_L	Male	87.30	12.22	0.89 NS
	Female	84.51	14.95	
DPR_2KHZ	Male	-6.03	14.13	-0.71 NS
	Female	-3.76	14.07	
DPR_3KHZ	Male	-5.70	14.24	0.12 NS
	Female	-6.07	13.68	
DPR_4KHZ	Male	-6.03	12.09	0.28 NS
	Female	-6.83	13.32	
DPR_5KHZ	Male	-7.62	13.13	-0.46 NS
	Female	-6.32	12.12	
NFR_2KHZ	Male	-16.78	6.88	-0.25 NS
	Female	-16.41	6.17	
NFR_3KHZ	Male	-16.54	9.73	0.23 NS
	Female	-16.95	5.35	

NFR_4KHZ	Male	-17.30	4.83	-0.09 ^{NS}
	Female	-17.20	5.49	
NFR_5KHZ	Male	-17.57	6.11	-0.71 ^{NS}
	Female	-16.44	7.76	
SNRR_2KHZ	Male	11.14	10.94	-0.64 ^{NS}
	Female	12.71	10.64	
SNRR_3KHZ	Male	12.73	10.85	0.79 ^{NS}
	Female	10.88	9.94	
SNRR_4KHZ	Male	11.59	10.81	0.34 ^{NS}
	Female	10.76	11.03	
SNRR_5KHZ	Male	9.95	9.68	-0.53 ^{NS}
	Female	11.15	10.11	
DPL_2KHZ	Male	-4.30	14.19	0.08 ^{NS}
	Female	-4.56	13.41	
DPL_3KHZ	Male	-5.03	14.39	0.20 ^{NS}
	Female	-5.66	13.48	
DPL_4KHZ	Male	-5.92	13.30	0.30 ^{NS}
	Female	-6.78	12.32	
DPL_5KHZ	Male	-6.78	12.66	-0.22 ^{NS}
	Female	-6.15	12.71	
NFL_2KHZ	Male	-16.81	6.09	-0.24 ^{NS}
	Female	-16.49	5.78	
NFL_3KHZ	Male	-15.51	9.31	0.91 ^{NS}
	Female	-17.05	5.20	

NFL_4KHZ	Male	-18.19	4.15	-0.76 ^{NS}
	Female	-17.29	5.95	
NFL_5KHZ	Male	-17.92	4.90	-0.84 ^{NS}
	Female	-16.88	5.93	
SNRL_2KHZ	Male	12.89	12.36	0.24 ^{NS}
	Female	12.27	10.40	
SNRL_3KHZ	Male	12.65	11.66	0.32 ^{NS}
	Female	11.83	10.69	
SNRL_4KHZ	Male	12.30	11.78	0.51 ^{NS}
	Female	11.05	9.99	
SNRL_5KHZ	Male	11.27	10.40	0.24 ^{NS}
	Female	10.71	10.01	
df = 76, * = p < .05, * *= p < .01, ^{NS} = p > .05.				

There will be no significant sex difference in between the audiological profile of children with ANSD and children with SNHL,' is accepted. The obtained results from table 4.2-b.also support the stated hypothesis.

4.3.3 There will be no significant difference in between the audiological profile of male children with ANSD and SNHL.

To test this hypothesis, several independent sample *t*-tests were performed to find out the differences between male children with ANSD and children with SNHL. The obtained results were provided in table 4.3-c. rejects the stated hypothesis. The detailed analyses were showed that, on PTAL_AVG, children with SNHL were scored higher scores than children with ANSD. Similarly, on all frequencies of distortion product, noise floor, and signal to noise ratio for both the ears children with ANSD obtained significantly higher scores than children with SNHL.

Table 4.3-c: Descriptive statistics and t-tests for all variables for male participants.

Variables	**Disorder type**	**Mean**	**SD**	***t***
PTAR_250HZ	ANSD	67.22	19.34	-2.39*
	SNHL	80.53	14.33	
PTAR_500HZ	ANSD	79.44	19.84	-2.11*
	SNHL	92.37	17.35	
PTAR_1KHZ	ANSD	91.11	17.45	-1.41 NS
	SNHL	98.95	16.46	
PTAR_2KHZ	ANSD	98.89	12.43	-1.07 NS
	SNHL	103.42	13.23	
PTAR_4KHZ	ANSD	103.89	11.83	-0.73 NS
	SNHL	106.58	10.55	
PTAR_8KHZ	ANSD	99.44	2.36	-0.02 NS
	SNHL	99.47	6.21	
PTAR_AVG	**ANSD**	**89.61**	**15.53**	**-1.85 NS**
	SNHL	**98.47**	**13.67**	
PTAL_250HZ	ANSD	67.78	16.56	-2.45*
	SNHL	79.21	11.46	
PTAL_500HZ	ANSD	80.83	13.85	-2.21*
	SNHL	90.00	11.30	

PTAL_1KHZ	ANSD	90.28	13.77	-2.51*
	SNHL	99.74	8.74	
PTAL_2KHZ	ANSD	101.11	12.55	-1.94 NS
	SNHL	107.63	7.33	
PTAL_4KHZ	ANSD	104.72	9.15	-1.95 NS
	SNHL	110.00	7.26	
PTAL_8KHZ	ANSD	98.89	3.23	-0.64 NS
	SNHL	99.47	2.29	
PTAL_AVG	**ANSD**	**90.89**	**12.82**	**-2.37***
	SNHL	**99.08**	**7.71**	
SAT_R	ANSD	84.17	12.86	-1.80 NS
	SNHL	90.79	9.32	
SAT_L	ANSD	83.06	14.05	-2.16*
	SNHL	91.32	8.79	
DPR_2KHZ	ANSD	6.89	5.99	12.37**
	SNHL	-18.26	6.36	
DPR_3KHZ	ANSD	7.72	5.98	14.97**
	SNHL	-18.42	4.59	
DPR_4KHZ	ANSD	4.72	6.06	10.82**
	SNHL	-16.21	5.71	
DPR_5KHZ	ANSD	4.17	7.88	11.28**
	SNHL	-18.79	3.98	
NFR_2KHZ	ANSD	-13.00	6.16	3.82**
	SNHL	-20.37	5.57	
NFR_3KHZ	ANSD	-10.94	10.85	4.08**
	SNHL	-21.84	4.14	
NFR_4KHZ	ANSD	-15.33	5.04	2.59**
	SNHL	-19.16	3.89	
NFR_5KHZ	ANSD	-13.56	3.63	5.03**
	SNHL	-21.37	5.56	
SNRR_2KHZ	ANSD	20.67	7.05	9.94**
	SNHL	2.11	3.97	
SNRR_3KHZ	ANSD	22.56	6.24	11.78**
	SNHL	3.42	3.25	

SNRR_4KHZ	ANSD	20.72	7.36	8.91**
	SNHL	2.95	4.50	
SNRR_5KHZ	ANSD	17.72	7.25	7.68**
	SNHL	2.58	4.49	
DPL_2KHZ	ANSD	8.72	6.81	12.59**
	SNHL	-16.63	5.40	
DPL_3KHZ	ANSD	8.17	7.43	12.56**
	SNHL	-17.53	4.80	
DPL_4KHZ	ANSD	6.11	7.16	11.71**
	SNHL	-17.32	4.85	
DPL_5KHZ	ANSD	4.89	6.62	12.97**
	SNHL	-17.84	3.72	
NFL_2KHZ	ANSD	-14.11	5.12	2.88**
	SNHL	-19.37	5.94	
NFL_3KHZ	ANSD	-10.61	10.60	3.60**
	SNHL	-20.16	4.51	
NFL_4KHZ	ANSD	-16.72	3.46	2.20*
	SNHL	-19.58	4.35	
NFL_5KHZ	ANSD	-15.22	3.70	3.83**
	SNHL	-20.47	4.56	
SNRL_2KHZ	ANSD	23.61	8.40	9.79**
	SNHL	2.74	3.89	
SNRL_3KHZ	ANSD	23.22	6.28	11.85**
	SNHL	2.63	4.13	
SNRL_4KHZ	ANSD	22.89	7.26	11.37**
	SNHL	2.26	3.07	
SNRL_5KHZ	ANSD	20.39	6.58	10.19**
	SNHL	2.63	3.70	
N_{ANSD} = 18, N_{SNHL} = 19, df = 35, * = p < .05, * *= p < .01, ^{NS} = p > .05.				

4.3.4 There will be no significant difference in between the audiological profile of female children with ANSD and SNHL

To test this hypothesis, several independent sample *t*-tests were performed to find out the differences between female children with ANSD and SNHL. The obtained results were provided in table 4.4-d.

Table 4.4-d: Sex wiz descriptive statistics and t-tests for all variables for female participants.

Variables	**Disorder type**	**N**	**Mean**	**SD**	***t***
PTAR_250HZ	ANSD	21	65.48	16.58	-1.51 ^{NS}
	SNHL	20	73.00	15.17	
PTAR_500HZ	ANSD	21	80.24	19.78	-1.68 ^{NS}
	SNHL	20	89.75	16.18	
PTAR_1KHZ	ANSD	21	91.90	19.78	-0.86 ^{NS}
	SNHL	20	97.00	18.09	
PTAR_2KHZ	ANSD	21	96.90	18.74	-1.21 ^{NS}
	SNHL	20	103.50	15.82	
PTAR_4KHZ	ANSD	21	100.00	16.12	-2.09*
	SNHL	20	109.00	10.83	
PTAR_8KHZ	ANSD	21	95.71	11.65	-1.22 ^{NS}
	SNHL	20	99.00	3.08	
PTAR_AVG	**ANSD**	**21**	**89.89**	**18.19**	**-0.54** ^{NS}
	SNHL	**20**	**92.97**	**18.44**	
PTAL_250HZ	ANSD	21	69.76	15.85	-1.76 ^{NS}
	SNHL	20	78.00	14.09	

PTAL_500HZ	ANSD	21	81.67	13.45	-1.57 NS
	SNHL	20	88.25	13.40	
PTAL_1KHZ	ANSD	21	89.29	19.12	-1.78 NS
	SNHL	20	98.75	14.50	
PTAL_2KHZ	ANSD	21	99.05	15.78	-1.46 NS
	SNHL	20	105.50	12.13	
PTAL_4KHZ	ANSD	21	105.24	14.10	-1.49 NS
	SNHL	20	111.00	10.21	
PTAL_8KHZ	ANSD	21	98.10	5.12	-0.26 NS
	SNHL	20	98.50	4.89	
PTAL_AVG	**ANSD**	**21**	**89.89**	**15.30**	**-0.86** NS
	SNHL	**20**	**93.98**	**15.04**	
SAT_R	ANSD	21	81.43	16.59	-0.63 NS
	SNHL	20	84.75	16.90	
SAT_L	ANSD	21	82.14	15.05	-1.04 NS
	SNHL	20	87.00	14.81	
DPR_2KHZ	ANSD	21	8.90	4.81	16.30**
	SNHL	20	-17.05	5.38	
DPR_3KHZ	ANSD	21	6.00	6.35	14.25**
	SNHL	20	-18.75	4.59	
DPR_4KHZ	ANSD	21	4.48	6.10	11.58**
	SNHL	20	-18.70	6.71	
DPR_5KHZ	ANSD	21	4.71	4.26	17.92**
	SNHL	20	-17.90	3.80	

NFR_2KHZ	ANSD	21	-12.86	4.70	4.66**
	SNHL	20	-20.15	5.31	
NFR_3KHZ	ANSD	21	-13.38	3.44	5.99**
	SNHL	20	-20.70	4.35	
NFR_4KHZ	ANSD	21	-14.86	4.33	3.07**
	SNHL	20	-19.65	5.60	
NFR_5KHZ	ANSD	21	-13.00	8.87	3.24**
	SNHL	20	-20.05	4.14	
SNRR_2KHZ	ANSD	21	21.86	5.97	12.30**
	SNHL	20	3.10	3.37	
SNRR_3KHZ	ANSD	21	19.38	4.85	12.05**
	SNHL	20	1.95	4.38	
SNRR_4KHZ	ANSD	21	20.10	6.07	11.48**
	SNHL	20	0.95	4.43	
SNRR_5KHZ	ANSD	21	19.71	5.71	11.53**
	SNHL	20	2.15	3.80	
DPL_2KHZ	ANSD	21	7.57	4.42	16.98**
	SNHL	20	-17.30	4.95	
DPL_3KHZ	ANSD	21	6.57	5.40	17.43**
	SNHL	20	-18.50	3.58	
DPL_4KHZ	ANSD	21	3.95	5.01	13.19**
	SNHL	20	-18.05	5.66	
DPL_5KHZ	ANSD	21	5.29	4.30	16.25**
	SNHL	20	-18.15	4.92	

NFL_2KHZ	ANSD	21	-13.10	4.75	4.80**
	SNHL	20	-20.05	4.51	
NFL_3KHZ	ANSD	21	-13.71	3.35	5.57**
	SNHL	20	-20.55	4.45	
NFL_4KHZ	ANSD	21	-14.33	5.03	3.76**
	SNHL	20	-20.40	5.29	
NFL_5KHZ	ANSD	21	-13.81	5.00	3.97**
	SNHL	20	-20.10	5.14	
SNRL_2KHZ	ANSD	21	21.33	5.21	13.20**
	SNHL	20	2.75	3.63	
SNRL_3KHZ	ANSD	21	21.14	5.00	13.20**
	SNHL	20	2.05	4.20	
SNRL_4KHZ	ANSD	21	19.33	6.13	10.53**
	SNHL	20	2.35	3.88	
SNRL_5KHZ	ANSD	21	19.05	5.86	10.73**
	SNHL	20	1.95	4.15	
N_{ANSD} = 21, N_{SNHL} = 20, df = 39, * = p < .05, * *= p < .01, ^{NS} = p > .05.					

From the obtained results, the hypothesis no 4.3.4 is partially accepted for PTA results of both the ears; and partially rejected for DPOAE results for both ears. The overall results for DPOAE, for both ears, on all frequencies of distortion product, noise floor, and signal to noise ratio showed that children with ANSD obtained significantly higher scores than children with SNHL.

Doyle et al. (2009) conducted a retrospective review of audiologic findings in eight children with auditory neuropathy. In their study pure tone audiologic testing revealed five children with sloping sensorineural hearing loss, two with high frequency loss, and one with a mild, flat configuration. Six children demonstrated poor word discrimination scores, and the other two had fair to good word discrimination. All eight subjects had normal distortion product and transient otoacoustic emissions. All eight children demonstrated absent or marked abnormalities of brainstem auditory evoked potentials. These findings suggest that while cochlear outer hair cell function is normal, the lesion is located at the eighth nerve.

Berlin et al. (2010) summarized test results and management of 260 patients diagnoses with Auditory Neuropathy Spectrum Disorder (ANSD. They reported 250 children, and all showed absent/grossly abnormal auditory brainstem responses (ABR), often 'ringing' cochlear microphonics, and the presence or history of otoacoustic emissions. Etiologies and co-existing conditions included genetic (n=41), peripheral neuropathies (n=20), perinatal jaundice and/or anoxia and/or prematurity (n=74).

In present study audiological results of 39 children (78 ears) showed out of 78 ears, 53 ears had sloping type of hearing loss, 25 ears had flat configuration (S.N. in nature).Almost all the 39 children had showed absent or abnormal ABR waves. 37 (94.8%, n = 39) showed absent ABR waves with cochlear microphonics. Rest 2 (5%, n =39) showed elevated waves with cochlear microphonics. 38 children (97.4%, n = 39) showed normal evoked OAEs as per the audiological characteristics of ANSD, except 1 (2.5%, n = 39) of the subjects were present with absent of evoked OAE but cochlear microphonics were present at higher stimulus level of 95 dBnHL.

Figure 4.1, 4.2, 4.3-a and 4.3-b: Showing audiological profile of a child having bilateral profound sensori neural hearing loss with present cochlear microphonics (CM) and oto acoustics emission (OAE).

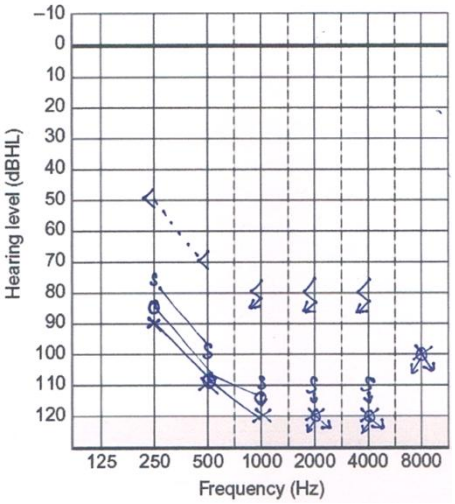

Figure 4.1: Showing bilateral profound sensori neural hearing loss.

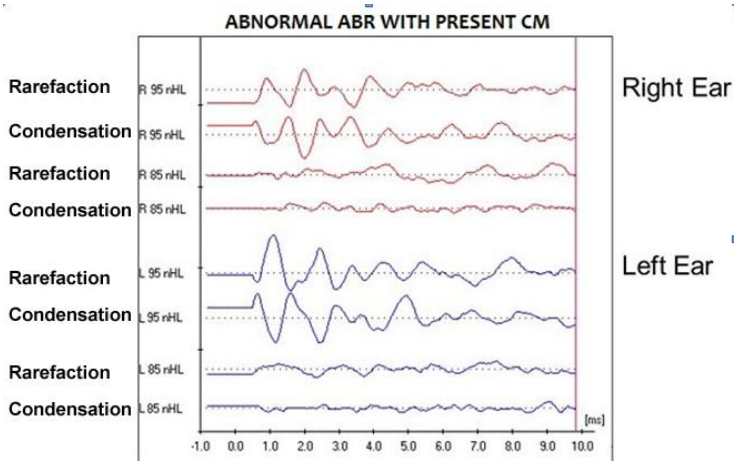

Figure 4.2 Showing Abnormal ABR with present cochlear microphonics (CM).

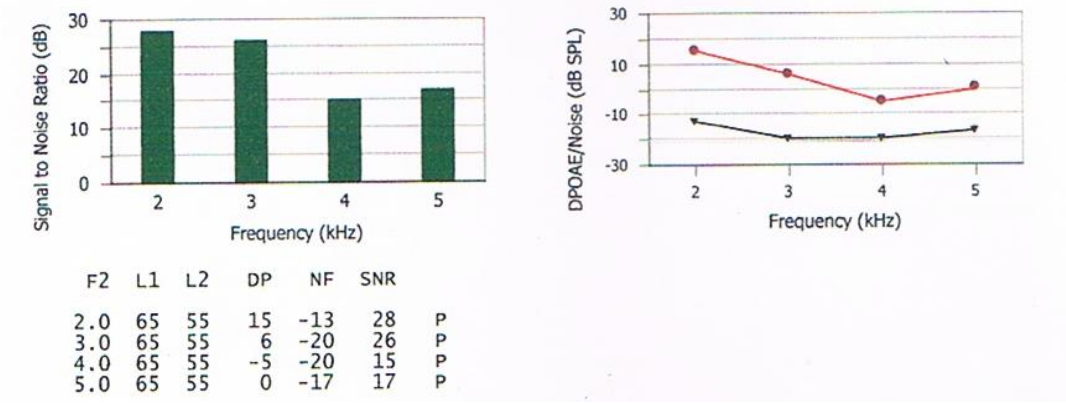

Figure 4.3.1: Normal DPOAE Test Report for Right Ear.

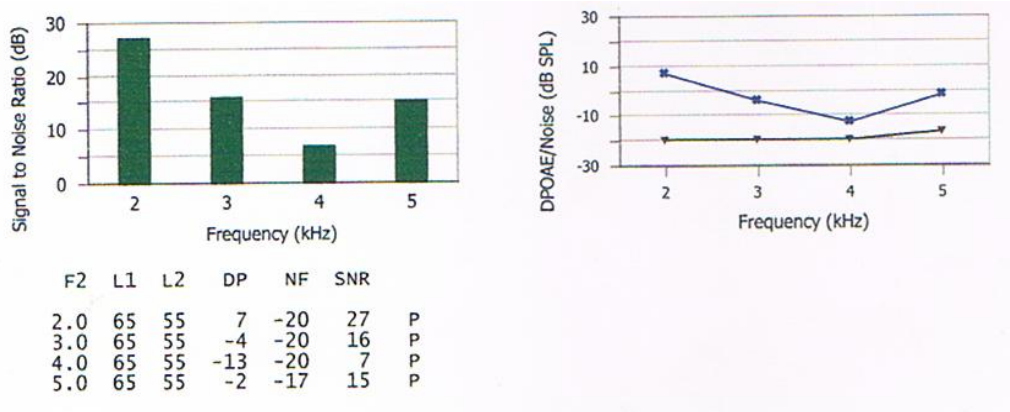

Figure 4.3.2: Normal DPOAE Test Report for Left Ear.