

Status and Factors Affecting E-Health Literacy among Users of Smart Devices: A Community Based Cross Sectional Study

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Abstract

Background: e-health literacy can be a powerful tool to engage communities in their own health care management

Materials and method: Sample size was calculated to be 384 rounded to 400 using Cochran's formula. Simple random sampling technique was used to select the participants. eHEALS tool was used to measure electronic health literacy. Frequencies, proportions, chi squared values as measures of association and Phi(Φ) and Cramer's V for strength of association were calculated.

Results: There were 118 (29.5%) males and 282 (70.5%) females with a mean age of 45.1 (11.8) years. Median eHEALS score was 19 with IQR (13.5- 21.7). Age (= 38.95, df=1, p=<.001), education (= 15.51, df=4, p=.003), presence of comorbid condition (= 13.01, df=1, p=.003), practice of self-medication (= 10.76, df=2, p=.004) and trust on online information (= 9.9, df=2, p=.007) emerged as factors significantly associated with adequate e-health literacy.

Conclusion: Digitally literate communities can participate more fully in taking care of their own health.

Keywords: e-health literacy, management of health problems, online health resources, online health information

Introduction

The illiterate of 21st century will not be the ones who cannot read and write but those who cannot learn, unlearn and relearn. Alvin Toffler.¹

Rapid strides in scope and reach of health-related information and communication technologies have been largely made possible by the extensive network and ease of use of the internet.²

Digital health literacy is defined as the ability to seek, find, understand, and appraise health information from electronic sources and apply the knowledge gained to addressing or solving a health problem.³ Digital health literacy has emerged as one of the major influencing factors impacting the health outcomes of a community in an increasingly digitized healthcare ecosystem.⁴

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Digital health literacy is vital in digital health ecosystem.⁵ The Organisation for Economic Co-operation and Development has defined the digital divide as the gap between individuals, households, businesses, and geographic areas at different socio-economic levels in both their opportunities to access information and communication technologies (ICTs) and to their use of the internet for a wide variety of activities.⁶

Due to rapid digital transformation with ever-increasing importance of the Internet of Things, the digital divide has the potential to be the new face of inequality.⁷

The disparity in the rural-urban healthcare system in the country is also reflected in the digital divide. Data from NFHS-5 reveals that 72.5% urban and 48.7% rural males and 51.8% urban and 24.6% rural females have ever used the internet.⁸

Need of the study: The present study is undertaken to find status of digital health literacy of an urban community and attempts to find association between e-health literacy and various sociodemographic variables.

Objectives-of the study

1. Assess the digital health literacy of among 15 to 65 year old residents of an urban community using eHEAL scale.
2. Find association between e-health literacy and various sociodemographic variables.

Materials and method

Study design: This community based cross sectional study was conducted after obtaining ethical clearance from the Institutional Ethical Committee vide letter number SGRD/IEC/2023-169.

Sample size calculation: Cochran's formula $N = z^2 p(1-p)/e^2$ was used. With assumed prevalence (p) of electronic health literacy in the community as 50% (no studies available on prevalence of electronic health literacy in Punjab) could be found, an absolute margin of error (e) as 5%, $z=1.96$ for confidence level of 95%, the sample was calculated to be 384. The sample size was rounded to 400 for more intuitive understanding of the interpreted results.

Study participants- One participant who owned or had access to an internet enabled smart device- smart phone, laptop etc was chosen from each of 400 randomly selected households in the urban field practice area after taking their informed consent and assuring confidentiality of the information shared.

Data collection- Information was gathered through a predesigned and pretested. An 8-item electronic Health Literacy Scale (eHEALS) was used to assess the electronic health literacy of the participants. A pilot study was conducted on 20 participants. The Cronbach alpha was calculated to find the internal consistency of the eHEALS tool. It was found to be .694. Principal Component Analysis (with varimax rotation) was performed for dimensionality reduction. It yielded one principal component with items loadings ranging from .46 to .81.

Statistical analysis- Frequencies and proportions were calculated in descriptive analysis while chi squared test with appropriate Yates correction was used in inferential statistics. Φ coefficient and Cramer's V were calculated to find the strength of association between the categorical variables. Microsoft excel and SPSS version 24.0 were used for data analysis.

Results

There were 115 participants each in the age group of 36-45 years, 98 in the age group of 56-65 and just 30 in the age group of 15-25.

There were 118 (29.5%) males and 282 (70.5%) females among the 400 participants. Fig.1

Socioeconomic status was assessed by using modified Kuppaswami scale. Most of the respondents 112 (28%) belonged to the lower middle class followed by upper lower class 98 (24.5%). Most of the participants 155 (38.7%) were graduates while 121 (30.2%) had studied up to intermediate level.

The social media platforms with universal usage were Facebook, WhatsApp and YouTube i.e 100% each while government run portals and websites were routinely used by 16 (4%) of the participants. Fig 2.

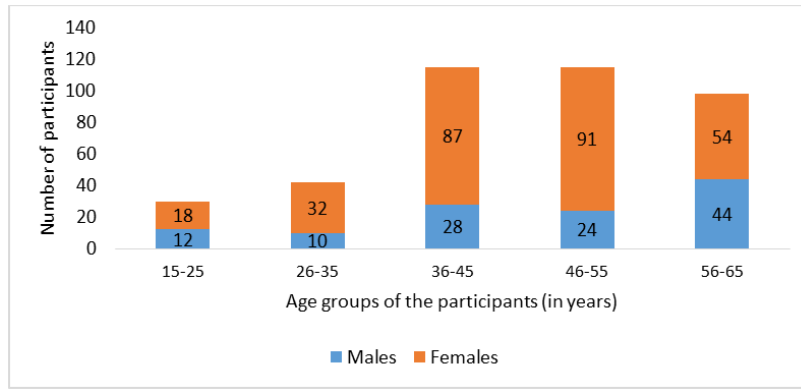


Fig 1. Distribution of participants according to age and sex

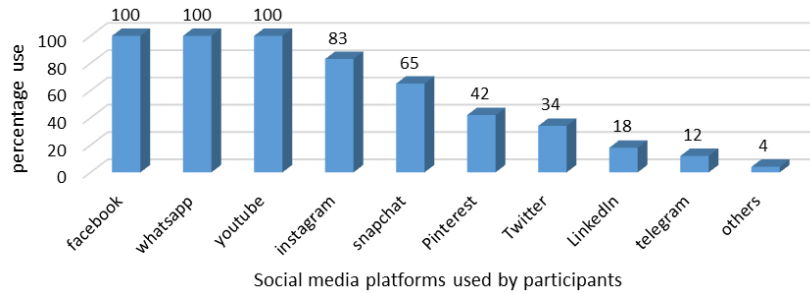


Fig 2. Percentage distribution of social media platforms used by participants

Health related applications were found in 74 (18%) users of smart mobile phones and wearable technology was used by 39 (10%) of the participants. Most of the participants 287 (72%) did not use any health apps. Fig 3. The most frequently used health applications were for monitoring distance walked (n=58), nutrition related (n= 41), water in take (n=40), heart rate, respiration rate and oxygen saturation levels (n=36 each).

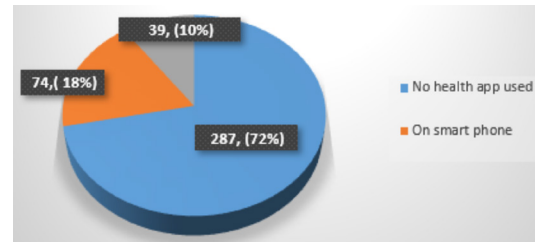


Fig 3: Platform for use of health applications

The electronic health literacy of the participants was assessed by using an 8-item eHEALS tool.⁹ The 8 statements are rated on a 5-point Likert scale from strongly disagree to strongly agree. The total score ranges from 8 to 40. The higher the score, the higher the electronic health literacy is considered. Fig-4

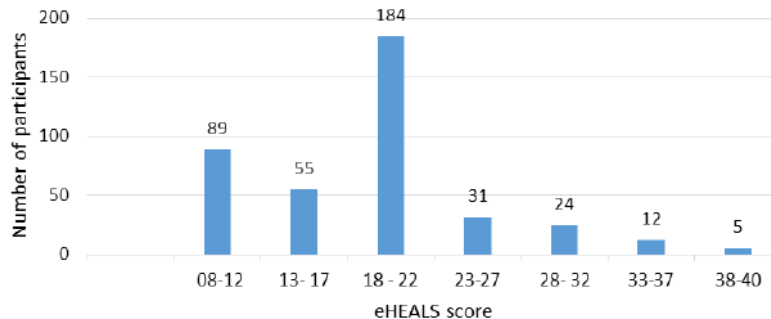


Fig 4: Distribution of participants according to eHEALS score

The median score was 19 (IQR=13.5- 21.7 The study participants were divided into two groups based on the median score. 271(67.7%) of the participants, who had score of ≤ 19 were categorised

as having inadequate e- health literacy while 129 (32.3%) who had score more than 19 were categorized as having adequate e health literacy.

Table 1: Factors associated with e-health literacy among users of smart device

Factor	Subsets of factor	Adequate e-health literacy (n=129)	In adequate e-health literacy (n=271)	Degrees of freedom (df)	Chi sq. value (χ^2)	P-value	Effect size (Φ and Cramer's V)
Age (in years)	<45(136)	72 (52.9%)	64 (47.0%)	1	38.95	0.00001	$\Phi=0.317$ Medium
	>45(264)	57 (21.5%)	207 (78.4%)				
Sex	Males(118)	31 (26.2%)	87 (78.3%)	1	2.36	0.124	
	Females (282)	98 (34.7%)	184 (34.6%)				
SES	Upper(45)	14 (31.1%)	31 (68.8%)	4	8.57	0.0725	
	Upper middle(87)	20 (22.9%)	67 (77.0%)				
	Lower middle(112)	35 (31.2%)	77 (68.7%)				
	Upper lower(98)	42 (42.8%)	56 (57.1%)				
	Lower lower(58)	18 (31.0%)	40 (68.9%)				
Education	Middle(67)	16 (23.8%)	51 (76.1%)	4	15.51	0.003	CV=0.196 Large
	Secondary(145)	34 (23.4%)	111 (76.5%)				
	Higher Sec(117)	49 (41.8%)	68 (58.1%)				
	Graduates(40)	17 (42.5%)	23 (57.5%)				
	Post graduates(31)	13 ((41.9%)	18 (58.0%)				
Co morbid condition	Yes(176)	74 (42.0%)	102 (57.9%)	1	13.01	0.003	$\Phi=0.185$ Small
	No (224)	55 (24.5%)	169 (75.4%)				
Practice self-medication	Yes (148)	46 (31.0%)	102(68.9%)	2	10.76	0.004	CV=0.164 Small
	No (24)	15 (62.5%)	9 (37.5%)				
	Sometimes(228)	68 (29.8%)	160 (70.1%)				
Self-rated health status	Good (109)	30 (27.5%)	79 (72.4%)	2	3.79	0.150	
	Okay (147)	56 (38.0%)	91 (61.9%)				
	Bad (144)	43(29.8%)	101 (70.1%)				
Trust online information	Mostly (56)	08 (14.2%)	48 (85.7%)	2	9.9	0.007	CV=0.157 Medium
	Never (102)	38 (37.2%)	64 (62.7%)				
	Sometimes (242)	83 (34.2%)	159 (65.7%)				
Electronic device possession	Personal (251)	57 (22.7%)	271 (77.3%)	1	3.15	0.075	
	Shared (149)	72 (48.3%)	147 (51.6%)				
Screentime	Unrestricted (233)	70 (30.0%)	163 (69.9%)	1	1.01	0.314	
	Restricted (167)	59 (35,3%)	108 (64.6%)				

Discussion

Age and e-health literacy

The mean age of the participants was 45.1 (11.8)

years. Of the 136 participants less than 45 years of age, 72 (52.9 %) possessed adequate e-health literacy while only 57 (21.5%) of 264 participants aged more than 45 years possessed adequate e-health literacy.

This association between age of the participants and e-health literacy was found to be highly statistically significant ($= 38.95$, $df=1$, $p<.001$) with medium strength ($\Phi=.317$) of association.

A meta-analysis done in Hongkong also found that the younger age group is associated with better eHEALS score.¹⁰

Another study done among adults in China also found a significant association between younger adults and better e-health literacy scores. ($F = 3.18$, $p < 0.05$) and male gender ($t = 2.00$, $p < 0.05$).¹¹

The negative relationship between older age and poorer digital health literacy was also found in a review study conducted by Wang.¹²

Sex and e-health literacy

31 (26.2%) of 118 male participants and 98 (34.7%) of 282 female participants had adequate e-health literacy. No statistically significant association of sex with e-health literacy was found. The above findings are in consonance with the meta-analysis done by Estrela M which found that sex of the adult participants did not have any influence over the digital health literacy. ($B = - 0.17$, 95%CI [-0.64; 0.30]).¹³

However, another online cross-sectional study conducted among internet users across five regions in Ghana, found that males scored significantly more than females on electronic health literacy scale.¹⁴

Hagen *et al* found male adolescents to be more digitally literate than female adolescents in a research conducted among university students.¹⁵

SES and e-health literacy

No statistically significant association was found between socioeconomic class of the participants and e-health literacy ($= 8.5,7$ $df=4$, $p<.07$). However, a study found a positive association of income with higher eHEALS scores. (SII 13.27 vs 7.30).¹⁶ Similar associations of limited ehealth literacy with poorer standards of living were found in a study in Ghana.¹⁷

Education and e-health literacy

145 (36.2%) were educated up-to secondary school ie matriculation, 117 (29.5%) had completed higher secondary, 67 (16.6 %) had studied till middle

school while only 31(7.7%) were postgraduates. This association between educational level of the participants and e-health literacy was found to be highly statistically significant ($= 15.51$, $df=4$, $p=.003$) with a large effect size (Cramer's $V=.196$).

The positive association of level of education and digital literacy was observed by Adil et al among university students. This study concludes that educational level is the major factor for unequal response towards digital health literacy.¹⁸

Another study observed that inpatient portal use registration and use was positively associated with higher educational attainment of the inpatient and better digital literacy score.¹⁹

Reduced odds of having internet use in respondents with lower education level (none: 0.09 (0.06, 0.15), GCSE's or equivalent: 0.40 (0.24, 0.69)) compared to being educated beyond A-level was seen in another study.²⁰

Comorbid condition and e-health literacy

74 (42.04%) of the 176 participants with a chronic comorbid condition and only 55 (24.5%) of the 224 participants without a comorbid condition had good e-health literacy. Presence of a comorbid condition of chronic nature was found to be highly statistically significantly associated with adequate e-health literacy ($= 13.01$, $df=1$, $p=.003$) with a small effect size ($\Phi=.185$)

A study conducted in China revealed that chronic non communicable disease management was significantly better in digitally literate participants ($\beta=0.42$, $P<0.01$).²¹

The association between frequency of self-medication and e-health literacy was found to be highly statistically significant ($= 10.76$, $df=2$, $p=.004$) with a small effect size (Cramer's $V=.164$).

In a Saudi Arabia study, significant positive correlation exists between the health literacy screening scale (BRIEF) and the self-medication scale (SMS) scores ($r = 421$, $p < 0.001$).²²

A study in Taiwan found a positive correlation between perceived wellbeing and digital health literacy ($B 0.29$, 95% CI 0.10-0.49, $p < 0.001$)²³

The association between levels of trust on online information and e-health literacy was found to be highly statistically significant ($= 9.9$, $df=2$, $p=.007$) with a small effect size (Cramer's $V=.157$).

Similar observation was made in a study conducted in Slovenia, where participants with a sufficient level of DHL were more likely to seek information through search engines and websites of official institutions.²⁴

A study conducted in China on patients in outpatient department found that face-to-face inquiry for obtaining health information was important in the low eHealth literacy group while Internet-based technologies crucially affected decision-making skills in the high eHealth literacy group.²⁵

This difference could be due to difference in research settings.

Conclusion

The internet is increasing being recognized as an important determinant of health by the health care systems worldwide. The spectrum and reach of health information and services can be vastly improved through the interactivity via the Internet of Things, particularly for those who are able to engage critically and productively with the online health resources as compared to those who rely solely on the traditional health care. e-health literacy is a key to unlock the access to the online health resources and empower communities to become more involved in their own health care management in the spirit of self-reliance and self-sufficiency as envisaged in the primary health care.

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