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Website Accessibility Evaluation of National Institutes under the DEPWD Ministry of Social Justice & Empowerment

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Abstract:

Accessibility is an important aspect in this IT era for updated information for every individual with a disability as well. They also have an equal right to access the contents available online. Thus, web developers should follow the universally accepted guidelines to develop the web pages reachable for everyone. Websites that are not complying with WCAG 2.0 guidelines are very difficult to access by the disabled users. This evaluation is an attempt to analyze the accessibility of the websites of the National Institutes under the DEPWD, Ministry of Social Justice & Empowerment under the different priority level of WCAG2.0. Evaluation of the websites has been done by automatic web accessibility evaluation tool WAVE and AChecker.

Keywords: Web accessibility, WCAG, Priority level, WAVE Tool, Accessibility Errors

Introduction:

The web revolution has changed the communication and working culture of people. It gives different mediums for ease of access and quick delivery of information to everyone, websites are one of the medium. Every organization, whether it is government, academic and corporate make their website to reach people to deliver information to every person. When we say the electronic or digital accessibility for all that means it should also include the person with disabilities. Many of the organizations and institutions make their information available online modes, some of them consider the accessibility guidelines and develop their contents compatible for the people with disability on the other hand, there are most of the web pages in terms of access are not easy to use for the disabled users. Accessibility of web pages is an important aspect when disseminating and creating the content. Access to the Web ensures that people with any form of impairment will use the Web in the same circumstances as other people.

There are some standards like WCAG 1.0, WCAG2.0 and latest one is WCAG 2.1 for making more accessible web pages which should be considered by the web developer while designing

websites. These guidelines provide some check points by which the accessibility can be evaluated.

Web Accessibility Guideline:

Internationally recognized standards devised by the World Wide Web Consortium (W3C) are WCAG 1.0, WCAG 2.0 and WCAG 2.1 standards for web accessibility. WCAG 2.0 guideline was released on 11 December 2008 and compatible with existing and forthcoming tools. WCAG 2.0 consist of three levels of conformance and all of the following conformance criteria must be met in order for a Web page to comply with WCAG 2.0:

Table 1: Web Accessibility Conformance Level

Priority Level	Description	Symbol
1	The WCAG 2.0 framework must have to be accomplished by websites creators. This Level is a fundamental necessity for few individuals to be able to access the contents of a web page.	A
2	The standard of WCAG 2.0 should be fulfilled by website designers. Satisfying this level will eliminate major obstacles to accessing the contents of a webpage.	AA
3	The standard of WCAG 2.0 may also be considered by web page creators. By satisfying this level will enhance the access to the content of the web pages.	AAA

Literature Review:

Alsaedi (2020) have compared the efficiency of web accessibility assessment tools and evaluated the web pages of the Saudi Universities under WCAG 2.0 guidelines. The result of the comparison showed that SiteImprove is better than WAVE evaluation tool. The Findings of the study also reveal that all the university homepages have some errors in accessibility.

Campoverde-Molina et al. (2020) studied the literature in a methodical manner to know the pragmatic methods used for finding the inaccuracies and accessibility evaluation of academic websites. It was found that out of 25 papers in 20 papers automatic evaluation tool was used to check the web accessibility, in 3 articles evaluation done by automatic tools, experts and real users and in rest 2 articles evaluation done by real users.

Ismail and Kuppusamy (2016) has conducted a study on the ease of access of homepages of Indian university websites to know the validity of the homepages with reference to various WCAG 2.0 approval standards. They evaluated the 302 Indian university homepages to find the accessibility report. The analyses show that there is a need of improvement regarding accessibility and usability in accordance with WCAG 2.0 guiding principle. Recommendations also provided on the basis of the result of evaluation to enhance the accessibility of the websites.

Khan et al. (2015) has investigated the library websites for the disabled users under the different conformance level of WCAG. The evaluation reveals that 50 % of the Websites have numerous conformance A level accessibility problems & the remaining Websites were in

considerable improved state. There were also compliance issues with different priority level AA and AAA.

Shawar (2015) analyzed the compliance of the accessibility standards for visually impaired with the contents of educational websites. This study also explores the existing guideline and its implementation on educational institute websites. As a result of the study, errors in infrastructural compatibility to websites of universities in the Jordan & Arab region outweigh those in the United Kingdom by 13 and 5 times, respectively.

Kaur and Dani (2014) assessed the banking websites of India in terms of accessibility for the disabled users. The result of the study revealed that there is no website fully accessible to disabled people. The result of the study shows no important difference in the accessing the Public and Private banks' websites of India.

Baksh and Mehmood (2012) studied the Central government's websites of the Pakistan on the basis of W3C web accessibility standards. The analysis of the study reveals that maximum websites were not created by following the accessibility principles for users with special needs. Recommendations also made on the basis of the results to boost the accessibility of these websites for specially-abled.

Abanumy et al. (2005) examines three major points, i.e., website accessibility analysis mechanisms, tools and techniques, specifications of web accessibility and human factors involved in the creation of Saudi Arabia & Oman's successful e-Government webpages. It inspects the problems that liable for inaccessibility of a website and discovers the eminence positioned for web usability and ease of understanding with reference to e-Government websites. It assesses the online accessibility of e-Government websites by adapting WGAG 2.0 framework. On the basis of the outcome, it gave some suggestion for web accessibility enhancement of Government web pages.

Objectives:

- To find out the number of accessibility errors by WAVE TOOL.
- To know the present status of the institutional websites in terms of web accessibility for disabled users.
- To find out the highly accessible and least accessible website among these institutions.

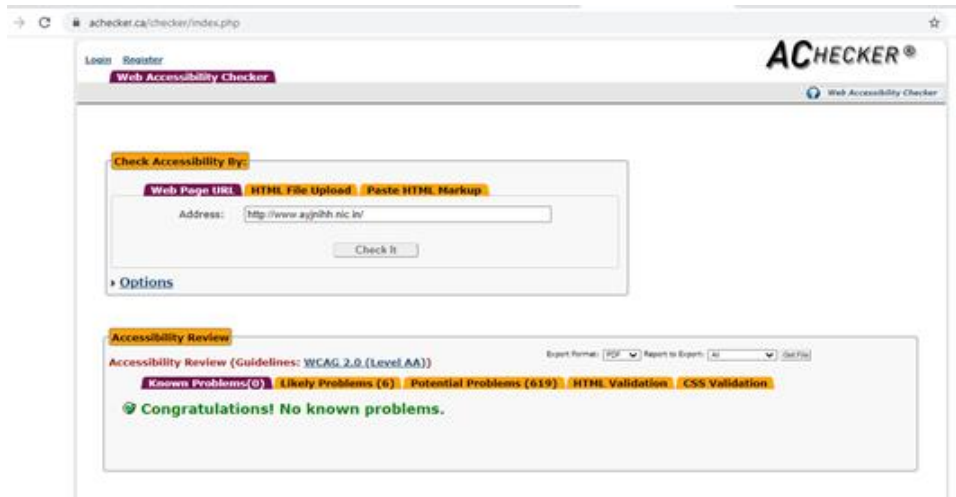
Research Methodology:

To improve any website, first we have to measure the problem in accessing the webpages concern with any widely accepted standards. This is an evaluative study. For the evaluation of the websites the list of the institution was collected from the websites of the Department of Empowerment of Persons with Disabilities (Divyangjan). The URL of every institute was analyzed indivisibly by simply pasting the URL on the online evaluation tool. The website of these institutions was analyzed via web accessibility assessment tools like AChecker & WAVE. The data were analyzed with the help of MS Excel.

Web accessibility tool

There are various open source web accessibility evaluation tools available like A11Y Machine, WAVE, AChecker, etc. The evaluation tools used in this study was AChecker and WAVE. AChecker offers various options to provide accessibility reports under different accessibility

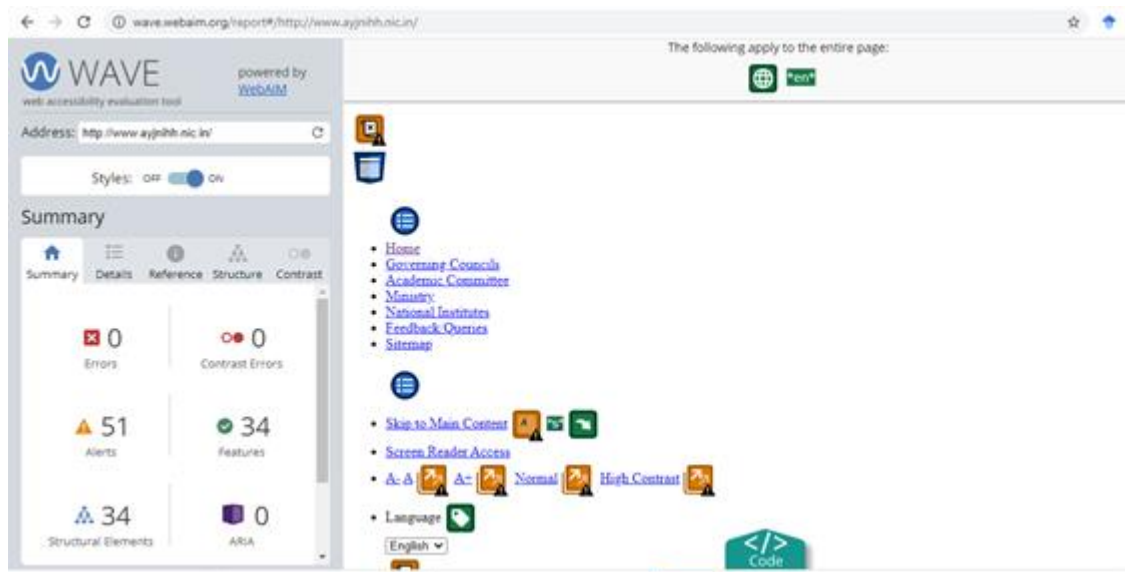
guidelines. This tool categorizes the report into three types of problems viz, Known Problem (Problems described with precision as hurdles to accessibility), Likely Problems (errors recognized as possible obstructions, but needs a human judgement) and Potential Problem (issues that cannot detect by AChecker, those needs a manual judgment). The accessibility checks of the website of these institutions were done under the WCAG 2.0 Conformance level by AChecker.



Screenshot of AChecker

On the other hand, WAVE offers evaluation report under following categories:

- Errors
- Contrast errors
- Alerts
- Features
- Structure Elements
- ARIA.



Screenshot of WAVE web accessibility evaluation tool

Scope and Limitation of the Study:

The scope of the study is restricted to the nine National Institutions under the Department of Empowerment of Persons with Disabilities (Divyangjan), Ministry of Social Justice & Empowerment. These Institutions are autonomous bodies established for different types of disabilities. They are as:

Table 2: List of Institutions

Name of The Institute	Abbreviation	URL
National Institute for the Empowerment of Persons with Visual Disabilities, Dehradun	NIEPVD	http://nivh.gov.in/index.php
Ali Yavar Jung National Institute of Speech and Hearing Disabilities, Mumbai	AYJNISHD	http://www.ayjnihh.nic.in/
National Institute for the Empowerment of Persons with Intellectual Disabilities, Secunderabad	NIEPID	http://niepid.nic.in/
National Institute for Empowerment of Persons with Multiple Disabilities, Chennai	NIEPMD	http://www.niepmd.tn.nic.in/
Pt. Deendayal Upadhyaya National Institute for Persons with Physical Disabilities, Delhi	PDUNIPPD	http://www.iphnewdelhi.in/Home.aspx?ReturnUrl=%2f
Swami Vivekanand National Institute of the Rehabilitation Training and Research, Cuttack.	SVNIRTAR	http://svnirtar.nic.in/
National Institute for Locomotor Disabilities, Kolkata	NILD	http://www.niohkol.nic.in/
Indian Sign Language Research & Training Centre, New Delhi	ISLRTC	http://www.islrtc.nic.in/
National Institute of Mental Health and Rehabilitation, Sehore, Madhya Pradesh	NIMHR	https://nimhr.ac.in/

Data Analysis and Interpretation:

The data collected from the evaluation of individual websites are collected in an MS Excel sheet and then further analyzed.

A. WAVE web accessibility tool

Table 3: Number of Errors detected by WAVE

Institution	Accessibility Errors	Contrast Errors	Alerts	Features	Structural Element	ARIA
NIEPVD	7	5	65	40	26	8
AYJNISHD	0	0	49	34	34	0
NIEPID	2	10	64	109	17	0
NIEPMD	0	0	37	64	18	0
PDUNIPPD	6	1	85	24	18	0
SVNIRTAR	7	4	70	19	40	0

NILD	33	16	45	21	43	0
ISLRTC	4	0	250	27	140	5
NIMHR	14	27	11	2	24	2
Total	73	63	676	340	360	15

Table 3 shows the number of accessibility errors, errors in Contrast requirement, Alerts, Features, Structural Elements and ARIA category that was analyzed by the WAVE tool. This evaluation tool can examine whether every image is having an alternative text or not, but does not verify the accurate interpretation of that provided text, so there is a requirement of manual check for the accurate interpretation. From the above table, we can conclude that the NILD has the maximum number of accessibility errors followed by NIMHR, SVNIRTAR, NIEPVD, PDUNIPPD, ISLRTC and NIEPID respectively. Whereas AYJNISHD and NIEPMD have no Accessibility error.

B. AChecker web accessibility tool

Table 4: Number of problems within diverse levels of Conformance by AChecker

Institution	Level A	Level AA	Level AAA	Total
NIEPVD	429	465	593	1487
AYJNISHD	603	619	638	1860
NIEPID	781	1118	1124	3023
NIEPMD	585	616	675	1876
PDUNIPPD	380	391	408	1179
SVNIRTAR	698	720	737	2155
NILD	598	672	688	1958
ISLRTC	702	719	735	2156
NIMHR	170	195	201	566
Total	4946	5515	5799	16260

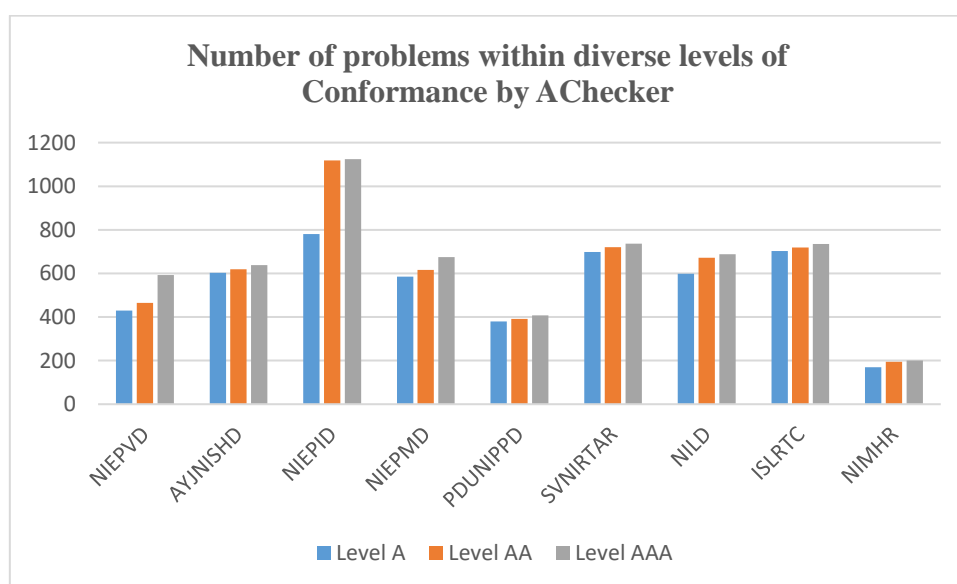


Figure 1. Number of problems within diverse levels of Conformance by AChecker

The above table and figure shows that NIEPID has a maximum no. of problems (781) for Level A. After that ISLRTC (702) holds second position, then SVNIRTAR (698), fourth position holds by AYHNISHD (603) after that in fifth position NILD (598). NIEPMD with 585 problems places at sixth position, NIEPVD at seventh with 429 issues, PDUNIPPD with 380 stands on eighth and NIMHR (170) at last position i.e. ninth, on basis of decreasing problems. The maximum no. of problems (1118) for Level AA was found at the website of NIEPID, which was then followed by the SVNIRTAR (720), ISLRTC (719), NILD (672), AYJNISHD (619), NIEPMD (616), NIEPVD (465), PDUNIPPD (391) and NIMHR (195). On the basis of the no. of problems analyzed by the AChecker web accessibility tool for Level AAA, NIEPID was identified with the maximum problem (1124). AChecker identifies 737 problems for the website of SVNIRTAR, 735 for ISLRTC, 688 for NILD, 675 for NIEPMD, 638 for AYJNISHD, 593 for NIEPVD, 408 for PDUNIPPD and 201 problems under level AAA were identified in the website of NIMHR.

Table 5: Level wise problems of WCAG 2.0 by AChecker

WCAG 2.0 Levels	Known Problems	Likely Problems	Potential Problems
Level A	79	20	4847
Level AA	208	21	5286
Level AAA	217	106	5476

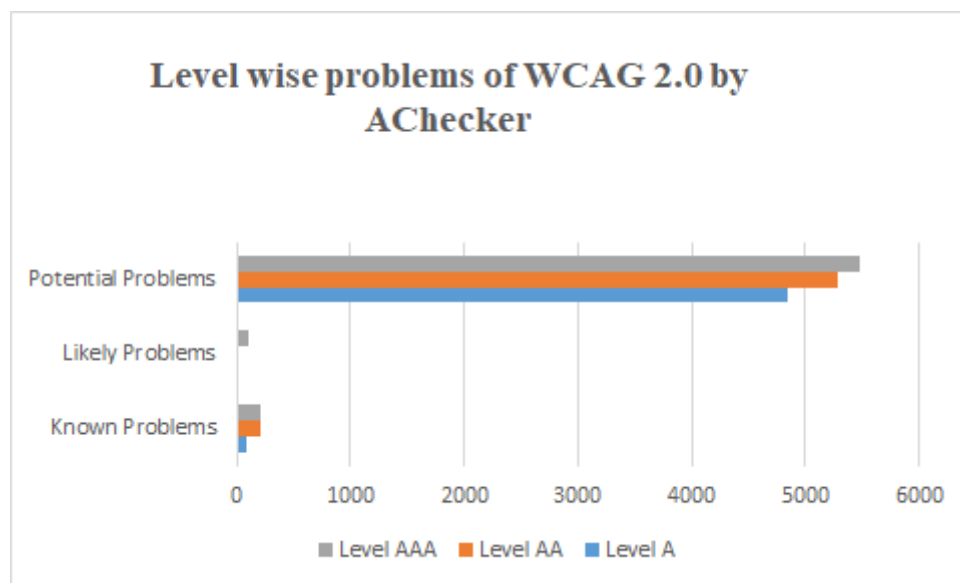


Figure 2. Level wise problems of WCAG 2.0 by AChecker

The above table and figure shows the consolidated result of the problems as defined under WCAG 2.0 level. AChecker found that under level A there were 79 known problems, 20 were likely problems and 4847 potential problems for the websites of the nine National Institutions under the Department of Empowerment of Persons with Disabilities (Divyangjan), Ministry of Social Justice & Empowerment. There were 208 known problems, 5286 Potential problems and only 21 Likely problems were encountered for the Level AA. Whereas there were 217 known problems, 106 Likely problems and 5476 Potential problems were existing for the level AAA as per result shown by the AChecker web accessibility evaluation tool.

Table 6: Total Problem and their classification by AChecker

No. of Website	Known Problems	Likely Problems	Potential Problems	Total No. of Problem
9	504	147	15609	16260

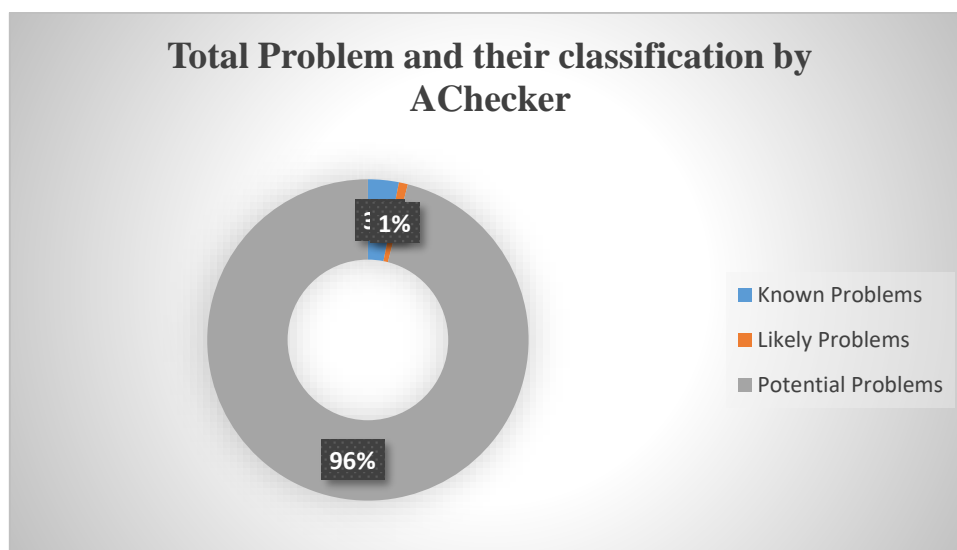


Figure 3. Total Problem and their classification by AChecker

The above table and figure shows total problems that were categorized under Known, Likely and Potential problems. It can be derived that in the all nine national institutions, there were 504 known problems, 147 Likely problems and 15609 Potential problems in total.

RESULT AND DISCUSSION:

It was found that as per the WAVE web accessibility evaluation tool, the website of NIMHR has minimum errors which was 80 and therefore this website was most accessible. After that AYJNISHD had a total 117 errors which comes at second position, the website of NIEPMD was ranked third for accessibility with a total 119 errors. Fourth position was held by the PDUNIPPD with 134 errors. SVNIRTAR ranked on 5th position with 140 errors, NIEPVD has 6th rank with 151 errors and NILD has ranked at 7th with 158 errors, NIEPID has 202 errors and ISLRTC has 426 errors with the ranking 8th and 9th respectively.

Whereas according to the AChecker web accessibility evaluation tool, the most accessible website was designed by the NIMHR as it had minimum problems. Secondly the website of PDUNIPPD was most accessible as compared to others with only 1179 problems. NIEPVD was at third position, AYJNISHD was at fourth position, NIEPMD was at fifth position, NILD was at sixth position, SVNIRTAR got seventh position, ISLRTC was at eight position and NIEPID achieve last (ninth) among all institutions with 1487, 1860, 1876, 1958, 2155, 2156 and 3023 problems respectively. But at the same time W3C has clearly mentioned in the guideline given for the accessibility that the website must satisfy as for level A criteria. Following the same instructions, it was found that NIEPID is the highly accessible website as it possesses a minimum number of level A errors and the website of NIEPVD is least accessible.

AChecker and WAVE evaluation tools are very easy to analyse the web accessibility of the websites, but such online tools cannot distinguish the seriousness of the errors between the

identical framework. Often, these tools were not tested all the checkpoints of WCAG2.0 and some require manual review. PDF files are currently inaccessible in these websites and some of the websites provide information in Hindi language; that information are also not accessible. From the analysis, it is recommended that all non-text content should be provided with alternative text.

CONCLUSION:

Disabled people are as much important for society as others. There are numerous attempts taken by the various organizations to provide them equal opportunity. There are National Institutions under the Department of Empowerment of Persons with Disabilities (Divyangjan), Ministry of Social Justice & Empowerment in India that are contributing for the same. Web accessibility of all the institutions was analyzed individually with the help of tools. The result of both tools is similar but not exactly the same. As per the WAVE tool, the website of NIMHR was most and the website of ISLRTC was least accessible, whereas the result of AChecker reveals the same result for the website of NIMHR which was the most accessible but NIEPID website was least accessible. Therefore, by comparing the result with both tools it was concluded during the study that the website of NIMHR was most accessible.

But still there is a need for more improvement so that the equal opportunity can be offered to disabled society.

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