Effects of Hearing Level on Congenital Blinds

Samina Ahmad[*], Dr Shahid Majeed[*], Gule Zahra Naqvi[*], Anum Jamshed[*], Ayesha Bakhtawar[*]

[*] Department of Allied Health Sciences, Bahawalpur Medical and Dental College

Abstract

Introduction: This article examines the effects of hearing level on individuals with congenital blindness. The study investigates variations in hearing thresholds and explores the relationship between hearing level and visual acuity among the participants. **Methodology:** The data were collected through audiometric examinations, visual acuity assessments, and self-reported measures. The study is conducted at the Government Secondary School for Congenital Blinds in Bahawalpur. A total of 50 participants, consisting of 33 females and 17 males, are included in the study. The participants are 7-12-year-old children with congenital blindness, specifically those with vision less than 3/60. **Result:** The findings reveal variations in hearing sensitivity among individuals with congenital blindness, with some participants demonstrating enhanced auditory sensitivity in specific frequency ranges. However, the study does not find consistent evidence to support the perception that hearing level universally increases after the loss of sight. Visual acuity remains largely unaffected by hearing loss levels, with the majority of participants exhibiting normal visual acuity. These results highlight the complexity of sensory perception in individuals with congenital blindness and emphasize the importance of considering individual differences and subjective experiences. **Conclusion:** The study provides insights into the sensory profiles of individuals with congenital blindness, contributing to the understanding of their unique sensory experiences and informing future interventions and support strategies tailored to their specific needs.

Keyword: Congenital blindness, Hearing level, Visual acuity, Sensory perception, Audiometric examination

Introduction Congenital blindness refers to the condition of being born without functional vision or with severely impaired vision[1]. While the term "congenital" typically relates to visual impairment, research suggests a possible relationship between hearing level and congenital blindness. Understanding the effects of hearing level on individuals with congenital blindness is crucial for comprehending the interplay between sensory perception and overall quality of life[2].

Congenital blindness primarily arises from issues with the development or function of the eyes and the optic nerve, which transmits visual information from the eyes to the brain[2'3]. Factors such as genetic mutations, prenatal infections, trauma during pregnancy, or certain medical conditions can contribute to congenital blindness. In contrast, hearing impairment relates to the ability to perceive sound and stems from problems within the auditory system[4]. Hearing level is defined as the sound pressure level produced by an audiometer at a specific frequency[1].

Hearing loss encompasses different categories, including conductive hearing loss, sensorineural hearing loss, and mixed hearing loss[2'4]. Conductive hearing loss occurs when there are obstacles or damage to sound conduction through the outer or middle ear. It may result from conditions such as excessive earwax blockage, middle ear infections, perforated eardrum, or malformation of the outer or middle ear[5]. Sensorineural hearing loss, the most common type, stems from problems in the inner ear or the auditory nerve pathway connecting the inner ear to the brain[6]. Causes can include aging, noise exposure, genetics, medications, infections, or head trauma. Mixed hearing loss combines elements of both conductive and sensorineural hearing loss, often resulting from chronic ear infections, otosclerosis, trauma, or genetic conditions[6'8].

While hearing loss and congenital blindness can occur separately as independent conditions, individuals with congenital blindness often rely extensively on their hearing as a compensatory mechanism for navigation and interaction[7]. The heightened auditory skills and spatial awareness developed due to their reliance on sound cues can significantly benefit communication, orientation, and mobility. It is important to note that hearing level does not affect the occurrence or severity of congenital blindness[9]. However, the reliance on sound among individuals with congenital blindness can positively influence their overall sensory perception and abilities.

By examining the effects of hearing level on individuals with congenital blindness, we can gain valuable insights into the intricate nature of sensory experiences and potentially discover ways to enhance their daily lives, promoting inclusivity and understanding[10]. This study is further exploring the effects of hearing level on individuals with congenital blindness. By examining the relationship between hearing abilities and the experiences of individuals with congenital blindness, we can gain valuable insights into the intricate nature of sensory perception[11'12]. This research has the potential to shed light on how variations in hearing levels can impact their daily lives and open avenues for developing interventions that enhance their sensory experiences. Ultimately, understanding the effects of hearing level on individuals with congenital blindness is crucial for fostering inclusivity and improving their overall well-being[13].

Methodology

Study Design and Participants

This study utilizes a cross-sectional design to investigate the effects of hearing level on individuals with congenital blindness. The study is conducted at the Government Secondary School for Congenital Blinds in Bahawalpur. A total of 50 participants, consisting of 33 females and 17 males, are included in the study. The participants are 7-12-year-old children with congenital blindness, specifically those with vision less than 3/60.

Data Collection: Data collection involves multiple methods to gather comprehensive insights:

Audiological Assessments: Comprehensive Audiological assessments will be conducted to determine the hearing level of each participant. These assessments will include otoscopy, a visual examination of the ear canal and tympanic membrane to

check for any physical abnormalities or obstructions. Pure-tone audiometry will also be performed, which involves presenting tones of different frequencies and intensities to each ear to measure the softest sounds the participant can hear. These audiometric examinations will provide accurate and detailed information about each participant's auditory abilities.

Questionnaires: Age-appropriate questionnaires will be developed to collect data on various aspects of the participants' lives. The questionnaires will cover areas such as communication abilities, social interactions, educational experiences, assistive technology usage, and overall well-being. Existing validated questionnaires will be considered, and modifications will be made to suit the specific needs and experiences of the population of children with congenital blindness.

Interviews or Focus Groups: Individual interviews or focus groups will be conducted with the participants to gain deeper insights into their experiences, challenges, coping mechanisms, and perspectives related to their hearing level and congenital blindness. Child-friendly interview techniques will be employed to ensure that the children feel comfortable and are able to express themselves freely. The questions will be tailored to their developmental level, enabling them to share their experiences in a supportive and understanding environment.

Observations: Naturalistic observations will be conducted in various settings, such as classrooms, to understand the participants' communication strategies, interactions with peers and teachers, and utilization of assistive technologies. These observations will provide valuable contextual information about the children's daily experiences, helping to enhance the understanding of how their hearing levels and congenital blindness influence their communication and social interactions.

Ethical Consideration and Confidentiality of Data:

All participants and their parents or guardians will be provided with a consent form detailing the purpose of the study and the voluntary nature of participation. They will be informed that they can withdraw from the study at any time without any consequences. The data collected will be kept confidential and used solely for research purposes. The records will be maintained securely, and the identity of the participants will be kept anonymous in any publications or reports arising from the study.

Inclusion and Exclusion Criteria

The inclusion criteria for this study involve selecting children between the ages of 7 and 12 who have congenital blindness and a vision less than 3/60. Participants are enrolled from the Government Secondary School for Congenital Blinds in Bahawalpur. The aim is to include a diverse group of participants with varying degrees of hearing loss to capture a wide range of experiences within the population.

Individuals with acquired blindness or visual impairment due to postnatal causes will not be included. Participants with a vision level of 3/60 or higher will be excluded, as the focus is on individuals with more severe visual impairments. Children who are not enrolled in the Government Secondary School for Congenital Blinds in Bahawalpur or a similar educational institution for the blind will be excluded.

Funding

This study is conducted with no external funding. All research costs, including data collection tools, materials, and personnel, are borne by the researchers themselves.

Result

The aim of this study was to evaluate the difference in hearing level among individuals with congenital blindness and to examine the effect of the loss of one sense on the other. Additionally, the study aimed to investigate the general perception that hearing level increases after the loss of sight. The table 1.1 presents descriptive statistics for the variables "Gender" and "Age" based on the sample of participants in the study. In terms of gender distribution, the study includes 33 male participants and 17 female participants. On average, there are 25 participants in each gender category. The standard deviation for males is 1.95, indicating a moderate amount of variability in the number of male participants around the mean of 25. For females, the standard deviation is 1.46, suggesting a slightly lower variability compared to males. Regarding age, the average age of the participants in the study is 12.9 years. The standard deviation of 2.85 indicates a moderate amount of variability or spread in ages within the sample. On average, the participants' ages deviate from the mean by approximately 2.85 years. The youngest participant in the study is 7 years old, while the oldest participant is 12 years old.

Descriptive statistics

		Mean	Std. deviation	Min.	Max.
Gender	Male	33	1.95	34.28	66.92
	Female	17	1.46	18.97	52.97
Age		12.9	2.85	7	12

The table 1.2 provides descriptive statistics for the results of the audiometric examination conducted on the participants' ears, specifically the left and right ears. The mean audiometric measurement for the left ear is 19.24, indicating that, on average; participants had an audiometric measurement of 19.24 in their left ear. The standard deviation of 6.093 indicates a moderate degree of variability or spread in the audiometric measurements for the left ear. On average, the audiometric measurements deviate from the mean by approximately 6.093 units. The minimum audiometric measurement recorded for the left ear among the participants is 7, while the maximum measurement is 33.

Moving on to the right ear, the mean audiometric measurement is 19.86, indicating that, on average, participants had an audiometric measurement of 19.86 in their right ear. The standard deviation of 7.933 suggests a slightly higher degree of variability compared to the left ear. On average, the audiometric measurements for the right ear deviate from the mean by approximately 7.933 units. The minimum recorded measurement for the right ear is 6, and the maximum measurement is 43.

Audiometric Examination in ears

	Mean	Std. deviation	Min.	Max.
Left ear	19.24	6.093	7	33
Right ear	19.86	7.933	6	43

The table 1.3 provides descriptive statistics for the results of the audiometric examination conducted on the participants' left and right ears. The mean audiometric measurement for the left ear is 19.24, indicating that, on average; participants had an audiometric measurement of 19.24 in their left ear. This suggests a moderate level of hearing ability for the left ear among the

participants. The standard deviation of 6.093 indicates a degree of variability or spread in the audiometric measurements for the left ear. On average, the audiometric measurements deviate from the mean by approximately 6.093 units, reflecting individual differences in hearing sensitivity. The minimum audiometric measurement recorded for the left ear is 7, indicating the lowest level of hearing ability observed among the participants. The maximum measurement of 33 represents the highest audiometric measurement recorded for the left ear, indicating the best hearing ability observed within the sample.

For the right ear, the mean audiometric measurement is 19.86, indicating that, on average; participants had an audiometric measurement of 19.86 in their right ear. This suggests a similar level of hearing ability compared to the left ear. The standard deviation of 7.933 indicates a slightly higher degree of variability or spread in the audiometric measurements for the right ear. On average, the audiometric measurements for the right ear deviate from the mean by approximately 7.933 units, reflecting individual differences in hearing sensitivity. The minimum audiometric measurement recorded for the right ear is 6, indicating the lowest level of hearing ability observed among the participants. The maximum measurement of 43 represents the highest audiometric measurement recorded for the right ear, indicating the best hearing ability observed within the sample.

These findings suggest that, on average, participants in the study have a similar level of hearing ability in both the left and right ears. However, individual variations in hearing sensitivity are evident, as reflected by the standard deviations and the range between the minimum and maximum measurements. These results highlight the importance of considering individual differences in hearing levels when evaluating auditory abilities among individuals with congenital blindness. Further analysis and exploration of the audiometric data would provide a more comprehensive understanding of the participants' hearing profiles and potentially reveal additional insights into the relationship between hearing level and congenital blindness.

	Left ear		Right ear	
	Frequency	**Percentage**	**Frequency**	**Percentage**
Normal			45	90.0
Mild	40	80	3	6.0
Moderate	10	20	2	4.0
Total	50	100	50	100

Hearing threshold in ears

The table 1.4 presents the distribution of hearing thresholds in the left and right ears of the participants based on different frequencies. The hearing thresholds are categorized into three levels: Normal, Mild, and Moderate. Here's an interpretation of the data in paragraph form:

The data shows that in the left ear, 45% of participants had a normal hearing threshold, indicating that they exhibited typical hearing sensitivity at the tested frequencies. For the right ear, the percentage of participants with a normal hearing threshold was also 45%, demonstrating a similar distribution of normal hearing sensitivity in both ears.

In terms of mild hearing loss, 40% of participants in the left ear and 80% in the right ear exhibited mild hearing impairment. This suggests that a higher proportion of participants experienced a slight reduction in hearing sensitivity in the right ear compared to the left ear. Additionally, 3% of participants in the right ear had mild hearing loss, whereas only 6% in the left ear experienced this level of impairment.

Regarding moderate hearing loss, 10% of participants in the left ear and 20% in the right ear showed moderate hearing impairment. This indicates that a greater proportion of participants had a moderate reduction in hearing sensitivity in the right ear compared to the left ear. In the left ear, 2% of participants had moderate hearing loss, while 4% experienced this level of impairment in the right ear.

Overall, the data suggests that the majority of participants had a normal hearing threshold in both ears, indicating typical hearing sensitivity at the tested frequencies. However, mild and moderate hearing loss were present in a portion of the participants, with varying degrees observed between the left and right ears. These findings highlight the importance of assessing hearing thresholds in both ears and considering the variability in hearing sensitivity among individuals with congenital blindness. Further analysis and exploration of the data would provide a deeper understanding of the specific frequency ranges affected and the implications for individuals with congenital blindness in terms of communication and auditory perception.

	Right Ear			Total	Left Ear			Total
	Normal	**Mild**	**Moderate**		**Normal**	**Mild**	**Moderate**	
HM	17	1	0	18	14	4	0	18
PL	16	1	1	18	15	3	0	18
NPL	12	1	1	14	11	3	0	14
Total	45	3	2	50	40	10	0	50

Visual acuity with respect to hearing loss

The table 1.5 provides data on the visual acuity of the participants with respect to their hearing loss. The visual acuity is categorized into three levels: Normal, Mild, and Moderate. The data is further divided into the right ear and left ear. Here's an interpretation of the data in paragraph form:

Looking at the right ear, 45 participants had normal visual acuity, indicating that they had typical vision in that ear. In terms of mild hearing loss, three participants exhibited this level of impairment in the right ear, while two participants had moderate hearing loss. Moving to the left ear, the majority of participants (40) had normal visual acuity. Ten participants had mild hearing loss, but no participants experienced moderate hearing loss in the left ear.

When considering the overall data, 50 participants had normal visual acuity in both ears. In terms of mild hearing loss, a total of three participants had this level of impairment across both ears. Additionally, two participants exhibited moderate hearing loss in both ears.

Focusing on the specific visual acuity categories, the data shows that the participants with Hand Motion (HM) visual acuity had a total of 18 individuals, with 17 in the right ear and 14 in the left

ear. Participants with Perception of Light (PL) visual acuity amounted to 18 individuals, with 16 in the right ear and 15 in the left ear. Those with No Perception of Light (NPL) visual acuity accounted for 14 participants, with 12 in the right ear and 11 in the left ear.

These findings highlight the relationship between visual acuity and hearing loss among the participants. It is important to note that the majority of participants had normal visual acuity in both ears, regardless of their level of hearing loss. However, mild and moderate hearing loss was observed in a subset of participants, with varying levels of visual acuity in each category. Further analysis and exploration of the data would provide a deeper understanding of the impact of hearing loss on visual acuity and the potential implications for individuals with congenital blindness in terms of their overall sensory perception and functional abilities.

Conclusion

In conclusion, this study aimed to examine the effects of hearing level on individuals with congenital blindness. The findings shed light on various aspects related to hearing level, visual acuity, and the relationship between the two among the participants.

The study revealed variations in hearing thresholds among individuals with congenital blindness, with some participants exhibiting enhanced hearing sensitivity in certain frequency ranges. However, the results did not support the general perception that hearing level universally increases after the loss of sight. While some individuals reported subjective improvements in their hearing abilities, others did not perceive significant changes or faced challenges in auditory processing. These findings highlight the complexity and individual differences in auditory perception among individuals with congenital blindness.

The analysis of visual acuity with respect to hearing loss demonstrated that the majority of participants had normal visual acuity, irrespective of their hearing loss levels. Mild and moderate hearing loss was observed in a subset of participants, but it did not directly correlate with visual acuity impairment.

Limitations

Several limitations should be considered when interpreting the findings of this study. Firstly, the sample size was relatively small, which may limit the generalizability of the results to a broader population of individuals with congenital blindness. Future research with larger and more diverse samples would provide a more comprehensive understanding of the topic.

Another limitation is the reliance on self-reported data and subjective perceptions. While questionnaires and interviews captured valuable insights, they are inherently subjective and may be influenced by individual biases or variations in participants' interpretation of their experiences.

Furthermore, the study focused primarily on hearing level and visual acuity, overlooking other potential factors that could influence the sensory perception of individuals with congenital blindness. Future studies could explore additional sensory modalities, such as tactile sensitivity or proprioception, to gain a more holistic understanding of their sensory experiences.

Summary

In summary, this study examined the effects of hearing level on individuals with congenital blindness. The findings revealed variations in hearing thresholds among the participants, indicating individual differences in auditory sensitivity. However, the study did not find consistent evidence to support the perception that hearing level universally increases after the loss of sight. Visual acuity was largely unaffected by hearing loss levels, with the majority of participants exhibiting normal visual acuity.

The study contributes to the understanding of sensory perception among individuals with congenital blindness. The findings emphasize the importance of considering individual differences and subjective experiences when investigating the relationship between hearing level, visual acuity, and congenital blindness. Future research should address the limitations and explore additional factors to provide a comprehensive understanding of sensory perception in this population. Ultimately, such knowledge can inform interventions, support strategies, and educational approaches tailored to the specific needs of individuals with congenital blindness.

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Authors

First Author – Samina Ahmed, senior Lecaturer Audiologist Bahawalpur Medical and dental college

Second Author – Dr shahid Majeed, HOD of Allied Health Sciences.
Bahawalpur Medical and dental college
Third Author – Gule Zahra Naqvi, Vice principle Allied Health Sciences
Bahawalpur Medical and dental college
Fourth Author Anum Jamshed, lecturer Audiologist, Bahawalpur Medical and dental college
Fifth Author Ayesha Bakhtawar, lecturer optometry, Bahawalpur Medical and dental college

Correspondence Author – Samina Ahmed