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Soundless Success: A Comprehensive Study of Academic Information Access for Hearing-Impaired Students in Karnataka

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The study examines soundless success: a comprehensive study of academic information access for hearing-impaired students in Karnataka**.** The data was collected using quantitative and qualitative methods, including in-depth interviews, survey methods, and focus groups conducted among 1027 hearing-impaired students in Karnataka. The study results showed hearing-impaired students' information-seeking behaviours are similar to normal students. Although, their challenges involve searching for information because they do not have modern facilities, due to the lack of support infrastructures at school. In other words, they are bound to encounter barriers before meeting their information needs. This causes them to waste much time in the information-seeking process, so they are slowed down in many ways. This study identifies constraints and challenges and suggests ways to improve current information sources and services.

Keywords: School Library, Deaf and Hard of Hearing, Academic Information Access, Hearing-Impaired Students, Karnataka.

Introduction

Access to academic information is crucial for the educational success of all students. However, students with hearing impairments encounter unique challenges and often struggle to fully engage with classroom activities, access library resources, and utilise online content due to the lack of appropriate accommodations. Although tools such as sign language interpreters, captions, and specialised learning aids exist, they are not always readily available or effectively integrated within academic institutions. This study explores the current state of accessibility by examining the experiences of hearing-impaired students; the study will identify barriers to information access and propose solutions to improve inclusivity.

Review of literature

Bogdanović and Gligorovic[1] found that Serbia teachers lacked sufficient knowledge and skills to work with differently-abled children, highlighting the need for targeted professional development. Fernando and Kuhn[2] emphasise the significance of ongoing training and support for teachers to implement inclusive practices effectively. Woodard, B. S., and McAdam, J. A[3] describe the design elements that make the Perkins Library, which serves patrons who are blind, visually impaired, or deafblind, accessible. Lipton, S. B., and Paez, A.[4] found that while many academic libraries in New York State offer some services for students with disabilities, there is room for improvement.

Hearing impairment

The term "hearing impaired" (H.I.) is frequently used to refer to people with varying degrees of hearing impairment, from mild to profound, including those who are deaf or hard of hearing. It is caused by inner ear or nerve damage and can range from mild to profound. Treatment options include hearing aids, cochlear implants, and sign language. Fortunately, many hearing impairments are preventable. Most parents and caretakers are not aware of such programs. Hearing loss affects all ages, genders, races, and ethnicities, affecting a child's speech, language, and social skills development. Most hearing losses are identified through screening at birth, and hearing loss in children is one of the most common congenital disabilities. Students with hearing impairments face various challenges inside the classroom. However, that does not mean a higher

class or college is out of reach. Today's wide variety of tools, technologies, and methods can support hearing-impaired students succeeding in an educational setting.

Information access

Accessibility refers to the ability of users to identify and utilise the assistance. Information access is the ability to successfully identify, retrieve, and use information. A library is not simply a collection of books and other reading material. It is a location where information sources are grouped to assist users in locating the information they require. Users can ensure maximum utilisation when information sources are organised carefully and easily access textual and non-textual material in paper-based and digital collections.

Assistive technologies

Assistive technologies for hearing-impaired individuals include hearing aids, cochlear implants, and assistive listening devices. These technologies can improve communication, enhance speech perception, and increase the overall quality of life for those with hearing loss. In addition, there are also captioning and sign language interpretation services available to help hearing-impaired individuals access information and communicate effectively in various settings, such as work, school, and social events. These technologies and services have greatly improved accessibility and inclusivity for the hearing-impaired community. Providing training for the efficient use of assistive technology among students can be challenging due to technical difficulties, limited resources, learning barriers, lack of awareness, and attitudinal barriers. Recognising and addressing these challenges proactively ensures that students with disabilities receive the training and support they need to use assistive technology effectively.

Objectives of the study

- To examine academic information access and library use of hearing-impaired students.
- To know the students' participation in various activities.
- To know the difficulties encountered by students in hearing-impaired schools while obtaining and using information.
- Finally, based on the above, suggest best practices to be followed in the libraries to provide optimum services to the user community in the era of ICT.

Scope and limitation of the study

Figure 1 explains the Hearing-impaired selected schools. The present study is confined to academic information access for hearing-impaired students in Karnataka. The data collected is from 18 H.I. schools and 1027 H.I. students in Karnataka. This

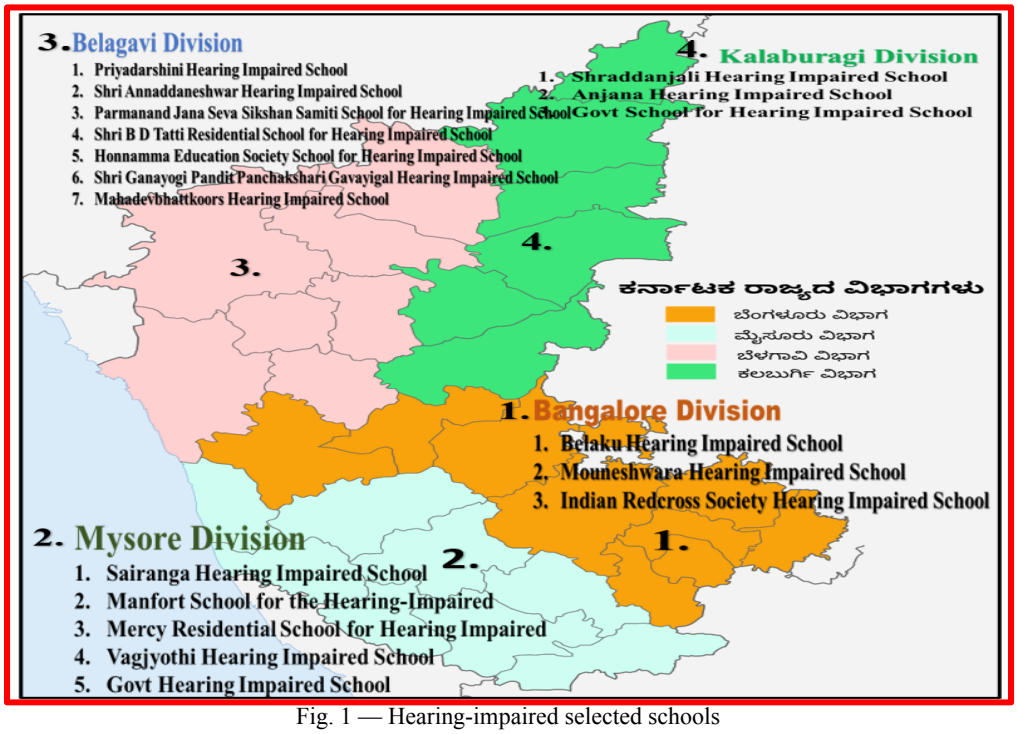

Fig. 1 — Hearing-impaired selected schools

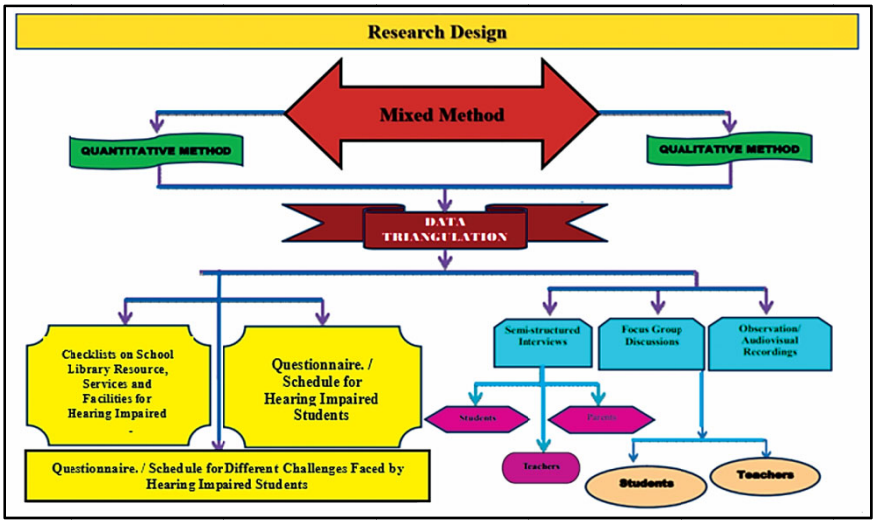

Fig. 2 — Research methods

investigation is confined to hearing-impaired students only.

Figures 2 explain the research methods used in the present study, when the researcher asked hearing-impaired students the questions, they were uncomfortable answering them. Also, the researcher needed help understanding what he was trying to convey. Therefore, the researcher enlisted the help of teachers teaching hearing-impaired students while collecting data from each hearing-impaired student. The researcher asked teachers who teach hearing-impaired students this question during data collection. Then, the same was communicated to the student using sign or finger language, etc., at the student's convenience. Then, the student answered, and the teacher told the researcher the same thing. The same procedure was followed in collecting the data for each student with a hearing impairment from each school.

Sampling size calculation

The sample size of respondents was calculated based on Krejcie & Morgan[5] formula.

S = required sample size.
χ^2 = Z value (e.g. 1.96 for 95% confidence level)
N = the population size.
P = the population proportion (assumed to be 0.5(50%)
D = the degree of accuracy expressed as a proportion (0.025). It is the margin of error.

$$S = \frac{\chi^2 NP(1-P)}{d^2(N-1)+\chi^2 P(1-P)}$$

$\chi 2$ = 1.96, N=1740, P=0.5, d=0.025

$$S = \frac{(1.96)^2 \times 1740 \times 0.5 \times (1-0.5)}{(0.025)^2 \times (1740-1) + (1.96)^2 \times (0.5)(1-0.5)}$$

$$= \frac{(3.8416) \times (1740) \times 0.5 \times 0.5}{(0.000625) \times (1739) + (3.8416) \times (0.5)(0.5)}$$

$$= \frac{1671.096}{(1.086875) + (0.9604)}$$

$$= \frac{1671.096}{2.047275}$$

=816.25380078397
=816 Sample Size

It appears there is a discrepancy between the sample size calculated using the Krejcie-Morgan[5] formula (816) and the actual sample size used in the study (1027). It is recommended to use the calculated sample size as a starting point and adjust it based on practical considerations and the study's specific context. In this case, the researchers may have decided that a larger sample size was necessary to ensure the generalizability of the findings or to capture the full range of experiences among hearing-impaired students.

Sampling method used

The sampling method employed for this study was random sampling. This method is advantageous in achieving a robust and statistically significant sample that accurately reflects the broader population.

Administration of the research tools

The investigator collected the data by administering all the tools and the personal proforma to hearing-impaired students. Before administering the devices, the researcher had taken prior permission from the head of the special schools and developed a

good rapport with the students. The researcher took every response from the students, along with the help of teachers teaching in special schools.

Data analysis and interpretation

Table 1 presents the respondents' distribution by gender. The male respondents form a majority with 64.3%, compared to the female respondents, 35.7%. The findings pinpoint that the male population is higher in the special schools for H.I. than the female population. The findings and results of previous studies provide a foundation for further research and can help inform decision-making in various fields. When interpreting their conclusions, it is essential to consider these studies' limitations and potential biases. Xuewen, Y., & Jianbo, G.[6] reported that males had a higher prevalence of hearing loss due to extra responsibilities and that hearing loss was more common in rural areas. According to Von Gablenz, Hoffmann, & Holube[7], hearing can be affected by living and working conditions, health care, and lifestyle factors. Huang et al.[8] found gender differences in the association between hearing loss and cognitive function. Teele, Klein, & Rosner[9] reported that five out of six children experience ear infections (otitis media) by the time they are three years old. These findings highlight the importance of early detection and management of hearing loss and ear infections, particularly in children, to mitigate cognitive decline later in life. Healthcare providers should prioritise regular hearing screenings and prompt treatment of ear infections to promote optimal cognitive function.

Table 2 shows the distribution of respondents (H.I.) based on age. The respondents between the ages of 10–15 form the majority (79.2%), and the remaining 20.8% belong to the age group of 16–20. The data indicate that fewer students are studying in the higher grades in special schools. The researcher found that the studies conducted by various investigators support the concept being tested, even though there is no direct study investigating the above findings. According to Ansari[10] implementing screening methods to detect hearing impairment at an early stage can aid countries in mitigating the negative consequences of this condition. This highlights the importance of early identification and intervention in addressing hearing loss. According to Stevens et al.[11], low- and middle-income regions have the highest hearing impairment prevalence, necessitating implementing interventions such as hearing aids. These interventions can help improve individuals in these regions' access to hearing healthcare services.

Table 3 reveals that the majority of the respondents (H.I.) are studying in special schools located in rural areas (81.1%) as compared to the respondents studying in special schools situated in urban (17%) and semi-urban regions (1.9%). The data in the table indicates more respondents (H.I.) in rural areas than in urban and semi-urban regions of Karnataka. Rural areas are characterised by small villages and low population density, making it difficult for children with special needs to find appropriate and affordable child care. Improving the health of rural children requires enhanced public health surveillance and research, as well as cross-cutting solutions involving education, economic development, and health care. Libraries can play a crucial role in providing access to books and other resources, helping bridge the gap, and promoting literacy for all children regardless of socioeconomic status. Research has shown that individuals living in rural locations tend to have limited access to academic resources, leading to a greater reliance on library use for information seeking. Rural residents may face unique challenges in accessing and utilising library services due to geographical barriers and limited technology infrastructure. The previous studies have shown promising results, indicating a strong correlation between the variables under investigation. However, further research is needed to establish a causal relationship and generalise the findings to a larger population. Barr, Dally, and Duncan[12] found that

Table 1 Gender of hearing-impaired students

S. No	Gender	Respondents
1	Male	66 0 (64.3%)
2	Female	367 (35.7%)
	Total	1027 (100.0%)

Table 2 Age-wise distribution of hearing-impaired students

S. No	Age	Respondents
1	10-15	813 (79.2%)
2	16-20	214 (20.8%)
3	21 -25	-
4	26-30	-
	Total	1027 (100%)

Table 3 Location of hearing-impaired students

S. No	Location	Respondents
1	Rural	833 (81.1%)
2	Urban	175 (17.0%)
3	Semi-urban	19 (1.9%)
	Total	1027 (100%)

children with hearing loss in rural areas may experience poor outcomes due to limited-service provision. However, alternative methods such as teleintervention and visiting specialists can enhance access to services and improve outcomes. According to Powell et al.[13] rural areas face challenges with hearing loss due to limited access to providers and high costs.

Table 4 exhibits respondents' distribution with H.I. by their 'Class of Study.' This group indicates a mixed trend in taking part in research studies. However, the percentage of respondents from Middle Classes (4th Std- 12.4%, 5th Std- 10.9%, 6th Std-11.4%, and 7th Std-13.9%) is higher than other classes in the group. It suggests that the students in the Middle Classes (from Std-4th to Std-7th) are more enthusiastic about responding to such research studies. Although no direct study looks into the abovementioned findings, the findings are consistent with those of other researchers' studies. According to Fitzpatrick et al.[14] the impact of hearing loss in Canada's North extends beyond academic performance. It affects social and emotional development, emphasising the need for a comprehensive hearing health strategy. According to Maharjan et al.[15] early screening, detection, and timely management of chronic otitis media can prevent hearing loss and its adverse effects on primary school-aged children's social, educational, and language development. Therefore, it is crucial to prioritise these measures in healthcare settings.

Table 5 shows that the Kannada language is the mother tongue of a majority (90.3%) of the respondents (H.I.), followed by Hindi (6.1%) and other languages (3.6%). The results are evident since the special schools are in Karnataka, whose official language is Kannada. Mother-tongue education refers to any instruction that utilises the child's native language. This is typically the language in which children communicate with their families at home. Kannada is the mother tongue of the majority of Karnataka residents. Omogho[16] emphasised the significance of the English language and its connection to one's tongue. This highlights the importance of language in communication and cultural exchange. According to Giotis[17], language is crucial in human life as it facilitates communication, expression of thoughts, and description of experiences. According to Drigas, Kouremenos, and Vrettaros[18], most information and communication services and facilities do not cater to the linguistic needs of impaired individuals, including those who are deaf or hard of hearing. This lack of support can create significant barriers to communication and access to information for these individuals.

Table 6 presents the data gathered on the student's impairment percentage of H.I. The data reflects that most respondents (88.5%) suffered from 'Complete Hearing Loss/ Impairment." The respondents had no mild or moderate hearing loss or impairment cases. This crucial information can be utilised in planning and implementing new services or improving existing ones for hearing impaired students. Khanna et al.[19] suggest implementing screening methods and strategies to alleviate the high prevalence of severe visual impairment and blindness among children in Andhra Pradesh and Telangana based on their study findings. Such measures could significantly reduce the burden of these conditions in the region. According to Amdur[20], the disability determination system's allowance rates are also affected by its administrative or structural features. According to Gloss[21], the guides to the evaluation of permanent impairment rating schedule by the American medical association is a dependable and accurate tool for evaluating permanent hand impairment. The study also found a strong correlation between psychomotor test scores and impairment ratings. There is a need for reform in the disability determination system to

Table 4 — Class-wise distribution of hearing-impaired students

S. No	Class (Standard)	Respondents
1	1	73 (7.1%)
2	2	94 (9.2%)
3	3	93 (9.1%)
4	4	127 (12.4%)
5	5	112 (10.9%)
6	6	117 (11.4%)
7	7	143 (13.9%)
8	8	98 (9.5%)
9	9	80 (7.8%)
10	10	90 (8.8%)
	Total	1027 (100%)

Table 5 — Mother tongue of hearing-impaired students

S. No	Mother Tongue	Respondents
1	Kannada	927 (90.3%)
2	Hindi	63 (6.1%)
3	Others	37 (3.6%)
	Total	1027 (100%)

Table 6 — Percentage of impairment among hearing-impaired students

S No	Hearing Impairment	Respondents
1.	Mild Hearing Loss/ Impairment	-
2.	Moderate Hearing Loss/	-
3.	Severe Hearing Loss/ Impairment	118 (11.5 %)
4.	Complete Hearing Loss/	909 (88.5%)
	Total	1027 (100%)

increase approval rates and provide necessary assistance to those in need.

Table 7 shows the data on the students' mood swings with H.I. Most respondents (93.2%) mainly felt happy. About 4.6% of the respondents opined that they are content most of the time, which is also a form of happiness. Only 2.2% of respondents said they are frequently "sad," which can be overcome with the help of professional counsellors. According to Powell et al.[13] rural areas face a significant challenge in addressing hearing loss due to limited providers and expensive treatment options. According to Theunissen et al.[22] children who have hearing loss exhibit greater indications of depression than those with typical hearing, emphasising the need for prevention and treatment strategies that emphasise coping abilities. Basch[23] states that school health programs should be evidence-based, strategically planned, and well-coordinated to address the achievement gap, it is essential to consider these studies.

Table 8 shows the data related to the income status of the students with H.I. It is revealed that a majority (70.8%) of respondents belong to the low-income group. While 290 (28.2%) of the respondents mentioned that they belong to the "middle-income group," only 10 (1.0%) of the respondents said that they belong to the high-income group. The data reflects that the prevalence of hearing impairment is higher in students with low incomes. Although a specific study has not looked into the above findings, the overall findings are consistent with other researchers' studies. The previous study findings suggest further investigation to confirm the alignment of the overall conclusions. Future studies could explore potential explanations for the similarities in results across different investigations. Powell et al[13] found that interventions targeting the social determinants of health, such as poverty and access to healthcare, may be necessary to reduce the prevalence of childhood hearing loss in disadvantaged communities.

Children from low-income families are more likely to have hearing problems because they are more likely to have other health problems, like malnutrition, chronic diseases, and mental health problems. Poverty can also make it hard for people to get health care and educational resources, making it take longer for children with hearing difficulties to be diagnosed and treated. Children born preterm and with low birth weight are more prevalent in low-income households, and the subsequent care of these children may negatively affect their hearing. Early detection and intervention can significantly improve the outcomes for children with congenital hearing loss, so it is essential to provide accessible and affordable hearing screenings and follow-up care for all children, especially those from low-income families. While it is widely believed that disability, poverty and poor health are inextricably linked, this is not the case. Disability exacerbates poverty by leading to permanent social exclusion and participation in society due to the systemic, institutional, environmental and behavioural challenges that people with disabilities face daily. Public health campaigns and education programs can raise awareness about the importance of hearing screening and the potential risk factors associated with congenital hearing loss. Hearing loss is a significant issue in rural areas due to a lack of providers and costs. This knowledge can inform targeted interventions to improve outcomes for disadvantaged children with hearing loss. This can be achieved by conducting longitudinal studies that track the health outcomes of children from low-income families and compare them to those from higher-income families. Therefore, addressing the systemic barriers that prevent children from receiving adequate healthcare in these areas is crucial.

Table 9 presents the data on the hobbies and interests of the students with H.I. Approximately 498 (48.5%) of those polled stated that their primary hobby/interest is "games." In comparison, 474

Table 7 — Emotion feeling most often among hearing impaired students

S. No	Emotion	Respondents
1	Happy	957 (93.2%)
2	Contented	47 (4.6%)
3	Sad	23 (2.2%)
4	Worried	
5	Restless	
6	Angry	
7	Fearful	
8	Overjoyed	-
	Total	1027 (100%)

Table 8 — Family income status of hearing-impaired students

S. No	Income status	Respondents
1	Low income	727 (70.8%)
2	Middle Income	290 (28.2%)
3	High Income	10 (1.0%)
	Total	1027 (100%)

Table 9 — Hobby/interest of hearing-impaired students

S. No	Hobby/interest	Respondents
1	Craft	474 (46.2%)
2	Games	498 (48.5%)
3	Drawing or Art	378 (36.8%)
4	Others	397 (38.7%)
	Total	1027 (100.0%)

(46.2%) of the respondents indicated "craft," 378 (36.8%) of the respondents declared "drawing/art," and about 397 (38.7%) of the respondents marked the "others" option as their hobby/interest. From the data above, it can be inferred that the students with H.I. are more inclined to play "games" and do "craft" work. Hobbies enable children to be active intellectually while also expressing their sorrow. Hobbies support good health and may help reduce developing high blood pressure. Participating in a few hours of weekly activities can also help minimize the chances of depression and dementia. The hobbies and interests of disabled students can be powerful motivators for academic information-seeking behavior and library use; therefore, libraries should strive to provide accessible and inclusive resources and services that cater to the diverse needs of disabled students. This can help create a welcoming and supportive environment that fosters academic success and personal growth. Each individual will have unique interests and preferences, but it is critical to assist students in discovering a lifelong leisure activity. Arts and crafts, reading, culture, exercise, and outdoor and community activities are all activities that can help students' overall growth. Each student should be motivated to engage in peer-to-peer recreational activities. The findings and results of previous studies provide a foundation for further research. They can inform future decisions and policies Taylor, J., Stalker, K., & Stewart, A[24] Rahmi, R., & Yulia, D[25] They offer insights into the effectiveness of various interventions and programs and the challenges different populations face. However, it is essential to consider these studies' limitations and potential biases when interpreting their results.

Table 10 shows the occupational status of the parents of students with H.I. A majority (70%) of the respondents indicated that their parents are "farmers." About 20% of the respondents said their parents are "coolies." In comparison, 79 (7.7%) informed their parents that they do jobs other than those listed in the table. A small percentage of respondents (2.1%) revealed that their parents are "self-employed." The data suggests that most students with H.I. belong to economically backward sections of society. H.I. children's parents' occupations can impact their academic information-seeking behaviour and library use. Parents with high-income occupations may be more likely to encourage and support their children's academic information-seeking behaviour and library use. In contrast, parents with low-income occupations may not prioritise or have the necessary skills to help their children's scholarly research and information-seeking behaviour. Libraries can play a crucial role in bridging this gap by offering tailored programs and resources for disabled children and their families. Libraries can provide resources and services tailored to the needs and interests of disabled children, such as access to assistive technology and specialised collections and resources, and offer programs and events that promote information literacy skills. Libraries can collaborate with local disability organisations and schools to ensure their services are inclusive and accessible to all children, regardless of their abilities or backgrounds. It is a well-known fact that parents have the most significant influence on their children's lives. The government should consider upgrading health systems to improve child health care and pay particular attention to social determinants of child health, such as parental educational achievement. There is a correlation between parents' educational attainment and their family's financial level. According to Porterfield[26] The monetary expenses associated with raising disabled children are significantly higher than those associated with raising nondisabled children. This highlights the importance of having accessible healthcare resources for families with children who have special healthcare needs. It also suggests that community resources beyond healthcare, such as safe neighbourhoods and educational support, can positively impact parental health and well-being.

Table 11 shows the information seeking from the library by hearing-impaired students. All the respondents in the study seek information from the library. The school library is the "heart of the school" and emits stimulating currents that reach every corner

Table 10 — Parents occupation of hearing-impaired students

S. No	Parents Occupation	Respondents
1	Self-employed	22 (2.1%)
2	Farmer	719 (70.0%)
3	Coolie	207 (20.2%)
4	Others	79 (7.7%)
	Total	1027 (100%)

Table 11 — Information seeking from library by hearing-impaired students

S. No	Information seeking	Respondents
1	Yes	1027 (100%)
2	No	-
	Total	1027 (100%)

of the school. It is essential to ensure that school libraries are adequately funded and staffed to provide students access to various resources and support their academic and personal growth. By doing so, students can become lifelong learners and critical thinkers who can navigate the world's complexities. Students with H.I. may face unique barriers to accessing information and using library services, impacting their academic success. It is essential to understand and meet the unique needs of these children when it comes to getting information for school and using the library, such as making facilities and technology easy to use, providing materials in different formats, and ensuring all children feel welcome and included for developing library services for these individuals. No direct study examines the above results. However, further research is needed to confirm these results and explore potential underlying mechanisms. Sambo et al.[33] found that most physically challenged students (82%) use the library occasionally and 18% regularly. Akolade et al.[34] reported that 36.1% of physically challenged users visit the library three times a week, 21.3% visit the library daily, and 12.8% visit infrequently. According to Roberts and Smith[27], policies, services, and programs should make library facilities and collections more accessible to differently-abled individuals. Therefore, libraries need to continue to gather data on the library usage habits of disabled individuals to understand their needs better and make necessary accommodations. This information can also inform policies and programs to make library facilities and collections more accessible to differently-abled individuals.

Table 12 shows the data difficulties or challenges faced by the students with H.I. in accessing information from the library. About 49% of the respondents said they "always" face difficulties. About 26.3% of respondents said they encountered challenges "sometimes," and about 24.7% said it was difficult to access information in the library "usually." Although students with H.I. can see and search the materials independently in the library, they often find it difficult to effectively convey their needs to the library staff as they cannot speak, and most of the library staff cannot interpret the sign language. This could be why they expressed dissatisfaction with this particular question from the researchers. There is no direct study on the above findings, but the overall conclusions align with those of studies done by different people. The results suggest that people who cannot see and those who cannot hear get the same help from library staff when they need to find information. Even though there is no direct study on these specific findings, they are consistent with what other researchers have found. Sanaman and Kumar[28] were right when they said that library staff should know about all the adaptive technologies that can help people with disabilities. Furthermore, they should know how to assist all users with library technology. According to Singit[29], being differentiated or disabled is a person's ability to do daily living tasks to the degree that they may need assistance. The range of academic libraries for people with disabilities is inadequate, and only recently have individual libraries made efforts in this direction. According to Solanki & Mandaliya[30], UNESCO and IFLA standards provide equitable library services to all people, including those with disabilities. It also looked at the recommendations of the Government of India and the University Grants Commission. Access to libraries and information centers easily accessible to students with hearing impairment is critical to their development. To stay current in their fields, libraries and information centres can only give authentic sources of knowledge, such as books, periodicals, newspapers, and journals. Because digital libraries keep and make collections accessible in digital formats, specially-abled students require access to physical and digital libraries. Thus, it is vital to build inclusive libraries and information centres at each level to meet the information demands of current and future specially-abled students. As a result, schools should have accessible libraries and information centers.

Table 13 presents the views collected from the students with H.I. on accessing information sources in the library. Most respondents found the information sources "easy to access" in the library in this group. About 21.5% found it "fairly easy to access"

Table 12 — Difficulties faced during seeking information among hearing-impaired students

S. No	Difficulties	Respondents
1	Always	503 (49.0%)
2	Usually,	254 (24.7%)
3	Sometimes	270 (26.3%)
4	Usually Not	-
5	Never	-
	Total	1027 (100%)

Table 13 — Accessibility of information sources

S. No	Accessibility	Respondents
1	Easy to access	785(76.4%)
2	Fairly easy to access	571(27.8%)
3	Not easy to access	21(2.0%)
	Total	1027 (100%)

information sources. A tiny portion of the respondents (2%) claimed that the information sources in the library were "not easy to access. Information access is critical for social, political, economic, and educational progress when information sources and services are available but not easily accessible to users, circulation system, low shelving, a lack of adequate guides to library arrangement, and administrative and physical barriers. According to Bhyrappa & Sarasvathy[31], Sign language is one of the primary services provided to hearing-challenged pupils, followed by assistance from staff or cooperation.

Table 14 shows the responses collected from the students with hearing impairments on their participation in different activities related to information seeking. Students with hearing impairments (HI) are most engaged in active participation and discussion activities. They are also interested in seeking information from outside sources and are motivated to do more than the assigned work; they are not afraid to ask questions and are confident in their ability to answer them. Finally, they are committed to quality work. These findings suggest that students with HI are eager to learn and can achieve academic success. With the proper support, they can thrive in the classroom and beyond. The following studies suggest a gap in the information provided to disabled individuals and highlight the importance of addressing their diverse information needs. Future research could explore ways to address these gaps and provide more comprehensive information to disabled individuals. For example, Patil Rohit and Kumbar[32]reported that information needs to be related to agriculture were the least requested by respondents (18.6%); Sambo et al.[33] cited that students with physical disabilities need information for recreational purposes and social and personal development; Idhalama[35] showed that physically challenged students need information about marriage and free time; and according to Murugan and Jeyshankar[36] students need sociocultural information. These studies suggest that other factors may influence the information needs of disabled individuals, and further research is needed to explore these factors. Understanding these additional information needs could help improve accessibility and inclusivity for disabled individuals in various settings. These results are similar to those of studies by researchers in other countries who have also found a correlation between these variables. However, further research is needed to determine this relationship's causality and potential underlying mechanisms. Ekwelem[37] state that electronic texts, large prints, and tactile graphics are unavailable in any library. Khasseh et al.[38]state that 55% of libraries lack easy-to-read, picture, and large print books. These studies highlight the lack of accessibility resources in libraries, which can limit the ability of individuals with disabilities to access information and participate fully in society. Libraries need to address these gaps and work towards creating more inclusive spaces.

Table 15 reflects the data collected from the respondents of the special schools for the H.I. on their familiarity of assistive technology devices. The findings were not encouraging. Some of the AT devices were not used by the students with H.I. Here is the list: Teletypewriter (0%) and Amplified Listening Device (0%). Portable Speech Synthesizers (0%), alerting Devices (0%), Induction Loops (0%),

Table 14 — Student participation among hearing-impaired Students
(1= Strongly disagree 2= Disagree 3= Neither disagree nor agree 4= Agree 5= Strongly agree)

S. No	Student participation	1	2	3	4	5	Total Scores	Mean	Rank
1	Work thoroughly and well rather than just trying to get by.	174 (16.9%)	247 (24.1%)	171 (16.7%)	135 (13.1%)	300 (29.2%)	3221	3.136	7
2	Do more than the assigned work.	159 (15.5%)	146 (14.2%)	68 (6.6%)	269 (26.2%)	385 (37.5%)	3656	3.559	4
3	Ask questions to get more information.	160 (15.6%)	166 (16.2%)	138 (13.4%)	218 (21.2%)	345 (33.6%)	3503	3.41	5
4	Raise hand to answer a question or volunteer information.	194 (18.9%)	130 (12.7%)	171 (16.7%)	185 (18.0%)	347 (33.8%)	3442	3.351	6
5	Go to a dictionary, encyclopaedia, or another reference source on your own to seek information.	185 (18.0%)	94 (9.2%)	82 (8.0%)	239 (23.3%)	427 (41.6%)	3710	3.612	3
6	Engage the teacher in conversation about the subject matter outside of class.	184 (17.9%)	52 (5.1%)	52 (5.1%)	273 (26.6%)	466 (45.4%)	3866	3.764	2
7	Participate actively in class discussions.	196 (19.1%)	35 (3.4%)	54 (5.3%)	218 (21.2%)	524 (51.0%)	3920	3.816	1

and Closed Caption Decoders (0%). The reason could be the non-availability of these essential devices in these schools. Most respondents (62.2%) mentioned only using the Group Hearing System slightly. Assistive Learning Devices were highly used by all the respondents (100%) in the group. Hearing-impaired students can embrace computers and the Internet more thoroughly than other groups because much communication can be accomplished through writing and reading. For deaf people, many devices and apps with assistive technology (AT) have been developed. Many of them are devoted to assisting deaf people with day-to-day issues. Apps that automatically convert spoken words to text or generate subtitles in multiple languages are famous, as devices convert audio cues to physical feedback. "Leaving no one behind" entails ensuring that people with disabilities are integrated into society and have the opportunity to live a healthy, dignified life. Assistive technology is a broad term that encompasses the systems and services involved in providing assistive products and services. Assistive products help individuals maintain or improve their function and independence, improving their well-being. The previous study findings/results suggest a positive correlation between the variables. However, further research is needed to determine the variables that may have been overlooked or not included in the previous study and explore the potential causal relationship between the variables. As Sanaman and Kumar[28] said, libraries should care enough to determine the technologies needed to help disabled users. One is the financial problem, and the other is the degree of usefulness of the device in the context of a particular library. Therefore, it is essential to consider these factors in future studies to understand the relationship between the variables better and provide practical recommendations for libraries to serve disabled users better. It may be helpful to conduct surveys or interviews with disabled users to gather their perspectives on the technologies and services that would be most beneficial for them. The amount spent on such ICT devices should have justification in terms of judicial use by the respective patrons.

Table 16 shows the data collected from the H.I respondents of the special schools of the H.I. on the familiarity of assistive software. Technology has advanced in today's society. The child's technological requirements will change as grows. Simultaneously, the technology available will change. Library staff must know these ever-changing possibilities to help children use global and assistive technology to maximise their independence. The above table shows the data collected from the respondents of the special schools of the H.I. on the use of assistive software. A few essential AT software products, such as TTY Emulating Software, Dragon Dictate, I-Communicator, Video Captioning Software, TTS Reader, Alerting Software, Sound Recognition Software, etc., were not used by the people with H.I. The reason could be the non-availability of this software in the libraries attached to the special schools for the H.I. The only software that the people with H.I. used was the picture software, and its usage was also poor, with about 63.2% of respondents using it less frequently and rarely. Computers, smartphones, and tablets are becoming increasingly popular in almost everyone's lives. When combined with the appropriate websites, apps, and software, they may be pretty beneficial in assisting someone with hearing loss to live a fulfilling life.

Table 15 — Familiarity in using assistive devices among hearing-impaired students

S. No	Assistive devices	Not at all 1	Slightly 2	Moderate 3	High 4	Very high 5
1	Tty (teletypewriter)	1027 (100%)	-	-	-	-
2	Tdd (amplified listening device)	1027 (100%)	-	-	-	-
3	Portable speech synthesiser	1027 (100%)	-	-	-	-
4	Alerting devices, alarming devices, and signals system	1027 (100%)	-	-	-	-
5	Assistive listening system (induction loop)	1027(100%)	-	-	-	-
6	Closed-captioned decoders	1027 (100%)	-	-	-	-
7	Assistive listening devices (ALDs) (hearing aids and cochlear implants)	-	-	-	1027 (100%)	-
8	Augmentative and alternative communication (AAC) devices	1027 (100%)	-	-	-	-
9	Smart gloves	1027 (100%)	-	-	-	-
10	Group hearing	-	639 (62.2%)	388 (37.8%)	-	-
11	Others	-	1027 (100%)	-	-	-

Table 16 — Familiarity with using assistive software among hearing-impaired students

S. No	Assistive software	Most Frequently	Frequently	Less Frequently	Rarely	Do Not Use
1	TTY emulating software	-	-	-	-	1027 (100%)
2	Dragon Dictate (convert speech to text	-	-	-	-	1027 (100%)
3	Picture Software	-	-	263 (25.6%)	386 (37.6%)	378 (36.8%)
4	Real-Time Translation Software	-	-	-	-	1027 (100%)
5	I Communicator	-	-	-	-	1027 (100%)
6	Video Captioning Software	-	-	-	-	1027 (100%)
7	TTS Reader	-	-	-	-	1027 (100%)
8	Alerting software	-	-	-	-	1027 (100%)
9	Sound-recognition software	-	-	-	-	1027 (100%)
10	Translator Software	-	-	-	-	1027 (100%)
11	Speech synthesiser software	-	-	-	-	1027 (100%)
12	Augmentative and alternative communication Software	-	-	-	-	1027 (100%)
13	Others	-	-	-	1027 (100%)	-

Table 17 shows the challenges faced by hearing-impaired students: "lack of equipment and facilities like laptops, computers, and assistive technologies" and "reading problems" as the top challenges (Rank # 1) by the students with H.I. The findings suggest a lack of computing and AT facilities in the schools for H.I. As technology significantly assists students with H.I. in learning the subjects, the school authorities need to ensure the proper availability of such technological devices. "Difficulty in Grasping," "Negative Attitude," "Usually Underestimated," and "Over-Reliance on Buddies" were some of the challenges rated at Rank # 2, # 3, # 4, and #5, respectively, by the students with H.I. Unlike the students with V.I., those with H.I. cannot hear the sound and face many difficulties in understanding the concepts in the classroom. They heavily rely on sign language to communicate in school. The negative behaviour or attitude of general students in society towards those with H.I. develops an inferiority complex. As discussed in the previous paragraphs, the community has an established misconception that students with disabilities cannot manage their work independently. Sometimes, students with H.I. face difficulties due to their over-dependency with their friends and classmates. All these things were perceived as challenges by the students with H.I. "Difficulty to Interpret Sign Language," "Deprived attention," and "Quite Slow" were rated at Rank # 6, # 7, and # 8, respectively, by the students with H.I. communication with others solely through sign language. They need to learn this skill to effectively communicate with peers with the same disability issues or their teachers and friends who know sign language. The students also face the problem of lack of attention and are relatively slow at learning new concepts. All these things were perceived as challenges by the students with H.I. "Isolation," "Noise from the A.T. Machine," "Mobility Problem," and "Dictation Problem" were some of the problems that were rated at Ranke # 9 together by the Students with H.I. these issues were not considered significant challenges by the students with H.I. However, they were still treated as challenges by them. The feeling of isolation is one of the psychological issues faced by students with disabilities in general. Some A.T. devices, such as AACDs, etc., create noise (if not properly installed or connected), and students with H.I. might find them disturbing. It is challenging to move from one place to another as they cannot hear others correctly. Since listening to sound is a big challenge. A minor, undiagnosed hearing loss in a school-age child can have a negative impact on the learning process and result in some learning difficulty in school. Classwork may suffer if a child with hearing loss expends extra energy trying to listen to the teacher, take notes, and process what is being said all at once. Children's hearing problems frequently go unnoticed because many believe that a lack of concentration or inattention causes their academic issues. The researcher could not compare the present study's findings on the various library services with those of other studies because other studies have yet to analyse the same issue. Instead, other studies explored the general use and availability of library services. For example, Chijioke et al.[39] reported that 69.9% use email reference services to a very low extent and 10.1% to a great extent. Cassner et al.[40]reported that 33.3% of the respondents use abstracting and indexing, 41.7% use binding services, 20.8% use CAS, 33.3% use internet service, 25% use lending services, 33.3% use photocopying services,

Table 17 — Challenges faced by the hearing-impaired students
(1=strongly agree 2=somewhat agree 3=neither agree nor disagree 4=somewhat disagree 5=strongly disagree)

S No	Challenges	1	2	3	4	5	Total Scores	Mean	Rank
1	Difficulty in interpreting sign language	177 (17.20%)	155 (15.10%)	171 (16.70%)	148 (14.40%)	376 (36.60%)	2690	2.619	6
2	Noise from assistive machine	-	-	-	-	1027 (100.00%)	1027	1	9
3	Mobility problem	-	-	-	-	1027 (100.00%)	1027	1	9
4	Lack of handout	-	-	-	-	1027 (100.00%)	1027	1	9
5	Dictation- they are slow	-	-	-	-	1027 (100.00%)	1027	1	9
6	Lack of machines like laptops, computers, and assistive technologies	1027 (100.00%)	-	-	-	-	5135	5	1
7	Quite Slow	165 (16.10%)	130 (12.70%)	47 (4.60%)	141 (13.70%)	544 (53.00%)	2312	2.251	8
8	Overreliance on buddies	189 (18.40%)	197 (19.20%)	91 (8.90%)	186 (18.10%)	364 (35.40%)	2742	2.669	5
9	Isolation	-	-	-	-	1027 (100.00%)	1027	1	9
10	Deprived attention/ no attention	163 (15.90%)	195 (19.00%)	95 (9.30%)	164 (16.00%)	410 (39.90%)	2618	2.549	7
11	Usually under looked	156 (15.20%)	181 (17.60%)	240 (23.40%)	146 (14.20%)	304 (29.60%)	2820	2.74586	4
12	Negative attitude	155 (15.10%)	209 (20.40%)	179 (17.40%)	272 (26.50%)	212 (20.60%)	2904	2.827	3
13	Reading problems	1027 (100.00%)	-	-	-	-	5135	5	1
14	Difficulty grasping	197 (19.20%)	236 (23.00%)	105 (10.20%)	195 (19.00%)	(294 (28.60%)	2928	2.851	2

16.7% use reference service, and 20.8% use reservation service. Chijioke et al.[39] disclosed that all five universities provide e-reference services for students with disabilities.

Findings of the study

The findings of the study revealed that male students (64.3%) form the majority, with most respondents aged between 10-15 years (79.2%) and predominantly coming from rural areas (81.1%). A significant number of students (90.3%) speak Kannada, reflecting the regional language of Karnataka. Most students have complete hearing loss (88.5%) and come from low-income families (70.8%), potentially limiting access to educational resources. Despite these challenges, many strongly engage in academic activities. However, the availability and usage of assistive devices and software remain critically low. Devices like TTY, TDD, and speech synthesisers are entirely unused, and only hearing aids are universally used. Students also face significant challenges and lack of access to necessary technologies as the most critical barrier. Schools should seek financial resources to improve their

libraries and empower students with disabilities to pursue their academic goals.

Discussion

The prevalence of Kannada as the primary language calls for more regionally tailored educational resources. Socio-economic barriers, limited access to technology, and lack of parental involvement are additional obstacles that impede students' academic advancement despite their strong commitment to learning. It is crucial to tackle these issues to establish a more inclusive and supportive learning atmosphere. Creating an inclusive and supportive learning environment for hearing-impaired students requires a comprehensive approach that addresses their academic, emotional, and overall development needs. This includes integrating technology, providing emotional support, enhancing infrastructure and resources, promoting parental involvement, fostering peer education and sensitization, adapting curriculum, improving library accessibility, offering financial assistance, developing skill development programs, and conducting continuous research and evaluation. By addressing the multifaceted challenges of hearing-impaired students, special schools can effectively empower them to reach their full potential.

Directions for further research

Further research is undertaken on the same aspect but studying in regular schools, colleges, universities, and private Government and added academic institutions having inclusive settings would be supportive in knowing the conditions of academic information access among the students.

Conclusion

The present study strongly recommends fine tuning the strategies and proposals to improve the hearing-impaired community's overall socioeconomic, academic, and economic empowerment and social security. And so is apparent that poverty is the leading cause of disability, a vicious cycle that aggravates the incidence of impairment in Karnataka. Given the present basic framework and methods, the department's concern should be to take more notice of the results of the current study and chalk out initiatives for the overall improvement of the state's hearing-impaired community.

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