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Prevalence of Hearing Impairment in the Medinipur Sadar Subdivision, Paschim Medinipore district, West Bengal, India

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Abstract: ***A cross-sectional study was designed to investigate the prevalence of hearing impairment among the sample population at a given point in time in Medinipur Sadar Subdivision, Paschim Medinipore District. The current research recruited 700 respondents from this subdivision were used in the data collection. The procedure adopted included interviews, questionnaires, and physical examination at Audiology Division of Midnapore Rehabilitation Centre for Children, Midnapore. Out of the 700 respondents, 103 (representing 14.71%) were diagnosed as having significant hearing impairments. Findings showed majority of the respondents was men than women had mild hearing loss with occurrence of conductive hearing impairment more than other types of hearing impairment. Presbycusis and noise were the major causes of the sensorineural hearing impairment. Ear wax, otitis media, and noise induce factors were the other frequent causes of hearing impairment. These findings have significant implications on the need of resource development for prevention and rehabilitation.***

Keywords: Hairing impairment, Audiology**,** sample population, conductive hearing impairment, Presbycusis, sensorineural hearing impairment.

1. Introduction

The World Health Organization (WHO) reported an escalating trend in the statistics of global number of persons with hearing impairment, a principal public health tasks in the world is most likely due to a mixture of improved diagnosis, early detection, old age, ototoxic drugs and long-term exposure to environmental noise (WHO, 1995; Crofton et al., 1994). It has been showed that globally out of 278 million hearing impaired people 89% are adults while 11% were children under 15 years (WHO, 2014;Smith,2008), and using of hearing aids meet up less than 10% of global need. So, in developing countries a widespread insufficiency of appropriate data about hearing impairment still exists (UNICEF, 2013; Groce, 2004), which is urgently needed in order to raise awareness, for intervention, calculate about the needs, monitoring of outcome, economic analyses. On that background our aim was to investigate out the profile and demographic pattern of hearing impairment along with its causative historical background i.e. family history, past medical history and drugs history and present factors predispose respondents in the Medinipur Sadar subdivision of Paschim Medinipore District.

2. Materials and Methods

To establish the impact database required for future needs and developments seven hundred (700) people, with both of male and female subjects were incorporated in this study.The Paschim Medinipur is situated in the south western side of West Bengal comprises four sub divisions: Medinipur Sadar, Kharagpur, Ghatal and Jhargram. Medinipur Sadar sub division consists of Midnapore municipality and six community development blocks: Medinipur Sadar, Garhbeta–I, Garhbeta– II, Garhbeta–III, Keshpur and Shalboni. The sampling design was cluster random sampling (Ahmed, 2009) along side cross-sectional research design (Lee, 1994) was employed for this study. A ratio of the total sample was selected from clusters by a random technique to obtain the required total sample. The research instruments employed were all regulated tools with testing its validity and reliability. The research tools consist of the following: i) Questionnaire: Pre-tested open and closed ended questions questionnaire was used to obtain respondents, opinions. The questionnaires enabled the researcher to collect data from a large number of respondents ii) Interview: To describe the uniqueness of the study participants possible causes of common ear infection, hearing impairment, demographic distribution and its profile were recorded through interview of the subject. iii) Physical Ear Examination After the interview the participants were subjected to physical ear examination by using otoscopy to determine the presence or absence of outer, middle and inner ear infections. Participants with any form of ear infections were not be permitted to the audiometric examination iv) Audiometry: The ELKON [Model- eda 3 N 3 mille] audiometer was used calibrated to the ANSI standard (ASHA, 1978). The purpose of the screening was first explained to them and date for the screening was arranged in advance. A separate room with an average noise level of 41dB SPL was selected as test room (Frank and William, 1993). On their day of screening, subjects were brought into

the test rooms in group of twenty and instructed regarding the procedure for the hearing test, asked about any ear discharge or earache and was presented with questionnaire. Audiometric screening was carried out at three frequencies 1000Hz, 2000Hz and 4000Hz (OSHA,1983). Ambient noise level in the test room limited testing to these mid–range and high frequencies. The degree of hearing impairment was based on the criteria developed by the world health organization i.e. for each ear, "pass" was operationally defined as responding properly to stimuli at 30dB HTL and at all three frequencies. When a respondent failed to respond at any of these frequencies, the tone was re-presented at 35, 40 and 45 dB HTL followed by the recording of response (Martin,1986).

3. Results and Discussion

The **Table 1** showed that among the 700 respondents selected from the Medinipur Sadar Subdivision, 424 of the respondents (60.57%) came from Medinipur Sadar. 46 (6.57%), 38 (5.43%) and 51 (7.29%) of the respondents came from Garhbeta–I, Garhbeta–II and Garhbeta–III respectively. 106 of the respondent (15.14%) came from Shalboni community development blocks.

Table 1: Geographical Area of Respondents within the Medinipur Sadar Subdivision

Community development blocks	Frequency	Percentage (%)
Medinipur Sadar	424	60.57
Garhbeta–I	46	6.57
Garhbeta–II	38	5.43
Garhbeta–III	51	7.29
Keshpur	35	5.00
Shalboni	106	15.14
TOTAL	700	100

Among 700 respondents in the target subdivision, 239 (39.83%) were male while 361(60.17 %) were females (**Table 2).**

Table 2: Distribution of gender among respondents

Gender	Frequency	Percentage
Male	280	40
Female	420	60
Total	700	100

The age distributions of the respondents in the present study are shown in **Figure 1**. Out of 700 respondents, 175 (25 %) belonged to the 0- 20 age group, 126 (18%) were 21-40 years old, 238 (34%) under the 41-60 age group and 161 (23%) were above 60 years.

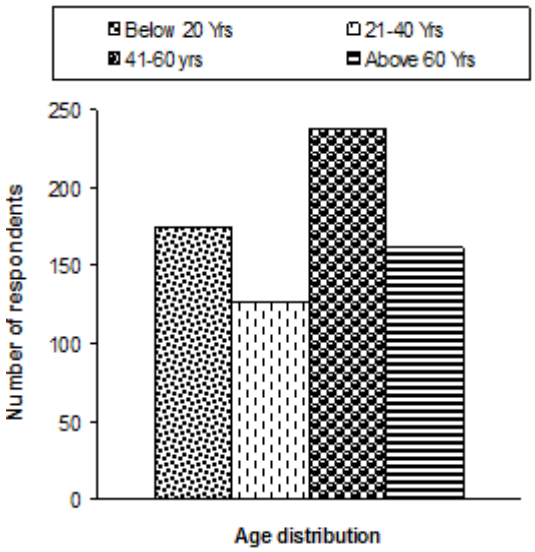

Figure 1: A bar chart illustrating the age distribution of the respondents in the study area

Among seven hundred people interviewed, 104 (14.9%) had no formal education, 228 (32.6%) had primary education, 235 (33.6%) had up to secondary education whilst 92 (13.1%) of them attained up to higher secondary and 41 (5.9%) of the respondents had education above higher secondary (**figure 2)**.

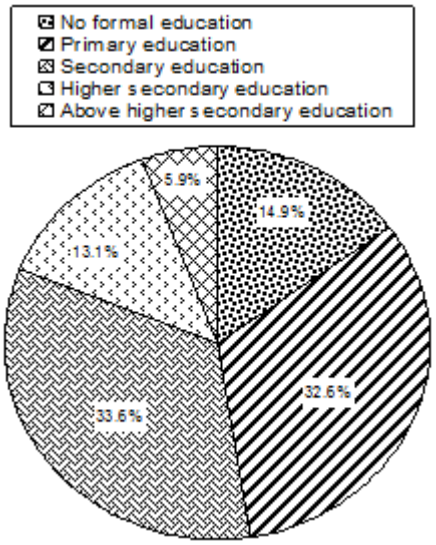

Figure 2: A pie chart illustrating the educational Status of the respondents.

Out of 700 respondents selected from the said area, majority of the respondents (46.43%) were working in the non-formal sector with 15.71% of them in the formal sector and 37.86% of the respondents were unemployed (**Table 3**).

Table 3: Profile of employment status of respondents in Medinipur Sadar Subdivision

Employment status		Number and Percentage (%) (n=700)	
Employed	Formal profession (Govt. sectors like education, finance, health, engineering, environmental and agricultural	110 (15.71%)	435 (62.14%)

	sectors)		
	Non-formal profession (Mechanic, cotton mill-worker, chain-shaw mill worker, car driver, constructional worker)	325 (46.43%)	
Un-employed		265 (37.86%)	

Table 4 showed the age distribution of the results of the field audiometric screening test. To fail field audiometric screening test means not able to respond correctly to stimuli at 30dB HTL for all frequencies and to pass audiometric screening test means to respond correctly to stimuli at 30dB HTL for all frequencies. Out of the 700 respondents selected, majority of the respondents 515 (73.57%) passed the audiometric screening test and were not referred. Meanwhile, 185 (26.43%) of the respondents failed the audiometric screening test and were accordingly referred to MRCC for further clinical examination and management. Out of 175 respondents belonged to the 0-20 age 46 respondents failed the audiometric screening test while 129 passed the audiometric screening test. From 126 respondents under the 21–40 age groups, 17 respondents failed the audiometric screening test as 109 respondents passed the audiometric screening test. Of the 238 respondents belonged to the 41–60 age group, 57 respondents failed the audiometric screening test even as 181 respondents passed the audiometric screening test. Out of 161 respondents above 60 years, 65 respondents failed the audiometric screening test whereas 96 respondents passed the audiometric screening test.

Table 4: Results of audiometric screening

Age (Years)	*Passed screen test*	*Failed in screen test*	*Total*
Below 20	129 (73.71%)	46 (26.29%)	175
21-40	109 (86.51%)	17 (13.49%)	126
41-60	181 (76.05%)	57 (23.95%)	238
Above 60	96 (59.63%)	65 (40.37%)	161
Total	**515 (73.57%)**	**185**	**700**

Table 5 shows the results of pure tone audiometry and threshold levels (Martin, 1986) for the current study. Out of 185 respondents who failed screening and were referred for further evaluation 103 respondents had hearing impairment at the low (250 and / or 500 Hz) and high frequencies (4000 and /or 8000Hz). Twenty (29) respondents with hearing impaired, having a threshold range of 26dB-61 dB, 9 respondents hearing impaired, having threshold range of 26 dB - 40 dB, 21 respondents were hearing impaired, having a threshold range of 26 dB - 42 dB and 44 respondents were hearing impaired, having a threshold range of 26 dB-85 dB.

Table 5: Results of pure tone audiometric and threshold levels

Threshold level of Hearing impaired (dB)	*Failed in screen test and referred*	*Detected as hearing impaired*
26-61	46	29
26-40	17	9
26-42	57	21
26-85	65	44
Total	**185**	**103**

Table 6 showed the pattern of hearing impairment among the respondents. Out of 103 respondents with hearing impairment, 46 (44.66%) had problems in the right ear, 38 (36.89%) had problems in the left ear and 19 (18.45%) had problems in both ears.

Table 6: The pattern of hearing impairments

Hearing impairment pattern	*Number and percentage (%) (n=103)*
Right ear	46 (44.66%)
Left ear	38 (36.89%)
Both ear	19 (18.45%)

The types of hearing loss of respondents using tuning fork in the recent study were shown in **Table 7**. Out of 103 respondents with hearing loss, 97 (72%) had conductive hearing loss, 32 (24%) had sensorineural hearing loss and 6 (4%) had mixed hearing loss.

Table 7: Types of hearing impairment

Types of Hearing impaired	Number and percentage (%) (n=103)
Conductive hearing loss	68 (66.02%)
Sensorineural hearing loss	31 (30.10%)
Mixed hearing loss	4 (3.88%)

The geographical area of respondents with hearing impairment in the present study is expressed in **Table 8**. Out of 103 respondents with hearing impairment, 41 of respondents (39.80%) came from Medinipur sadar; 12,6,14 of the respondents (11.65,5.83,13.59%) came from Garhbeta-I, II, III; 10 of the respondents (9.71%) came from Keshpore and 20 of the respondents (19.42%) came from Shalboni community development blocks. The higher number of hearing impairment in Midnapore sadar in comparison to others may due to the number of population in each block. It was however observed that the higher the population, there were more hearing problems (Olusanya and Okolo, 2006). The higher percentage of hearing impairment could be attributable to the load of noise in Midnapore sadar.

Table 8: Geographical area of respondents with hearing impairments

Community development blocks	Frequency and percentage (%)
Medinipur Sadar	41(39.80%)
Garhbeta–I	12(11.65%)
Garhbeta–II	6(5.83%)
Garhbeta–III	14(13.59%)
Keshpur	10(9.71%)
Shalboni	20(19.42%)
TOTAL	103(100%)

The age distributions of the respondents with hearing impairment in the current study were shown in **Table 9**. Out of 103 respondents, 28 (27.18 %) belonged to the 0-20 age group,11 (10.68 %) were 21- 40 years old, 19 (18.45 %) under the 41-60 age group and 45 (43.69%) were above 60 years. The results mean that respondents above 60 years had higher hearing impairment, resembles the findings of Robinson et al. (1979) that one in five adults over the age of 80 suffer from age related hearing loss.

Table 9: The age distribution of respondents with hearing impairment

Age (Years)	Number and percentage
Below 20	28 (27.18%)
21-40	11 (10.68%)
41-60	19 (18.45%)
Above 60	45 (43.69%)
Total	103 (100%)

The gender distribution of respondents with hearing impairments in the present study are shown in **figure 3**. Out of 103 respondents with hearing impairments, 42 (59%) were female while 61 (41%) were male. So, it could be said that males in Medinipur Sadar subdivision are more exposed to high risk employment such as jobs where noisy equipments are used (Miller, 1971).

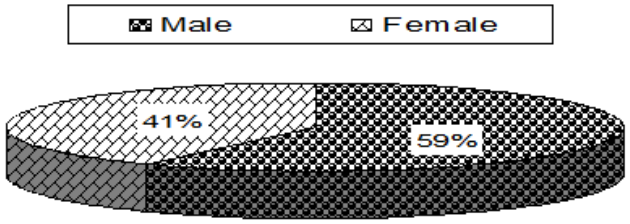

Figure 3: A pie chart illustrating the gender distribution of respondents with hearing impairments.

Among 103 people with hearing impairment, 22 (21.36%) had no formal education, 41 (39.81%) had primary education, 31(30.10%) had up to secondary education while 31 (30.10%) of them attained up to higher secondary and 9 (8.74%) of the respondents had education above higher secondary. This result shows that most people suffering did not achieve higher education. It may be said that they had been marginalized by the society and caused many of them to stop attending school. Another likely factor may also be due to insufficient sign language professionals in the schools in that subdivision (Carney and Moeller, 1997) (**Table 10)**.

Table 10: Educational Status of Respondents with Hearing Impairments

Educational status	Number and percentage
No formal education	22 (21.36%)
Up to primary education	41 (39.81%)
Up to secondary education	31 (30.10%)
Above higher secondary education	9 (8.74%)
Total	103 (100%)

The occupational conditions attributed to hearing impairment in respondents are shown in **Table 11.** Out of 103 respondents with occupational conditions of hearing impairment, 23 (22.33%) were formal profession, 75 (72.82%) respondents were attached with non-formal profession and 5(4.85 %) personnel were unemployed. This finding correlates with the claim of WHO that 16 % of deafness is due to occupational noise (WHO, 2004). It has been observed that mill operators in India exposed to noise levels exceeding 90dB. Hence mill operators have evident of hearing loss (Sataloff and Sataloff, 1993). Alongside males exposed to noise in farm jobs where noisy equipment such as tractors, chainsaws, and grain crushers are used also suffers from the same.

Table 11: Hearing impairment associated with occupational status

Employment status		*Number and Percentage (%) (n=103)*	
Employed	Formal profession (Govt. sectors like education, finance, health, engineering, environmental and agricultural sectors)	23 (22.33%)	98 (95.15%)
	Non-formal profession (Mechanic, cotton mill-worker, chain-shaw mill worker, car driver, constructional worker)	75 (72.82%)	
Un-employed		5(4.85%)	

The medical conditions attributed to hearing impairment in respondents are shown in **Table 12**. Out of 68 respondents with conductive hearing impairment, 33(48.53%) had wax,10 (14.71%) had otitis media, 23 (33.82 %) had presbyacusis and 2 (2.94 %) were taken ototoic drugs (Roeser et al.,2005; Franks and Morata,1996). Olusanya et al. (2004) reported that among school children screened with otoscopy had unilateral or bilateral impacted wax occluding the tympanic membrane leads to hearing loss also supported by our study. Presbyacusis recorded the next highest medical condition common in said subdivision. It tends to agree with the findings of Robinson and Sutton (1979) that one in five adult over the age of 80 suffer from age- related hearing loss.

Table 12: Medical conditions attributable to hearing impairment in respondents

Conditions	Number and percentage (n=68)
Wax	33 (48.53%)
Otitis media	10 (14.71%)
Presbyacusis	23 (33.82%)
Drug toxicity	2 (2.94%)

From the 103 respondents, 21 (20.39%) and 6 (5.83 %) had family history of hearing impairment and speech disorders. Family history of mental retardation or cerebral palsy and learning disability was carried by 2 (1.94%) and 5(4.85%) of the respondents. Three (2.91%) had family history of visual impairments and 66 (64.08 %) had none of these family histories **(Table 13)**. This is in line with the findings of Schraders et al. (2010) and White (2004) that if a family had a dominant gene for deafness it would persist across generations because it would visible itself in the offspring even if it is inherited from only one parent. Schraders (2010) also claimed that if a family had genetic hearing impairment caused by a recessive gene it will not always be apparent as it will have to be passed onto offspring from both parents.

Table 13: Profile of family history of the hearing impaired subjects

Family history	Number and percentage
Hearing impairment	21 (20.39%)
Speech disorders	6 (5.83%)
Mental retardation or cerebral palsy	2 (1.94%)
Learning disability	5 (4.85%)
Visual impairment	3(2.91%)
None	66(64.08%)
Total	103 (100%)

The medical histories of the respondents with hearing impairment showed in **Table 14**. Among 103 respondents with hearing impairment 9(8.74%) suffered from childhood measles, 2 (1.94 %) had cerebrospinal meningitis, 5 (4.85 %) had diabetes mellitus, 13 (12.62 %) had medical history of hypertension and 74 (71.85%) had no such type of previous medical history. The findings are in consistence with literature of Shargorodsky et al, (2010) that medical history by itself is not associated with an overall greater risk of hearing loss.

Table 14: Profile of medical history of the respondents

Medical history	Number and percentage
Childhood measles	9 (8.74%)
Meningitis	2 (1.94%)
Diabetes mellitus	5 (4.85%)
Hypertension	13 (12.62%)
None	74 (71.85%)
Total	103 (100%)

Table 15 showed the profile of medication history of respondents with hearing impairment. Out of 103 respondents, 9 (8.74%) are taking or had taken antibiotics, 2 (1.94%) and 5(4.84%) had taken antidiabetics and antihypertensive drugs, other types of drugs was taken by 13 (12.62 %) respondents and 74 (71.85 %) had none of these drug histories. Our finding tends to agree with the claim of Fukushima (2004); Matz and Naunton, (1968); Robinson and Cambon (1964) who said that the drugs are known to common cause hearing impairment.

Table 15: Profile of medication

Medication history	*Number and percentage*
Antibiotics drug	9 (8.74%)
Antidiabetic drug	2 (1.94%)
Antihypertensive drug	5 (4.85%)
Others drugs	13 (12.62%)
None	74 (71.85%)
Total	103 (100%)

4. Conclusion

The purpose of this study was to survey the prevalence of hearing impairment in the Medinipur Sadar Subdivision of Paschim Medinipore District, West Bengal. The data has shown that out of 700 respondents screened for hearing impairments, 103 were diagnosed as having significant hearing impairment, which has a significant impact on the district. Again, the results showed that the frequent causes of hearing impairment were as follows: wax, presbycusis, otitis media and noise induce factors as in the case of machine operators in mill and factory operators. It was moreover found out that medicine also caused hearing impairment. Besides it was also revealed that families with dominant genes for hearing impairment have the tendency of spreading the disease across generations. It can be concluded that most of these findings is preventable if appropriate measures is taken.

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