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# Digital Health Literacy and its Impact on Hypertension Care Outcomes: Investigating the Effectiveness of Digital Resources in Managing Hypertension and Enhancing medication Adherence Among the Elderly

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**ABSTRACT**

**Background:** Hypertension is prevalent among the elderly population, and digital health resources offer potential benefits for disease management. However, the impact of online health information seeking on clinical outcomes in this demographic remains unclear.

**Objective:** To investigate the impact of digital health literacy on hypertension management outcomes among elderly patients and evaluate the effectiveness of digital resources in enhancing adherence to treatment regimens.

**Methods:** This cross-sectional study included 300 hypertensive patients aged 60 years or older, divided into two groups: those who supplemented physician advice with online health information (n=150) and those who relied solely on healthcare professional advice (n=150). Blood pressure control, medication adherence (MARS-10), online health information-seeking behaviours, and barriers to digital resource utilization were assessed.

**Results:** Patients who used digital health resources showed significantly better blood pressure control (systolic: 131±08 mmHg vs. 134±09 mmHg, p=0.013; diastolic: 83±05 mmHg vs. 87±05 mmHg, p=0.017) and higher medication adherence scores (MARS-10: 7.19±0.44 vs. 6.86±0.93, p=0.031) compared to those who did not. However, significant gaps in digital health literacy were identified, with only 36% of users correctly identifying credible website extensions and 68.7% never checking publication dates of online health articles. Major barriers to online health information seeking included lack of digital literacy (62.7%), language accessibility (71.3%), and privacy concerns (52.7%).

**Conclusion:** While the use of digital health resources is associated with improved hypertension management outcomes in elderly patients, significant challenges in digital health literacy and access exist. These findings underscore the need for targeted interventions to improve digital health literacy and the development of age-appropriate digital health resources, while maintaining the primacy of the patient-provider relationship in healthcare delivery.

## INTRODUCTION

Hypertension is notably common in older adults, among adults aged 60 and above, the prevalence of hypertension surpasses 60%, indicating that more than half of this population is affected by the condition [1]. This high prevalence, coupled with the increased vulnerability of older adults to cardiovascular complications [2,3], underscores the critical need for effective management strategies. The integration of digital health resources into chronic disease management, particularly for conditions like hypertension [4,5], has become increasingly prevalent in recent years. This shift offers potential benefits for patient education and engagement, especially among the elderly population who bear a significant burden of hypertension. However, the impact of online health information seeking on clinical outcomes and medication adherence in elderly hypertensive patients remained unclear. Furthermore, the proportion of elderly patients actively engaging with digital health resources, their perception of the quality of online health information, and the barriers preventing some from accessing these resources are critical factors that have needed exploration.

This study addressed these knowledge gaps by investigating the relationship between online health information seeking and hypertension management among elderly patients. We determined the proportion of elderly hypertensive patients who actively used online platforms and social media for health information and compared blood pressure control and medication adherence between those who supplemented physician advice with online information and those who relied solely on healthcare professionals. Additionally, we assessed the perceived quality and trustworthiness of online health information among elderly users and explored the barriers that prevented others from engaging with digital health resources.

## METHODOLOGY

This cross-sectional study investigated the impact of digital health literacy on hypertension management among elderly patients. A total of 691 participants aged 60 years or older, diagnosed with hypertension at least one year prior was recruited for this study. Medication Adherence Rating Scale (MARS-10) [6] questions were administered to all the 691 hypertensive patients to access the adherence level of the patients. Out of 691 patients, 297 poor adherent patients were excluded based on MARS-10 score (scored below 6). From the pool of good adherent patients, 300 patients were selected for the study based on inclusion and exclusion criteria. The study included only adherent hypertensive patients to isolate the impact of digital health literacy on hypertension management, ensuring that findings specifically

address how online health information influences those already compliant with medication regimes. This approach minimizes confounding variables, focusing on digital engagement rather than basic adherence challenges.

Selected participants were divided into two groups of 150 each: Group 1 comprised those who used digital health resources in addition to professional medical advice, while Group 2 relied solely on healthcare professional advice for the management of hypertension. Both the group patients were use mobile devices. Group 1 participants, who were required to have access to the internet and mobile devices as an inclusion criterion, utilized a variety of digital health educational resources for hypertension management. These included health information websites offering evidence-based content on hypertension and online patient forums where individuals could share experiences and advice. Additionally, some participants engaged with social media platforms that provided health-related content, following healthcare professionals or organizations specializing in cardiovascular health. Exclusion criteria included severe cognitive impairment, terminal illness, recent hospitalization, and inability to use digital resources (for Group 1).

The study assessed two primary outcomes: blood pressure control and medication adherence. Blood pressure was measured in the clinic waiting room using a standardized protocol, with the average of two readings recorded. Medication adherence was evaluated using the MARS-10 scale. Data collection included detailed questionnaires on health information-seeking behaviours, digital resource usage, and perceived quality of online health information. For Group 2, barriers to online health information-seeking were explored. Statistical analysis, including descriptive statistics and comparative analyses (chi-square tests and t-tests), was conducted to identify significant differences in outcomes between the two groups. The study adhered to ethical guidelines, ensuring participant privacy and obtaining informed consent.

**Table 1: Socio Demographic and prescription pattern details of Study population**

| **Parameters** | **Category** | **Group 1 (n=150)** | **Group 2 (n=150)** | **P-value** |
|---|---|---|---|---|
| Gender | Male | 86 | 64 | 0.61 |
| | Female | 63 | 87 | |
| Age Group (years) | 60-64 | 29 | 31 | 0.87 |
| | 65-69 | 33 | 28 | |
| | 70-74 | 27 | 25 | |
| | 75-79 | 22 | 23 | |
| | 80-84 | 18 | 21 | |
| | 85+ | 21 | 22 | |
| Marital Status | Single | 5 | 6 | 0.93 |
| | Married | 108 | 110 | |
| | Widowed | 28 | 26 | |
| | Divorced/Separated | 9 | 8 | |
| Educational Level | Primary Education | 41 | 45 | 0.75 |
| | Secondary Education | 52 | 50 | |
| | Higher Education | 57 | 55 | |
| Employment Status | Unemployed | 87 | 82 | 0.24 |
| | Employed | 66 | 65 | |
| Prescribing pattern of Antihypertensive drugs | ACE Inhibitors | 45 | 43 | 0.89 |
| | Beta-Blockers | 30 | 29 | |
| | Calcium Channel Blockers | 42 | 41 | |
| | Diuretics | 36 | 38 | |
| | ARBs | 27 | 26 | |
| | Combination Therapy (2+ drugs) | 90 | 88 | |

**Table 2 Quality of online health information-Seeking in Group 1 patients (n-150**

| **Question** | **Options** | **Results** |
|---|---|---|
| Which website extension usually belongs to a nonprofit organization? | .com | 31 (20.7%) |
| | .net | 35 (23.3%) |
| | .org | 54 (36%) |
| | .biz | 30 (20%) |
| | Do not Know | N/A |
| Which of the following is a peer-reviewed source of medical information? | Personal Blog | 24 (16%) |
| | Social Media Post | 28 (18.7%) |
| | Medical Journal | 57 (38%) |
| | Lifestyle Magazine | 41 (27.3%) |
| Should you trust health information written by someone without relevant medical credentials? | Yes | 62 (41.3%) |
| | No | 88 (58.7%) |
| How often do you check the publication or update date of online health articles? | Always | 10 (6.7%) |
| | Often | 11 (7.3%) |

| | | |
|---|---|---|
| | Sometimes | 8 (5.3%) |
| | Rarely | 48 (32%) |
| | Never | 73 (68.7%) |
| When searching for health information online, do you verify the source's credibility (e.g., official health websites, certified medical professionals)? | Yes | 86 (57.3%) |
| | No | 64 (42.7%) |
| Do websites you visit for health information provide references or citations to scientific studies or recognized medical institutions? | Yes | 85 (56.7%) |
| | No | 65 (43.3%) |
| Do you cross-check health information from multiple websites before considering it reliable? | Yes | 99 (66%) |
| | No | 51 (34%) |
| Do you look for the date of publication or the last update to ensure the online health information is current? | Yes | 84 (56.3%) |
| | No | 66 (43.7%) |
| Do the health websites you visit have clear disclaimers or disclosures about the nature of the content? | Yes | 80 (53.3%) |
| | No | 70 (46.7%) |
| Are you cautious of websites that promote products or services in the guise of health advice without any scientific backing? | Yes | 98 (65.3%) |
| | No | 52 (34.7%) |

**Table 3: Barriers involved to online health information-seeking in Group 2 patients**

| Question Title | Response | Count (Percentage) |
|---|---|---|
| Digital Literacy for Online Health Information | Yes | 56 (37.3%) |
| | No | 94 (62.7%) |
| Trust in Online Health Information | No | 76 (50.7%) |
| | Unsure | 22 (14.7%) |
| | Not at All | 20 (13.3%) |
| | Somewhat | 32 (21.3%) |
| Language Accessibility of Online Health Information | Yes | 107 (71.3%) |
| | No | 43 (28.7%) |
| Concerns About Privacy When Searching Online | Yes | 79 (52.7%) |
| | No | 38 (25.3%) |
| | Unsure | 33 (22.0%) |
| Cultural Appropriateness of Online Health Information | Yes | 30 (20%) |
| | No | 70 (46.7%) |
| | Unsure | 50 (33.3%) |
| Impact of Internet Connectivity Cost on Access to Health Information | Yes | 83 (55.3%) |
| | No | 67 (44.7%) |
| Preference for Healthcare Professional Guidance Over Online Information | Yes | 105 (70%) |
| | No | 24 (16%) |
| | Unsure | 21 (14%) |
| Feeling Overwhelmed by Online Health Information | Yes | 66 (44%) |
| | No | 46 (30.7%) |

| | | |
|---|---|---|
| | Unsure | 38 (25.3%) |
| Preference for Information from Family, Friends, or Community Over Online Sources | Yes | 85 (56.7%) |
| | No | 45 (30%) |
| | Unsure | 20 (13.3%) |
| Past Negative Experience Using Online Health Information | Yes | 28 (18.7%) |
| | No | 103 (68.7%) |
| | Unsure | 19 (12.7%) |
| Navigational Challenges on Health Websites | Yes | 71 (47.3%) |
| | No | 46 (30.7%) |
| | Unsure | 33 (22%) |

**Table 4: Comparison of MARS-10 Score and Blood pressure and between Group 1 and Group 2**

| **Parameters** | **Group 1 (Mean±SD)** | **Group 2 (Mean±SD)** | **P-Value (Group 1 vs. Group 2)** |
|---|---|---|---|
| MARS-10 Score | 7.19±0.44 | 6.86±0.93 | 0.031 |
| Blood pressure (mmHg)<br>Systolic BP | 131±08 | 134±09 | 0.013 |
| Diastolic BP | 83±05 | 87±05 | 0.017 |

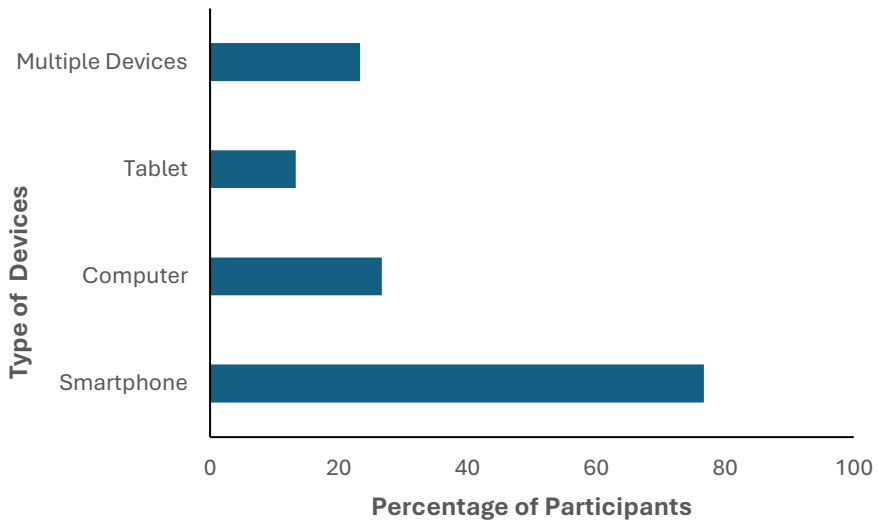


**Figure: 1 Type of Devices Used to Seek Online Health Information by Group 1 Patients (n=150)**

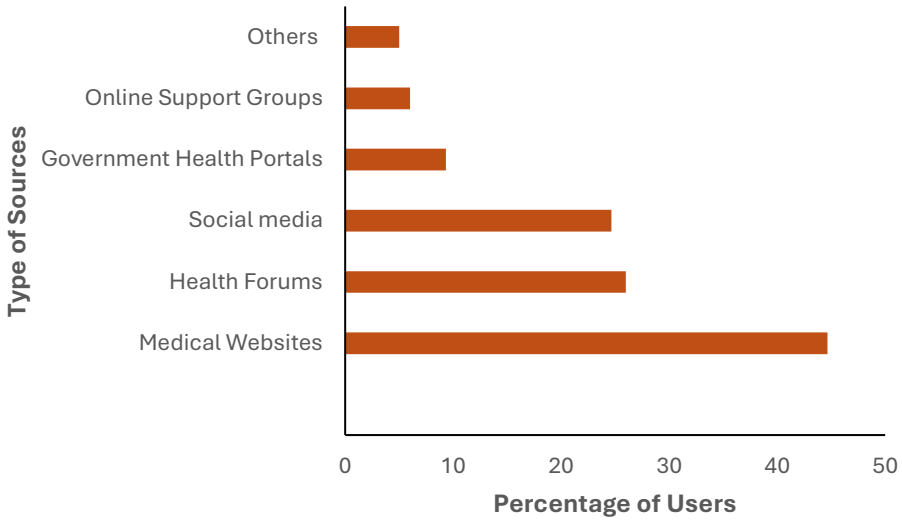


**Figure 2 Type of Devices Used to Seek Online Health Information by Group 1 Patients (n=150)**

## RESULTS

The study included 300 elderly hypertensive patients, equally divided into two groups of 150 each. Group 1 comprised patients who used digital health resources in addition to professional medical advice, while Group 2 relied solely on healthcare professional advice. Demographic analysis revealed no significant differences between the groups in terms of gender, age distribution, marital status, educational level, employment status, or antihypertensive prescribing patterns ($p > 0.05$ for all comparisons).

Among Group 1 participants, smartphones were the primary device used to access health information online (76.7%), aligning with the growing trend of mobile health adoption among older adults [7]. The most common sources of online health information were medical websites (44.66%), health forums (26%), and social media (24.66%). However, the study uncovered concerning gaps in digital health literacy. Only 36% of participants correctly identified .org as a nonprofit organization's website extension, and just 38% recognized medical journals as peer-reviewed sources. While 58.7% understood the importance of medical credentials for health information, a striking 68.7% never checked the publication or update date of online health articles.

For Group 2, several barriers to online health information seeking were identified. A majority (62.7%) reported lack of digital literacy as a significant obstacle. Half of the participants (50.7%) expressed distrust in online health information, while 71.3% found language accessibility to be a barrier. Privacy concerns (52.7%) and internet connectivity costs

(55.3%) were also notable impediments. Importantly, 70% of Group 2 participants preferred healthcare professional guidance over online information, highlighting the enduring importance of the patient-provider relationship in this demographic.

Comparison of outcomes revealed significant differences between the two groups. Group 1 demonstrated higher medication adherence scores (MARS-10: 7.19 ± 0.44) compared to Group 2 (6.86 ± 0.93), p = 0.031. Moreover, Group 1 exhibited better blood pressure control with lower systolic (131 ± 08 mmHg vs. 134 ± 09 mmHg, p = 0.013) and diastolic (83 ± 05 mmHg vs. 87 ± 05 mmHg, p = 0.017) blood pressure compared to Group 2.

**DISCUSSION**

The findings of this study suggest that the use of digital health resources among elderly hypertensive patients is associated with improved blood pressure control and medication adherence. This aligns with previous research indicating the potential benefits of digital health interventions in chronic disease management [4]. The preference for medical websites as the primary source of information among Group 1 participants is encouraging, suggesting an inclination towards more reliable sources. However, the substantial use of health forums and social media for health information raises concerns about the potential spread of misinformation, especially given the low rates of source verification and date-checking observed in the study [7].

The significantly better blood pressure control and higher medication adherence scores in Group 1 could be attributed to several factors, including increased health awareness, enhanced patient empowerment, and more frequent engagement with health-related information [8]. These findings support the potential of digital health resources as a complementary tool to traditional healthcare in improving hypertension management among the elderly. However, it's crucial to interpret these results cautiously, as the cross-sectional design doesn't allow for causal inference. The improved outcomes in Group 1 could also be partly due to other factors such as higher general health literacy or motivation to manage their condition [9].

The barriers identified in Group 2 provide valuable insights into the challenges faced by elderly patients in accessing online health information. The high prevalence of digital literacy issues and language barriers suggests a need for targeted interventions to improve access and usability of digital health resources for older adults [9]. The strong preference for healthcare professional guidance over online information among Group 2 participants

underscores the importance of maintaining and strengthening the patient-provider relationship, even as digital health resources become more prevalent [10].

The mixed results regarding the perceived quality and trustworthiness of online health information among Group 1 participants are concerning. While many showed awareness of the importance of credible sources, there were significant gaps in critical evaluation skills, such as checking publication dates and verifying source credentials. This suggests a need for educational interventions to improve digital health literacy among elderly patients who use online resources, as highlighted in previous studies.

These findings have several implications for clinical practice. Healthcare providers should be aware that many elderly patients are supplementing their advice with online information and should be prepared to guide patients towards reliable digital resources [11]. There's a need for patient education on evaluating the credibility and relevance of online health information. Digital health interventions targeting elderly hypertensive patients should consider the barriers identified, such as digital literacy and language accessibility [12]. The development of curated, easy-to-navigate digital health resources specifically designed for elderly patients could be beneficial in addressing these challenges.

## CONCLUSION

In conclusion, this study demonstrates that elderly hypertensive patients who supplement physician advice with online health information show improved blood pressure control and medication adherence compared to those relying solely on healthcare professional guidance. These findings suggest that digital health resources can serve as a valuable complement to traditional healthcare in managing chronic conditions like hypertension among older adults. However, the study also revealed significant challenges in digital health literacy, including difficulties in evaluating the credibility of online information and barriers such as language accessibility and privacy concerns.

While the potential benefits of digital health resources are evident, it is crucial to approach their use with caution. The strong preference for healthcare professional guidance among participants underscores the enduring importance of the patient-provider relationship. Therefore, online health information should be viewed as a supplement to, rather than a replacement for, professional medical advice. Moving forward, there is a need for targeted interventions to improve digital health literacy among the elderly, development of age-appropriate digital health resources, and guidance from healthcare providers in navigating

online health information. Future research, particularly longitudinal studies, will be essential to further understand the long-term impacts of digital health resource use on chronic disease management in the elderly population and to develop strategies for its effective integration into healthcare practices.

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