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eHealth literacy of late adolescents: Credibility and quality of health information through smartphones in India

Alfabetización en e-Salud de los jóvenes: Credibilidad y calidad de la información sanitaria con móviles en la India

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Abstract

The introduction of smartphones has revolutionized how late adolescents (aged 18-21 years) access and use the internet. Vast troves of health information are today just a tap or swipe away, with smartphones and internet connectivity becoming increasingly accessible. The need for eHealth literacy among late adolescents is now gaining importance as it ensures an effective use of health information. This study conducted a survey among 427 late adolescents in order to evaluate their eHealth literacy levels; their perceptions of the quality of online health information; their level of trust and credibility in online health and checked if acquiring health information through the online medium led to a change in their behavior intention. The results showed that most of the late adolescents preferred viewing multiple websites for their health information needs. Health information in the form of text and images were preferred over video content; and most preferred accessing online health information in their native language. Cancer and obesity are the common health issues of interest to both genders. Mobile applications (apps) were the least preferred mode of accessing health information despite the high usage of smartphones. eHealth literacy and credibility positively predicted behavior intention while quality of health information did not predict behavior intention.

Resumen

La introducción de los smartphones (teléfonos inteligentes) ha revolucionado la forma en que los adolescentes tardíos (de entre 18 y 21 años) acceden y usan Internet. Hay una gran cantidad de información a solo un toque de distancia y los teléfonos móviles y la conectividad a Internet son cada vez más accesibles. La necesidad de aprender acerca de eSalud entre los adolescentes tardíos ahora está cobrando importancia, ya que garantiza un uso eficaz de la información de la salud. En este estudio se realiza una encuesta a 427 adolescentes tardíos para evaluar sus conocimientos en eSalud; sus percepciones de la calidad de la información de la eSalud; su nivel de confianza y credibilidad en eSalud y verificar si la adquisición de información de salud a través de este medio conduce a un cambio en su intención de comportamiento. Los resultados mostraron que la mayoría de los adolescentes tardíos preferían ver múltiples páginas web para sus necesidades de información de salud y la mayoría preferían acceder a información de eSalud en su idioma nativo. Las aplicaciones móviles (apps) eran el método menos usado para acceder a la información de salud a pesar del alto uso de smartphones. La alfabetización y la credibilidad de eSalud predijeron positivamente la intención de comportamiento, mientras que la calidad de la información de salud no predice la intención de comportamiento.

Keywords / Palabras clave

Health Information, eHealth Literacy, mobile health, adolescents, mHealth, credibility, quality, online health information. Información de salud, alfabetización de eSalud, mSalud, adolescentes, salud móvil, credibilidad, calidad, información de la salud en línea.

1. Introduction

Health Literacy as a concept developed in the 1970s and dealt with people's ability to take decisions regarding their health. A person's capability to effectively gather health information, engage in discussions with health care providers and to make necessary changes to behaviors and lifestyles can be termed as health literacy. Health literacy directly correlates with healthy behaviors and responsible decision-making about an individual's health needs (Aaby et al., 2017; Guntzviller et al., 2017). When an individual has low levels of health literacy, they are most likely to display problems in various aspects related to their health. People today do not exclusively depend on their physicians for health information; rather they avail wide variety of options that are now available for all their health information needs (Boberg et al., 2015). This is especially true in cases where traditional sources fail to meet individual requirements (Spence et al., 2013). Some of the secondary sources of information are newspapers, radio and television but the most influential is new media (Vargo, 2014). The emergence of new technology has resulted in many people seeking out information online. Teenagers are increasingly using the internet for their health information needs (Kwan et al., 2019).

In India, access to smartphones is expanding rapidly and many have access to low cost internet (Mathi, 2019). Doctors, medical experts, scientific research, home remedies, etc. are also now increasingly shifting to the online platform. Between the ages of 15-20 years, individuals start to develop an interest in learning about their health and develop the requisite skills to look for both specific as well as general health information (Borzekowski et al., 2006). The ZOCDOC report has pointed out that 90% of Generation Z has never initiated any sort of physician check-up, yet, many individuals are very optimistic about the internet as a source of health information (Mangan, 2015). Health information is now available 24/7 and can be accessed anywhere using a wide variety of options like web pages, social networking sites, mobile applications, etc. (Deng et al., 2015). The use of new media to obtain health information may be due to various reasons. First, the cost of a general physician visit may have increased; second, new media is used to cross check the health information provided by the physician; third, it is used to get clarification for questions that were missed out in the physician's visit; fourth, it is used to get information on being diagnosed with a new disease; fifth, the cost of searching for health information is reduced when using the internet (Metzger, 2007; Yan, 2010; Walsh, 2016). Smartphone use among teenagers has witnessed a steep rise around the world (Lemola et al., 2015). According to the Pew research 2015, nearly 90% of teenagers access the internet through various means which includes using their smartphones (Wartella, 2016). The advent of the smartphone era has seen a tectonic shift in gathering health information through smartphones (Abrons et al., 2012) and has even become popular among teenagers. The process of using a smartphone by an individual to conduct health research and to improve his/her health behavior is referred to as mHealth (Mitchell et al., 2014). Credible health information which is not properly understood will lead to severe health issues (Deng et al., 2015). It is also essential for an individual who gathers the health information to analyze it critically in order to use in it in a proper way. He/She should be able to understand a variety of health information and treatment options available online (Ghaddar et al., 2012). The study focuses on late adolescents (18-21 years) access and use of health information online. Ability to gain knowledge and understanding a complex situation reaches a peak when a person reaches late adolescence. Therefore, this is a significant period for acquiring and using health information (Pasupathi et al., 2001). As a result, it is easy for late adolescents to become literate about the health issues that concern them and they also have the requisite understanding and implementing capacity in their life. The risk here is that health information obtained online can be misused; or if the wrong information has been fetched, it can lead to poor health outcomes (Diviani et al., 2019; Deng et al., 2015). The Uses and Gratification theory (1974) deals with people usage of various media on how their needs or desires decide their media choices. According to the theory different media serve different needs and in that context one can be viewed as being better than another. Similarly, new media can also replace older ones, if they provide greater satisfaction (Lee & Hawkins, 2010). Therefore, people actively choose which media they consume in accordance with psychological and social needs (Korhan & Ersoy, 2016).

This study aimed to measure the usage of smartphones among late adolescents to access health information, their opinions about the content and the resulting impact in their lives. Specifically, the objectives of this study are to investigate among late adolescents: a) To assess their smartphone usage for acquiring health information; b) To check their eHealth literacy level; c) To evaluate the level of trust and credibility that they have on online health information; d) To find out how they perceive the quality of health information that they find online; e) To check whether the acquired health information led to a change in behavior intention among late adolescents. The study is based on the uses and gratifications theory to understand how late adolescents use mobile phones to search for health information.

1.1. eHealth literacy

eHealth literacy' is an indicator of how able an individual is to effectively seek out, identify and evaluate the requisite health information needed to make informed health decisions and how he applies the gained knowledge practically in his life. While individuals need to equip themselves with the necessary competencies to improve their eHealth Literacy levels, medical professionals must also optimize the benefits of eHealth technologies by understanding existing eHealth literacy levels among the general public (Chung & Nahm, 2015). There are six components of eHealth literacy: 1) Traditional skills; 2) Health literacy; 3) Information literacy; 4) Scientific literacy; 5) Media Literacy; 6) Computer or smartphone literacy (Norman & Skinner, 2006). eHealth literacy is the outcome of an individual's perception and skills, especially his knowledge acquiring skills.

1.2. Quality of health information

The lack of content regulation on the internet is cause for concern as people do not depend on health professionals to interpret/validate the content (Eysenbach, 2003; Marshall & Williams, 2006). Good quality content acts as an incentive for people to use it while poor quality of information can misguide (So et al., 2019). When health information is misunderstood, it may cause health risks and result in improper behavior change among users (Deng & Liu, 2017). Analyzing the quality of information is not always easy. Some of the criteria used by people in judging content are whether a source is provided, whether there is scope for commenting/asking questions or seeking further help, whether the information can be easily retrieved and whether the user's information needs are met (Neter & Brainin, 2012).

1.3. Credibility

There is no universal standard for posting health information online. Such information can be altered, edited, misrepresented or created anonymously. In the past, there was a limited source of health information contributors, most of whom were from a reputed source, thus increasing their credibility (Metzger, 2007). But the advent of online portals has encouraged everyone to post their own content, which raises questions about the credibility of the content. Young minds that use these platforms are exposed to major health content which is why credibility is scrutinized so much. Given the difficulty in identifying credible content online, various initiatives have been undertaken to help content users like rating tools, portals like OMNI that list high quality websites and quality labels like HON code. In research various checklists and tools have been developed to help evaluate content.

1.4. Behavior intention

Behavioral intention is a measure as to how likely a person is to perform a particular behavior (Mamman, 2016). The ultimate goal of eHealth is to establish and develop the desired behavior among users. Longitudinal studies and/or an experiment followed immediately by the measurement of the actual behavior would be more definitive, of course, but seldom practical. As an alternative, scholars have long relied on respondents' behavioral intentions as a close predictor of actual behavior (Hu & Sundar, 2010):

- H1: There will be a positive influence on behavior intention when students have high eHealth literacy.
- H2: Credible online health information will positively predict behavior intention among students.
- H3: The higher the quality of information, the higher the level of positive influence in the behavior intention.

2. Method

The study used the survey method which was conducted in Chennai, India during the month of November 2019. The city of Chennai was subdivided into three zones. In each zone, five colleges were selected randomly and within each college 30 students were selected using simple random sampling. Permission was obtained in each institution to conduct the study. Respondents were briefed on the purpose of the survey and no honorarium was paid. Out of 450 surveys collected, 23 were eliminated because of missing data. This research used the eHEALS Literacy Scale by Norman and Skinner (2006) to understand how late adolescents acquire health information through smartphones. The eHeals scale is a validated scale developed to quantify eHealth literacy by measuring the skillsets that people used when obtaining health information from various information

technology devices (Koo et al., 2012). This study used the Discern Handbook for measuring the quality of health information. The Discern handbook consists of standardized criteria to evaluate the quality of written online health information on treatment options (Charnock & Shepperd, 2004). It is a critical appraisal tool that has validity and a good inter-rater agreement. This study tests the perceived credibility among college students using the credibility scale from Kienhues & Bromme (2012) and Hu and Sundar (2010).

2.1. Analysis

SPSS software was used to analyze the data. For variables like eHealth, quality of health information, credibility, and behavior intention mean and standard deviation of summated scales were calculated. Construct validity was tested using factor analysis with factors extracted using the scree plot and the Eigen value of above 1. Suitability of data was tested using the Kaiser-Meyer-Olkin (KMO) method and Bartlett's test. Convergent validity was tested using reliability (Cronbach's alpha) and factor loading for all the factors. Medical experts, care givers, social scientists, and social media users were used to analyze the questions for face validity. Regression analysis was used to test hypotheses. For all scale variables, a Likert scaling method was used with the regular interval from strongly disagree (1) to strongly agree (5). For quality of health information alone, a 3-point Likert scale was followed.

3. Result

Of the 427 participants 51.4% were male and 48.6% were female with a mean score of 19.52 and standard deviation of 1.445. It was found that all the participants had a smartphone (100%) and 78.3% had their own laptop. The preferred mode of accessing online information was through the smartphone (84.1%) followed by the laptop/computer (13.2%) and other modes (2.7%). A majority of 94.6% of students used the smartphone to access health information.

When the college students were asked about when their last search for health information had taken place, 26.3% said that it had been in the last five days before completing the survey. The highest percentage of students (35.7%) searched for health information 5-10 days before the administration of the survey (Table 1).

Last online search	Health (%)
0-5 Days	26.3
5-10 Days	35.7
10-15 Days	19.5
15-30 Days	15.6
Last Month	2.9

When asked for the purpose of searching for health information online, 82.8% said that they used to search for information in order to lead a healthy lifestyle. The second most popular reason was to cross-check information provided by the physician (79.3%). The third most popular reason was to find more information when someone known to them was diagnosed with a medical condition (74.8%) (Table 2).

Purpose	Yes (%)	No (%)
I have struggled to meet the general physician	19.4	80.6
I feel that charges for meeting the general physician are high	35.5	64.5
The internet helps in cross checking the information provided by the physician	79.3	20.7
The internet helps to answer the questions that I forgot to ask to physician	41.9	58.1
I am able to find the Disease-specific information on the Internet	64.6	35.4
I used to search for general information on healthy lifestyle	82.8	17.2
When I am diagnosed with a new health problem	65.3	36.7
When I am dealing with an on-going medical condition	12.9	87.1
When I was prescribed a new medication or course of treatment	43.6	56.4
When I don't have time to go to my physician	22.6	77.4
When I am unable to get a referral or an appointment with a specialist	25.9	74.1
When someone I know is diagnosed with a medical condition	74.8	25.2

The preferred language for accessing health information was mother tongue /native language (Tamil, Telugu, Malayalam, Hindi, and other native languages of India) with a score of 87.4%, followed by English 12.6%. According to 51.5%, the last health information that they accessed was in their mother tongue, while 48.5% accessed it in English (Table 3). Using chi-square analysis, it was further tested if there was a difference between the preferred language and the language in which the health information is obtained. The Chi-square value of 129.165 with the $P < 0.001$ and the df of 1 shows that there was a significant difference.

Language	Preferred (%)	Consumed (%)
Mother tongue	87.4	51.5
English	12.6	48.5

Among the recent health searches made by the participants' diabetes and thyroid (8.9%) were the top issues searched for by males, while among females it was menstrual issues (15.8%) and headache (6.1%). Overall, among both genders, obesity (27.6%) and cancer (23.6%) were the most searched issues. Among all students, 26.3% preferred accessing a combination of text and picture followed by 22.8% that accessed in video form alone (Table 4). It was found that search engines (82.7%) played a significant role in health information fetching, followed by video streaming sites (10.3%). The usage of mobile health applications was quite low at 2.3%. A majority of students (88.4%) switched between multiple pages or more than one site for their health queries.

Kind of health information	Percentage
Mix of all	19.3
Text and picture	26.3
Text and video	8.8
Video and Picture	5.3
Picture	3.5
Text	14
Video	22.8

The eHealth literacy scale was adopted from the eHEALS scale by Norman (2006). Statements like 'I know how to find helpful health resources on the Internet' was rated by the students on a 5-point Likert scale ranging from 'strongly disagree' to 'strongly agree'. High mean value near 5 was a positive comment about the factor, the respondents' option about that particular factor is approving. A total of eight statements were rated for this variable. The result showed a mean value of 3.998 and with a standard deviation of 0.507 (Table 5).

To check student's perception of credibility of online health information, we adopted the scale from Kienhues and Bromme (2012) and Hu and Sundar, (2010). Statements like 'One can almost always receive verified health information from the Internet' were rated by the students on a 5-point Likert scale ranging from 'strongly disagree' to 'strongly agree.'

A total of seven statements were rated for this variable. The result showed a mean value of 3.599 and a standard deviation of 0.497 (Table 5).

The quality of health information scale was adopted from the Discern handbook. Statements like 'Is the health content relevant?' was rated by the students on a 3-point Likert scale ranging from 'strongly disagree' to 'strongly agree'. A total of sixteen statements were rated for this variable. The result showed a mean value of 2.134 and a standard deviation of 0.347 (Table 5).

The behavior intention scale was adopted from the study of Liang et al. (2011) and Hu and Sundar (2010). Statements like 'I intend to continue seeking health information from the Internet' was rated by the students on a 5 point Likert scale ranging from 'strongly disagree' to 'strongly agree'. A total of seven statements were rated for this variable. The result showed a mean value of 3.783 and a standard deviation of 0.542 (Table 5).

Statement	Mean	SD
eHealth Literacy		
<ul style="list-style-type: none"> • I know how to find helpful health resources on the Internet • I know how to use the Internet to answer my health questions • I know what health resources are available on the Internet 	3.998	0.507

<ul style="list-style-type: none"> • I know how to use the health information I find on the Internet to help me • I have the skills I need to evaluate the health resources I find on the Internet • I can tell high quality from low quality health resources on the Internet • I feel confident in using information from the Internet to make decisions 		
Credibility <ul style="list-style-type: none"> • The information that I read/viewed online is accurate. • The information that I read/viewed is believable. • One can almost always receive verified medical information from the Internet. • The Internet almost always contains reliable statements with regard to medical research. • The Internet is a trustable source for gathering medical findings. • One should almost always critically scrutinize medical information from the Internet. • I can trust the information that I get from the online platform. 	3.599	0.497
Discern Handbook / Quality of health information <ul style="list-style-type: none"> • Are the aims of online health content clear? • Does it achieve its aims? • Is the health content relevant? • Is it clear what sources of information were used to compile it? • Is there a clear indication of the date of posting on online content? • Is the health information balanced and unbiased? • Does it provide details of additional sources of support and information? • Does it refer to areas of uncertainty? • Does it describe how each treatment works? • Does it describe the benefits of each treatment? • Does it describe the risks of each treatment? • Does it describe what would happen if no treatment is given? • Does it describe how the treatment choices affect overall quality of life? • Is it clear that there may be more than one possible treatment choice? • Does it provide support for shared decision-making? 	2.134	0.347
Behavioral Intention <ul style="list-style-type: none"> • I intend to continue seeking health information from the Internet. • I plan to continue using the Internet to obtain health information. • If I could, I would like to discontinue seeking online health information. • I used to act on the advice that is offered in the online messages • I recommend the health advice that I read online to my friends and family members. • Online health information heavily influences my personal health decisions. • I use online health information to cope with my emotions such as fear, stress, and frustration. 	3.783	0.542

Factor analysis was used in order to test the scale and item measures. KMO value of 0.831 and Bartlett's test p-value of 0.000 was significant and therefore factor analysis was conducted. Average variance extracted for 4 factors was 78.034% which is also above the Eigen value of 1. Principal component extraction method was used and varimax rotation was followed. The factor loading for all the items ranged from 0.724 to 0.817. Internal consistency of each scale item was measured with Cronbach's Alpha, scores of eHealth was 0.757, credibility was 0.783, behavior intention was 0.812, and quality of health information was 0.748.

H1, H2, H3: The linear regression was calculated to check the level in which variables such as eHealth literacy, credibility, and quality of health information predicted behavior intention. eHealth predicts behavior intention strongly with an R^2 value of 0.741 and a t-value of 6.983. Credibility also predicts behavior intention with a t value of 4.431 and an R^2 value of 0.581. For variable quality, there is no significant association with a t-value of 1.562 and a low R^2 value (0.057). Therefore, hypothesis 1 and 2 are proven: There is positive influence on behavior intention when students have high eHealth literacy; credible online health information positively predicts the behavior intention among the students. Hypothesis 3 was rejected (Table 6).

Table 6. Regression analysis of eHealth literacy, credibility and quality of health information

	Mean	Std. Deviation	Standardized coefficient	T	Sig.	f	df	Sig.	R^2
eHealth	3.9987	.50700	0.618	6.983	0.000	34.451	1, 426	0.000	0.741
Quality	2.1349	.34734	0.238	1.562	0.074	3.313	1, 426	0.074	0.057
Credibility	3.5991	.49745	0.454	4.431	0.000	27.516	1, 426	0.000	0.581

4. Discussion

Health information seeking behaviour is vital to maintaining good health among college students (Deng & Liu, 2017). The results of the study indicate that smartphones play a significant role in health information gathering. This might be because of the enhanced smartphone usage and the low cost of internet in India compared to other countries (Deng & Liu, 2017). The use of internet to seek health information and the particular dependence on websites is also in line with the uses and gratifications theory that states that people seek out media which meets their specific requirements and needs (Lee & Hawkins, 2010). The majority of the late adolescents (62%) surveyed had searched for health information in the last week.

Most students preferred accessing health information in their mother tongue, but information available online is more often in English. Respondents also highlighted that search engines were their first choice to gather health information and mobile health applications were the least popular source of health information. Earlier research by Peng (2016) and Deb (2018) has also shown that many people rarely download health apps. There are several reasons. First, some people feel that they do not need a health app given their current healthy status. Second, many people drop off after initially trying the apps. Third, people doubt the credibility of an app. Fourth, people fear that their personal data and search history would be shared with third parties (Peng et al., 2016). Fifth, lack of awareness due to little or no mainstream marketing for health applications in India. Sixth, there is a perception that apps provide limited and mostly westernized treatment options and may not include alternate options like Homeopathy and Ayurveda.

It is a significant result that mobile applications for health monitoring are not popular among students even though they might use them to develop a healthy lifestyle. Late adolescents are not exposed to several health issues and as a result find installing health applications in their smartphone quite unnecessary (Cheng & Dunn, 2017; Mitchell et al., 2014). In order to increase app usage, it is suggested that focus be on first developing well designed apps at low costs providing relevant information, in multiple languages, that is credible (with sources detailed) and includes alternative treatment options (Deb et al., 2018). Creating awareness about the app and providing app literacy are two other important steps (Peng et al., 2016).

Though smartphones were used for health information gathering, text and image scores had the highest preference among the participants, with videos getting the second leading preference. Video streaming sites play a vital role in communicating health issues to late adolescents (Madathil et al., 2015). The health communicator therefore needs to target video streaming sites for the sharing of health information (Mitchell et al., 2014).

The term 'disease' or 'health issue' for late adolescents in this study signified something serious and therefore they provided mostly serious replies when asked to identify the diseases or health issues for which they sought health information. Common health topics associated with this age group like acne and body image are not perceived by late adolescents as being serious enough to be listed as a disease or health issue when questioned. Therefore, a majority of respondents in this study did not mention any issues related to their external appearance. The common health issues which are of major interest to both genders are cancer and obesity. According to Rajpal (2018) cancer is one of the emerging issues that India needs to concentrate on as the prevalence of cancer is increasing rapidly. In India approximately 130 million individuals are affected by obesity (Ahirwar & Mondal, 2019) and both genders are concerned about this issue.

The high mean value of eHealth literacy shows that late adolescents possess a strong health literacy, information literacy, scientific literacy, media literacy, and computer or smartphone literacy along with traditional skills. Health literacy is closely related to health information seeking behaviour and education levels (Lam & Lam, (2012). Neter & Brainin (2012) have also pointed out that eHealth Literate individuals are more likely to be younger. This study's respondents were young and had high educational qualifications, thereby proving both associations. UNESCO has introduced the term Media and Information Literacy (MIL), which highlights the importance of knowing how to access and navigate content on a specific media (media literate), as well as the importance of being able to access and critically evaluate content (Gretter & Yadav, 2016). This study shows that late adolescents are good, media and information literate candidates.

In this study, late adolescents were able to find health information but were found to be unable to effectively evaluate the quality of health information, even though they find the source to be trustable (Hu & Sundar, 2010; Eysenbach, 2003). Despite guidelines being present on how to evaluate health information published by various medical organisations, governments and academicians (Marshall & Williams, 2006) there is not much awareness about them.

Other researchers have ignored eHealth literacy as a potential mediating factor for behaviour intention. In this study, it was found that eHealth literacy strongly influences behaviour intention. It is worth noting that the late adolescents do not check the information on only one web page but rather visit multiple websites. They apply

their analytical and cognitive skills to effectively gather and interpret health information. Late adolescents do not focus on the quality of the health content and therefore more awareness should be created on the importance of finding quality health information.

4.1. Limitation and recommendation

This study was limited to late adolescents and can extend to other age groups as well. As actual behaviour cannot be measured, behaviour intention was checked. Further studies can be extended to find links between eHealth literacy, credibility and behaviour intention as a mediation analysis.

4.2. Conclusion

More people are today turning to the online medium for their health information needs. The use of smartphones to access such information is also on the rise due to its highly portable nature and the low cost of internet access. Despite the popularity of smartphones among late adolescents, mobile applications (apps) are not as popular or preferred. Health communicators need to focus on creating awareness regarding eHealth literacy. There is no regularity mechanism to assure the credibility and the quality of online health information. Wrong health information can cause problems for the public. Despite having quality tools like HONCode and JAMA benchmark, they have not been effectively implemented across all websites. In the case of a multilingual country like India, it is essential to provide health information in all languages. Health information seekers should crosscheck information obtained online with their health care providers. For now, the need is to equip health information seekers with the requisite skill sets to effectively access and use online health information.

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