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Uses and Barriers of Assistive Technology in Visually Impaired Students

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ABSTRACT: This research paper is about to assess the uses and barriers of predominantly used assistive technologies in visually impaired students.This is a cross sectional study was conducted among 50 visually impaired students of age group 8-18 years In a tertiary eye care hospital. After detailed vision assessment and anterior segment evaluation, visually impaired students were interviewed individually with a self structured questionnaire. Among the visually impaired students, majority (54%) used smartphones as an assistive technology, stating advantages such as voice input and web browsing , while only a few used abacus(20%) , Taylor frame (14%) and Braille (10%) as an assistive technology.In our study visually impaired children preferred smartphones as assistive technology over other devices with advantages of voice input and web browsing and few barriers such as inaccessibility.

KEYWORDS: Assistive Technology, Visually Impaired Smartphones, Braille

I. INTRODUCTION

Childhood blindness is a major public health concern worldwide, with a prevalence of 0.5/1,000 .in India. [1] About 210,000 children have severe visual impairment or blindness.[2] Blindness was defined by WHO as a best corrected visual acuity (BCVA)of less than 3/60; severe vision impairment as BCVA of less than 6/60 to 3/60 and moderate vision impairment as PVA less than 6/18 to 6/60.[3] Cataract, trachoma, AMD and glaucoma are the main causes of blindness. Other causes are childhood blindness, onchocerciasis (river blindness), diabetes retinopathy, corneal opacities, ocular injuries, leprosy and visual loss [4]

At present, literacy is an important skill and knowledge to perform work-related, leisure, and other life maintenance activities. Braille, an ancient technique of reading in visually impaired and blind children, is a tactile system using raised dots.

Assistive Technology is a product, or tool, that is obtained commercially, modified, or customized, to enhance the functional capabilities of disabled individuals [5]. Few simple tools for students with visual impairments are enlarged text or raised line paper, while high tech tools include digital tools that "read" to the student. [6]. Assistive technology for visually impaired is growing rapidly over the recent years around the world. Students with visual loss may benefit from assistive technology for their educational activities.

Recently , smartphones have become one of the most advanced assistive technologies for visually impaired children .

The aim of this study is to assess the uses and barriers of assistive technology in visually impaired students.

II. MATERIALS AND METHODS:

A cross-sectional questionnaire based study was conducted among visually impaired children attending the ophthalmology clinic of a tertiary eye care hospital in Chennai. The study was conducted for a period of 4 months, A sample size of 50 was selected. Students whose visual acuity lesser than 3/60 or a corresponding visual field loss to less than 10 degree was included in this study. Students with good vision i.e. visual acuity greater than 3/60 or a corresponding visual field loss to greater than 10 degree were excluded from this study. Informed consent was obtained from all children as well as parents, who were willing to participate in the study. A detailed vision examination using the Snellen chart was done. Anterior segment was evaluated.

Students were interviewed personally with the help of a questionnaire to understand their educational needs and thereby have an idea of their satisfaction levels from the information services.

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Uses and Barriers in Visually Impaired Students
QUESTIONNAIRE
•Abacus
Questionnaire
1. What is the utility of learning mathematics?
2. Are you satisfied to know this?
3. Is abacus the basic device for doing mathematical calculation?
4. Do you feel any difficult to access and arrange the beads?
5. Is it useful for learning each and every concept of mathematics?
6. Does the dots in separation bar are helpful in locating the place value of numbers in abacus?

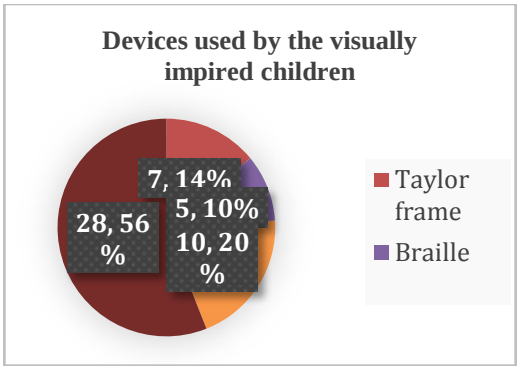
TAYLOR FRAME
1.Are you able to find the different types of pegs?
2. Is the Taylor frame useful for doing arithmetic calculation?
3. By using Taylor frame are you able to do algebraic calculation?

4. Is Taylor frame time consuming?

Smartphones
1) Do you know about the talkback option in smartphones?
2)On a scale of 1-5 how easy is it to use smartphones?
3)Do you know about the app "Be my eyes"?
4)Compared to other assistive technologies do you think smartphones have more advantages and easy to use?
5) What are the disadvantages you face with smart phone?

Braille
1)How easy is it to learn braille?
2)Compared to other advanced technologies ,is using braille difficult?
3)What are the disadvantages of using braille?

III. RESULTS



The total number of visually impaired children involved in this study is 50. All 50 were willing to participate in the study. Among them,there were 32 males (64%) and 18 females(36%). All children are in the age group 8-18 years.

ADVANTAGES OF SMARTPHONES

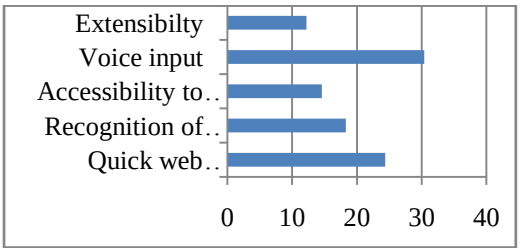


Table 1

DISADVANTAGES OF SMARTPHONES

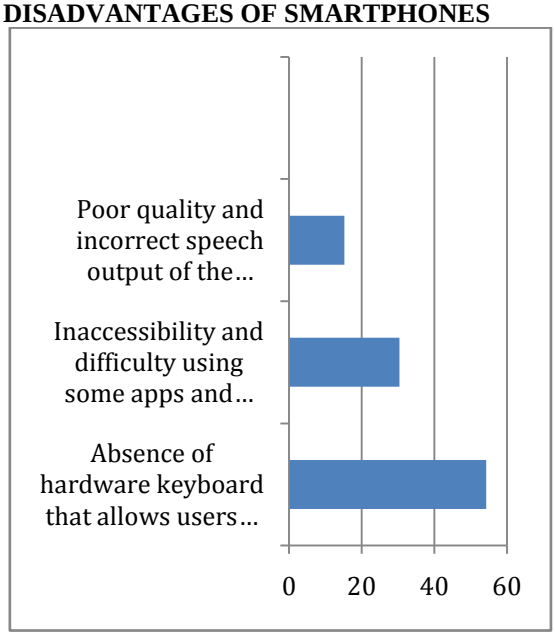


Table 2

Among them 27 children use smartphones. 20 (24.4%)of them chose that the advantages of using smartphones isquick Web browsing,15 (18.3%)chose recognition of objects, light and colour, 12(14.6%) of them chose accessibility to geographical information including maps, 25(30.4%) chose voice input ,10(12.2%) chose extensibility.It is depicted in table 1. On enquiring about the disadvantages of using smartphones 25(54.3%) chose Absence of hardware keyboard that allows users to input correctly by tactile cues,14(30.4%) choseInaccessibility and difficulty using some apps and functions, 7(15.2%) chose Poor quality and incorrect speech output of the screen reader. It is depicted in table 2.

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DISADVANTAGES OF BRAILLE

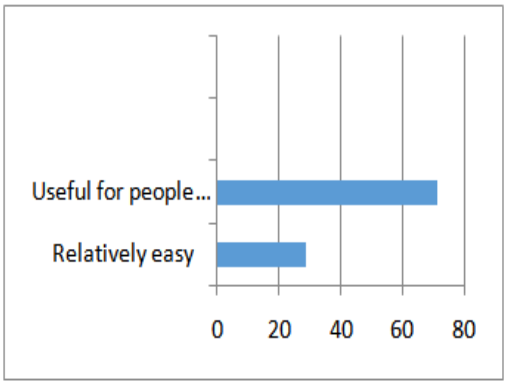

Table 3

ADVANTAGES OF BRAILLE

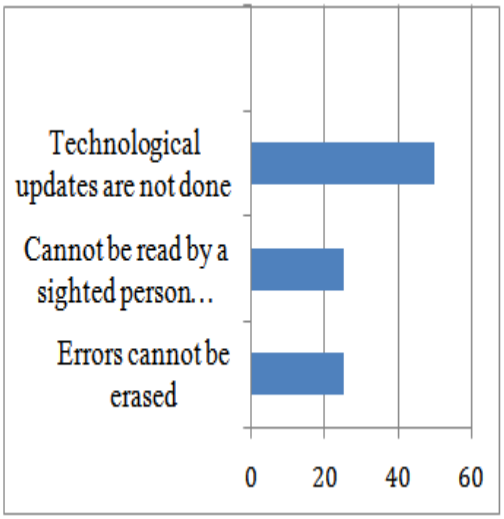

Table 4

Among the 50 visually impaired, 5 of them use braille.2(28.6%) chose that the advantage of using Braille is that it is relatively easy and 5(71.4%) chose that it is useful in people with hearing loss.It is depicted in table 3.About the Disadvantages of using braille are 2(25%) chose that it cannot be read by a sighted person who has not learnt it, 2(25%) chose that the errors cannot be erased and 4 (50%) chose that the technological updates are not there.It is depicted in table 4.

7 visually impaired people use Taylor frame and 10 of them use abacus. Advantages of these as stated by the children are mathematical functions like addition, subtraction, multiplication and division and better cognitive functions. Disadvantages are that it cannot be used for communication or any other purposes.

IV. DISCUSSION

Education is of prime importance for the overall socio-economic development of the people in any nation. Article 21A of the Constitution of India ensures education as a fundamental right. Section 26 of the Persons with Disabilities Act, 1995 mandates free and compulsory education to all children with disabilities up to the minimum age of 18 years.

SarvaShikshaAbhiyan (SSA) launched by the government guarantees eight years of elementary schooling for all disabled children of age 6-14 years by 2010.

Braille, the oldest technique uses standard rectangular cell, which contains up to six dots in a 2 by 3 grid. It has 3 encoding levels. Grade 1, in which words are fully spelled; Grade 2, which uses abbreviations and contractions, and Grade 3, which involves authors' personal and nonstandard shorthand.[7]

Smartphone help visually impaired understand and access a large amount of information for independent functioning, movement, social inclusion, participation, educational activities and news.[8]

Smartphones are gradually replacing traditional assistive devices such as Braille, in performing routine daily living activities.[9]

Both Android and Apple iOS have accessible built-in screen reading technology for visual impairment. [10,11]

They also play a role in communication, reading e-Books and news or listening, writing and typing.

Borges WF et al. conducted a study in Brazil with 28 visually impaired people and gave an account of the use of 50 apps in smartphones and tablets which provided access to text and information related to daily routine and navigation.[12]

Griffin- Shirley et al. conducted a global online study with 259 visually impaired participants of which more than 95% used smartphones for their daily routine activities. BeMyEyes, ColorID, CamFind were the most frequently used apps.[13]

A similar online survey conducted by Crossland et al. in the United Kingdom, stated that 81% of visually impaired used smartphones for various activities including calls, messages, camera to see things better, audiobooks.[14]

Few studies have reported that smartphones, decreases the feeling of isolation, creates better social contact and communication.[15],[16].

Prakash et al conducted a study in Nepal and reported that lack of training on the use of accessible features and apps in smartphones is a major challenge for them.[17]

The World Health Organization emphasises lack of affordability and accessibility as one of the important reasons for not acquiring assistive products in developing countries [18]

Senjam et al conducted a study in blind schools in Delhi and reported that only 11 out of the 52 ATs were available in 60% schools. Except for the Braille slate and stylus, the schools had a deficit of AT, signifying the gap in access.[19]

In another study conducted by Pradhan et al in schools for blind students in Medinipur and Burdwan districts of West Bengal, it was reported that only one institute in each of these divisions had sufficient availability of ATs. While braille was the most used, there was considerably lesser availability of other assistive technologies. [20]

In addition to various surveys, qualitative material and experiences also signify the importance and need of AT in India for better access to higher education.[21]

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