



Self-reported eHealth literacy skills among nursing students in Sri Lanka: A cross-sectional study

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ABSTRACT

Background: As nursing students are the future workforce in nursing, they should have the necessary skills to find, understand and apply health information available on electronic platforms into their practice.

Objectives: To assess eHealth literacy skills and associated factors among nursing students.

Design: Cross-sectional survey.

Setting: A Government School of Nursing, Sri Lanka.

Participants: A purposive sample of 440 nursing students.

Method: A self-administered questionnaire consisting of socio-demographic data, the questions related to the internet use and eHealth Literacy skills was used. In data analysis, descriptive statistics, the Mann-Whitney U test and Kruskal-Wallis H test were applied.

Results: The sample consisted of 440 nursing students (420 females and 20 males). The mean eHealth literacy score was 28.02 (SD ± 4.60). Nearly half of the respondents (49.4%) reported inadequate eHealth literacy skills. The respondents reported comparatively poor skills in differentiating high-quality health resources from low-quality health resources on the internet and the ability to use information from the internet to make health decisions. The majority viewed that including information technology (IT) as a subject into the nursing curriculum was very (50.7%) or absolutely (33.6%) important. The influencing factors of eHealth literacy skills of nursing students were self-rated internet skills ($P = < 0.001$), perception towards using the internet in health decision making ($P = 0.009$) and using the internet to access health resources ($P = 0.001$).

Conclusion: Half of the nursing students have inadequate eHealth literacy skills, particularly skills in identifying trusted health resources and using this information in health decision making indicating the need for improving eHealth literacy skills among nursing students. A positive attitude towards the internet has a significant role in developing eHealth literacy skills. Improving competencies in eHealth literacy skills of nursing students is essential. Introducing these concepts into curricula, planning target interventions, and enhancing IT facilities within the educational environment are essential.

1. Introduction

In recent decades, information and communication technology has become an integral part of society in many ways. It has a significant impact on healthcare, particularly health information seeking (Tubaishat and Habiballah, 2016), and the internet is a primary vehicle for exploring new health knowledge for the individuals who seek information in relation to their health problems (Stellefson et al., 2011). Today, a considerable number of electronic health resources are available online for users. These online sources act as a powerful medium in the dissemination of health knowledge (Gilmour, 2007). With the increased use of the internet and mobile technology, this

information can be accessed easily anytime, anywhere (Robb and Shellenbarger, 2014). The use of information and communication technologies in healthcare has evolved as eHealth (Silber, 2003), and it requires a skill set or literacy of its own (Norman and Skinner, 2006b). eHealth literacy can be defined as “the ability to seek, find, understand, and appraise health information from electronic sources and apply the knowledge gained to addressing or solving health problems” (Norman and Skinner, 2006b, p. 1). In addition to the general health literacy skills, for example, reading, comprehension and making decisions on health information and applying these decisions over their health needs and problems (Kindig et al., 2004), eHealth requires a basic understanding of science, the availability of electronic devices and internet access,

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skills in using computers and other electronic devices, and ability in using online resources (Kindig et al., 2004; Norman and Skinner, 2006b). eHealth literacy skills help to empower people by enabling them to participate in health decision making (Norman and Skinner, 2006b) and enhances consumers' health outcomes and the quality of healthcare (Robb and Shellenbarger, 2014; Tubaishat and Habiballah, 2016). Previous research has established that eHealth literacy is positively associated with consumers' health knowledge and behaviours, participation in health screening, seeking medical advice, health care utilization and participation in mHealth (i.e. use of mobile technology to achieve health care goals) research (James and Harville, 2016; Kim and Son, 2017; Mitsutake et al., 2012; Schulz et al., 2017). Consequently, eHealth literacy plays an essential role in consumer health.

1.1. Background/literature

Although there are a number of health information sources available electronically for users, it is important to determine the most credible and reliable information among them (Stellefson et al., 2011). Usually, reputable health organisations, for example, government organisations and established medical institutes provide quality information compared to the opinions from private sector marketers and non-verified public commentators (Park and Lee, 2015; Stellefson et al., 2011). Individuals with a low eHealth literacy skills experience difficulties in accessing reliable eHealth information (Norman and Skinner, 2006b). Studies have found inadequate eHealth literacy skills among different populations, for example, nearly half of the sample of older adults (Arcury et al., 2018) and individuals with cardio-vascular risk (Richtering et al., 2017) had low health literacy skills. Therefore, individuals with low health literacy skills need additional support, especially from health professionals. Health professionals including nurses have a significant role in developing eHealth literacy skills among clients, particularly educating them about how to access eHealth resources and how to identify credible and reliable information (Park and Lee, 2015). Moreover, health professionals also can benefit from having good eHealth literacy skills, because it helps to find valid and reliable health information relevant to their practice (Tubaishat and Habiballah, 2016). A systematic review by Stellefson et al. (2011) raises the need for preparation of building eHealth literacy competencies among future health professionals.

The role of nurse professionals is central to healthcare (Shamian, 2014) and they have an essential role in teaching individual clients, families, and communities. eHealth literacy skills are regarded as one of the key nursing informatics competencies (Tubaishat and Habiballah, 2016), and good eHealth literacy skills of nurses help them to assess the use of eHealth information by their clients and to correct misconceptions on clients' health problems due to the misinterpretation of eHealth information (Gilmour, 2007). Therefore, they should be capable of having the necessary skills to help their clients in using eHealth information effectively.

Similar to staff nurses, student nurses also need eHealth literacy skills (Park and Lee, 2015; Stellefson et al., 2011; Tubaishat and Habiballah, 2016). Robb and Shellenbarger (2014) pointed out eHealth literacy skills as a learning outcome of nursing education. However, there are a limited number of studies to examine eHealth literacy skills among nursing students (Park and Lee, 2015; Park and Park, 2016; Tissera and Silva, 2017; Tubaishat and Habiballah, 2016). These studies showed that although student nurses were aware of and have adequate skills in searching, locating and using eHealth information, they had poor skills in evaluating eHealth resources, in particular, in differentiating between high quality and low-quality health resources on the internet indicating poor eHealth literacy skills related to the findings of credible and reliable information. Therefore, it is essential to examine the eHealth literacy skills of nursing students. Additionally, the literature also reports poor eHealth literacy skills among health sciences students (Hanik and Stellefson, 2011; Robb and Shellenbarger, 2014;

Stellefson et al., 2011).

Moreover, studies have found that a number of factors are associated with eHealth literacy skills among nursing and health science students. These factors include the type of student admission (regular program admission or post registered nurse [RN] admission), the type of university (public or private), academic grade level (pre-nursing, junior or senior), the internet skills of students, and the students' perception of usefulness and importance of the internet (Hanik and Stellefson, 2011; Robb and Shellenbarger, 2014; Tubaishat and Habiballah, 2016).

In Sri Lanka, where the current study was conducted, there has been only one study reported related to eHealth literacy skills among nursing students. This study showed that eHealth literacy skills among third year diploma nursing students were fairly satisfactory (Tissera and Silva, 2017). Recently university-based undergraduate degree programs were introduced to nursing education in Sri Lanka. However, the majority of the public sector nurses graduate from the government run-diploma schools, and all schools implement the same curriculum under the Ministry of Health (Rathnayake et al., 2016). There are 16 Government run Schools of Nursing, and these schools provide a three-year Diploma in Nursing Program (Rathnayake et al., 2016). Usually, the higher education programs in Sri Lanka include information and communication technology as a part of their curricula. The diploma program of the government run-nursing schools does not include the subject of information and communication technology. With modern advances in technology, especially in the use of information and communication technology in healthcare, further assessment of internet usage and eHealth literacy skills among nursing students in Sri Lanka is essential. Therefore, the findings of this study could be used to plan the interventions for nursing students to improve their competency in eHealth literacy and to revise the nursing curriculum in the above program.

1.2. Aims

This study aimed to examine the eHealth literacy skills among nursing students in Sri Lanka. It further investigated the factors associated with eHealth literacy skills.

2. Methods

2.1. Research questions

1. What are the eHealth literacy skills among nursing students in Sri Lanka?
2. What are the factors associated with eHealth literacy skills among nursing students in Sri Lanka?

2.2. Study design, setting, and sample

This study was a cross-sectional survey conducted among a purposive sample of nursing students enrolled in the three-year Diploma Nursing Program in a Government School of Nursing, Western Province, Sri Lanka. This School of Nursing is located in the most commercial district in the country, which has more IT facilities including internet access compared with other parts of the country. Additionally, students from different provinces are studying here. The total number of students in the above Nursing School is 462. All nursing students from the first year to the third year were included. The students who refused to participate in the study were excluded.

2.3. Instrument

Data were collected using a self-administered questionnaire designed with three sections namely (1) socio-demographic data (2) questions related to internet usage (location and purposes) and (3)

eHealth literacy scale (eHEALS) (Norman and Skinner, 2006a). Section one and two of the questionnaire was developed by the researchers based on the study aims incorporated with current literature. Section one consisted of socio-demographic variables such as age, gender (male, female and other), ethnicity (Sinhalese, Tamils, Muslims and others), religion (Buddhism, Hindu, Islam, Catholic/Christians and other), academic year (first year, second year and third year), the district of residence and information about whether they studied information technology as a subject or not as a subject in their school education.

Section two consisted of the self-rated internet use skills, time spent on the internet, location for internet use, the purposes and reasons for internet use, and the perception towards including information technology as a subject into the nursing curriculum. Self-rated internet use skills were based on the five point Likert scale ranging from very poor to very good. Time spent on the internet consisted of five components: several times per day, one time per day, once a week, sometimes in the month and never used. Location for internet use included desktop at home, laptop, computer lab/nursing school, internet cafe, smartphone and tablet/iPad. The purposes and reasons for internet use were based on playing online games, gathering general information, gathering health-related information, study purposes, chatting, access to social media and other. The included study purposes were preparing for examinations, preparing to attend classroom activities, doing assignments, making presentations in the class, for patient care, conducting research, improve health-related knowledge, and other. The perception towards including information technology as a subject into the nursing curriculum was based on the five point Likert scale (Not important at all, of little importance, of average importance, very important, absolutely important).

In section three, eHealth literacy skills of nursing students were assessed by the eHealth Literacy Scale (eHEALS) (Norman and Skinner, 2006a). This scale assesses the individual's perceived skills at finding, evaluating, and applying electronic health information to health problems (Norman and Skinner, 2006a). This instrument has been widely used to assess eHealth literacy skills among students (Park and Lee, 2015; Robb and Shellenbarger, 2014; Tubaishat and Habiballah, 2016). The measure consists of eight items scored on a five-point Likert scale ranging from one (strongly disagree) to five (strongly agree). A higher score on the eHEALS indicates higher eHealth literacy skills (total score range from 8 to 40). The Cronbach alpha reliability in the original validation study was 0.88 (Norman and Skinner, 2006a). Cronbach's alpha reliability of eHEALS in studies conducted by Park and Lee (2015), Robb and Shellenbarger (2014), and Tubaishat and Habiballah (2016) were 0.86, 0.89, and 0.81 respectively.

This scale consists of two additional items that examine the perceived usefulness of the internet to make health decisions and the perceived importance of accessing health resources on the internet based on a five-point Likert scale ranging from one (not useful at all) to five (very useful). This questionnaire was pre-tested among nine nursing students with similar characteristics to the students of the study population. It helped to identify any problems with the wording, instructions, time for filling in the questionnaire and the respondents' overall impression towards the questionnaire. Based on the result of the pre-test, only minor changes were made for the questionnaire.

2.4. Data collection procedure

Data collection was conducted during February to March 2018. First, necessary permission to approach students was obtained from the school administration. One of the researchers from the research team contacted students at the end of the lectures. The students who fulfilled the inclusion criteria were selected, and written information was given. Written informed consent was obtained from each student before data collection. A paper and pencil based questionnaire was administered. Compared to the online survey method, the paper and pencil based

method helped all students to take part in the study without a need for internet skills.

2.5. Ethical considerations

The Human Ethics Committee, International Institute of Health Sciences, Welisara, Sri Lanka approved this study. Necessary permission to conduct this study was obtained from the Principal of the selected School of Nursing. Respondents were assured that information collected in this study was confidential and anonymous, and their participation was voluntary. All data collection forms were given a code number. Coded information was used in data management.

2.6. Data analysis

Data were recorded and analysed using the Statistical Package for Social Sciences (SPSS) 25 version for Windows. There were no missing data; therefore, 440 responses were included in the data analysis. Descriptive statistics were used to describe the socio-demographic characteristics, questions related to internet use and eHealth literacy skills of nursing students. The eHealth literacy level was categorised into two groups (high or low) based on the mean score. This method has been used in previous studies (Park and Lee, 2015; Park et al., 2014). The high eHealth literacy skills was defined as above the mean. The assessment of the normality of data was done by the Shapiro-Wilk test (Ghasemi and Zahediasl, 2012). It showed that the score was not normally distributed. Therefore, non-parametric tests were used. The influence of socio-demographic variables, self-rated internet skills and perception towards the use of internet in accessing health information and health decision making on eHealth literacy was computed by the Mann-Whitney *U* test and Kruskal-Wallis *H* test, and mean rank was used to identify possible differences within groups in the above variables. The Alpha level of significance was set at 0.05.

3. Results

3.1. Demographic characteristics

Four hundred and forty nursing students filled in and returned the questionnaire, giving a response rate of 95.23%. Table 1 shows descriptive statistics for socio-demographic data of the respondents. The total sample consisted of 95.5% of female and 4.5% of male students. The mean age of the sample was 23.5 years ($SD \pm 1.539$), and ranging from 21 to 30 years. Almost all respondents were Sinhalese (99.8%) and Buddhists (99.3%). The majority of the respondents were from the third year (40.9%), from Southern province (47.7%), and had followed information technology as a subject in school time (64.5%).

3.2. Use of the internet among respondents

Table 2 shows internet usage, particularly location and main purposes. The majority of the respondents rated their skills in using the internet as good (47%), and accessed the internet several times per day (56.1%). Most respondents used their smartphone to access the internet (97.3%). The primary purposes of using internet stated by respondents were study purposes (99.1%), chatting (63.4%) and accessing social media (63.2%). Among the respondents who used the internet for study purposes ($n = 436$), the main reasons reported were doing assignments (92%), gathering health-related knowledge (72.7%) and preparing examinations (39.2). Furthermore, half of the respondents viewed that including IT as a co-subject in the nursing curriculum was very important (50.7%).

Table 1
Descriptive statistics for socio-demographic characteristics of the respondents ($n = 440$).

Demographic characteristic		Number	Percentage %	Mean \pm SD
Age				23.5 \pm 1.539
Gender	Male	20	4.5	
	Female	420	95.5	
Ethnicity	Sinhalese	439	99.8	
	Tamils	0	0.0	
	Muslims	1	0.2	
Religion	Buddhism	437	99.3	
	Hindu	0	0.0	
	Islam	1	0.2	
	Catholic/Christians	2	0.5	
The academic year of the students	First year	163	37	
	Second year	97	22	
	Third year	180	40.9	
Studying IT as a subject in the school curriculum	Yes	284	64.5	
	No	156	35.5	
Residency (based on provinces)	Western Province	90	20.5	
	Southern Province	210	47.7	
	Sabaragamawa Province	126	28.6	
	North Western Province	3	0.7	
	North Central Province	2	0.5	
	Central Province/Uva Province	7/2	1.6/0.5	

3.3. The use of the internet in health decision making and in accessing health information among respondents

From the sample, 68% of respondents agreed that the internet was useful in health decision making while 23.4% and 6.4% of respondents said that it was very useful or unsure, respectively. The remaining respondents (2.2%) stated that it was not useful or not useful at all. The majority of the respondents reported that the internet was important (72%) or very important (21.1%) in accessing health resources while 5.5% stated that they were unsure. The rest of the sample (1.4%) stated that the internet was not important or not important at all in accessing health resources.

3.4. eHealth literacy among respondents

The internal consistency of the eHEALS was calculated by Cronbach's alpha, and showed a coefficient of 0.863 indicating the above scale is reliable. The total score ranged from 11 to 40 with a mean score of 28.02 (SD \pm 4.60). Based on the categorisation, 51.6% of respondents reported an adequate eHealth literacy skills. The response frequencies for the items of eHEALS are shown in Table 3. Based on the mean score of individual items of scale, the highest mean score was reported for item 4 'I know how to use the Internet to answer my questions about health' (M = 3.78 \pm 0.655). The lowest score was reported for item 7 'I can tell high-quality health resources from low-quality health resources on the internet' (M = 3.02 \pm 0.9).

3.5. Influencing factors of eHealth literacy of respondents

In the analysis, age was categorised into two groups: 18–25 years (young adults) and above (adults). Residency type was classified into two groups: living in Western province versus other provinces. Western Province is the most socio-economically developed province in the country (Semasinghe, 2009). Time spent on the internet was

Table 2
Internet usage among respondents ($n = 440$).

Variable	Number	Percentage %	
Skills using the internet	Very poor	1	0.2
	Poor	16	3.6
	Average	164	37.3
	Good	207	47
	Very good	52	11.8
Time spent on the internet	Several times per day	247	56.1
	One time per day	165	37.5
	Once a week	15	3.4
	Sometimes in the month	13	3
	Never used	0	0
Location for internet access	Desktop at home	39	8.9
	Laptop	148	33.6
	Computer lab/Nursing school	0	0
	Internet café	1	0.2
Purposes of internet use	Smartphone	428	97.3
	Tablet or iPad	25	5.7
	Playing online games	50	11.4
	Gathering general information	257	58.4
	Gathering health-related information	271	61.6
	Study purposes	436	99.1
	Chatting	279	63.4
Study purposes for internet use	Access to social media	278	63.2
	Other	17	3.9
	Preparing for examination	171	39.2
	Preparing to attend classroom activities	62	14.2
	Doing assignment	401	92
	Making presentations in the class	107	24.5
	For patient care	123	28.2
Perception towards including IT as a co-subject in the nursing curriculum	Conducting research	38	8.7
	Improve health-related knowledge	317	72.7
	Other	16	3.7
	Not important at all	2	0.5
	Of little importance	6	1.4
	Of average importance	61	13.9
	Very important	223	50.7
Absolutely important	148	33.6	

categorised into three groups: several times per day, one time per day and not on a daily basis. Self-rated IT skills were categorised into two groups: good (average, good and very good) and poor (very poor and poor). Perception towards using the internet in health decision making was categorised into two groups: useful (useful and very useful) and not-useful (unsure, not useful and not useful at all). Perception towards using the internet in accessing health information was categorised into two groups: important (important and very important) and not important (unsure, not important and not important at all). The Mann-Whitney *U* test showed that eHealth literacy was significantly higher among respondents who rated IT skill as good ($p = 0.005$), perceived internet was useful in health decision making ($p = 0.009$), and perceived internet was important in accessing health information ($p = 0.001$) (Table 4).

4. Discussion

This study examined the eHealth literacy skills of nursing students in one of the Government Schools of Nursing in Sri Lanka. We found that nearly half of the sample reported adequate eHealth literacy skills (51.6%) indicating eHealth literacy skills still need to be improved. In a Sri Lankan study, Tissera and Silva (2017) found a fairly satisfactory

Table 3
Response frequencies for the items of eHEALS (n = 440).

Question	Strongly disagree N (%)	Disagree N (%)	Undecided N (%)	Agree N (%)	Strongly agree	Mean (± SD) based on item score
1 I know what health resources are available on the Internet	7 (1.6)	41 (9.3)	61 (13.9)	298 (67.7)	33 (7.5)	3.70 (0.801)
2 I know where to find helpful health resources on the Internet	5 (1.1)	59 (13.4)	113 (25.7)	242 (55)	21 (4.8)	3.49 (0.827)
3 I know how to find helpful health resources on the Internet	5 (1.1)	38 (8.6)	84 (19.1)	288 (65.5)	25 (5.7)	3.66 (0.762)
4 I know how to use the Internet to answer my questions about health	0 (0)	27 (6.1)	73 (16.6)	311 (70.7)	29 (6.6)	3.78 (0.655)
5 I know how to use the health information I find on the Internet to help me	3 (0.7)	27 (6.1)	88 (20)	292 (66.4)	30 (6.8)	3.73 (0.707)
6 I have the skills I need to evaluate the health resources I find on the Internet	5 (1.1)	73 (16.6)	145 (33)	203 (46.1)	14 (3.2)	3.34 (0.83)
7 I can tell high-quality health resources from low-quality health resources on the Internet	17 (3.9)	106 (24.1)	186 (43.2)	114 (25.9)	17 (3.9)	3.02 (0.9)
8 I feel confident in using information from the Internet to make health decisions	10 (2.3)	66 (15)	162 (36.8)	179 (40.7)	23 (5.2)	3.32 (0.871)

Table 4
Influencing factors of eHealth literacy of respondents (n = 440).

Variable	Need for education in functional disability care		
	Mean rank	M-WU/K-WH value	Sig.
Age ^a		9021.5	0.291
18–25 years	222.82		
26 and above	202.89		
Gender ^a		3215.15	0.075
Male	269.73		
Female	218.16		
Academic year ^b		5.200	0.074
First year	99.76		
Second year	77.67		
Third year	90.67		
Residency ^a		15,069.00	0.525
Living in the Western province	228.07		
Other parts of the country	218.55		
Time spent on the internet ^b		4.789	0.092
Several times per day	226.12		
One time per day	220.49		
Not daily basis	170.96		
IT as a subject in school period ^a		20,319.5	0.149
Yes	226.95		
No	208.75		
Self rated IT skills ^a		2466.5	0.005*
Good	223.17		
Poor	154.09		
Perception of using the internet in health decision making ^a		7551.5	0.009*
Useful	264.47		
Not useful	214.86		
Perception towards using the internet in accessing health information ^a		3837.5	0.001*
Important	226.14		
Not important	143.42		

^a Mann-Whitney Test.

^b Kruskal-Wallis Test.

* Statistical significance at *p*-value < 0.05.

level of eHealth literacy skills among third-year nursing students, and they showed relatively high mean score (30.8) compared to the mean score of the present study (28.02). In our study, we included students from the first to the third academic year, which could be the reason for the above mean difference. A moderate level of eHealth literacy skills was also reported in the Jordanian study (Tubaishat and Habiballah, 2016). Similar to our findings, recent literature reported nearly half of the nursing students held adequate eHealth literacy skills in South Korea (Park and Lee, 2015) and in a comparative study in the USA and South Korea (Park and Park, 2016). This comparative study showed a higher mean score among US students compared to South Korean

students (Park and Park, 2016).

Compared to our study, the high eHealth literacy skills among college students (Robb and Shellenbarger, 2014) and poor skills among health science students (Hanik and Stollefson, 2011) were also reported. Although university students are usually literate, the literature suggests that university students show inadequate skills to conduct advanced searches, evaluate the reliability of health-related websites or identify quality health resources (Ivanitskaya et al., 2006; Tubaishat and Habiballah, 2016). These inconsistent findings related to eHealth literacy skills of nursing and other health science students might be caused by the methods used in the assessment, the type of educational programs, the use of technology, prior education and factors related to socio-cultural context based on the geographical location.

Our study further reported poor skills in differentiating high-quality health resources from low-quality health resources, and using information from the internet to make health decisions, compared to skills in accessing and locating health resources on the internet. These results are consistent with previous studies (Park and Lee, 2015; Park and Park, 2016; Tissera and Silva, 2017; Tubaishat and Habiballah, 2016). Although the internet is rich with readily available information, it is difficult to assess the reliability and accuracy of that information (Arcury et al., 2018). It leads to difficulties in finding trusted information from the internet. If users have lacked the skills to engage in electronic health resources effectively, these resources provide little value to society (Norman and Skinner, 2006b). Students who will soon enter the health professions need to develop information competencies (Ivanitskaya et al., 2006), particularly skills in looking for valid and reliable health information in a web-based environment (Stollefson et al., 2011). As nurses perform a vital role in health education, they need to master eHealth literacy skills, because they have to improve the eHealth literacy skills of their clients by educating them about how to access eHealth information and how to identify credible and reliable information (Park and Lee, 2015). As our study reported poor eHealth literacy skills among half of the sample, specifically the lack of skills in finding credible information, the nursing education system in Sri Lanka needs to include teaching and learning strategies that focus on cultivating eHealth literacy skills among nursing students. These concepts need to be included in the nursing curricula. Furthermore, this study reported that none of the students uses the school resources to access the internet, indicating resource allocation, particularly computer and internet facilities within the learning environment for the students is a high priority.

Our study further reported that nursing students were frequent internet users and almost all the students used the internet for study purposes, for example, doing assignments, and improving health knowledge. Additionally, they used the internet in direct patient care and for social communication. These findings indicate that internet and mobile activities are very popular among nursing students, particularly in education, direct patient care and communication. Therefore,

eLearning and mLearning can be initiated for nursing students. Electronic and mobile technologies have many benefits in the health field, especially eHealth and mHealth interventions which can advance modern health care (Grady et al., 2018). These technologies are a very important source to address health inequalities by delivering tailored interventions with high fidelity at low cost (Grady et al., 2018). In Sri Lanka, the integration of these technologies into modern healthcare is still in the primary stage. Our study further reported that the internet skills of nursing students were good. Overall, one-third of students owned a laptop, while almost all students owned smartphones. Due to the high popularity of the internet and the use of mobile phones by nursing students, the results of this study support that the introduction of eHealth interventions/strategies is practical for nurse professionals.

We found that self-rated skills in the use of the internet of nursing students were high. The majority perceived that the internet was very important for accessing health information and making a health decision. These findings are in line with the results of previous studies (Park and Lee, 2015; Tubaishat and Habiballah, 2016), indicating nursing students have positive attitudes towards using the internet in health decision making. We further found that factors associated with eHealth literacy skills of nursing students were perception towards the importance of using the internet in accessing health information and health decision making, in addition to the self-rated skills in using the internet. Tubaishat and Habiballah (2016) also reported similar results among nursing students. In our study, there was no significant difference in eHealth literacy skills based on age, gender, academic year, residency, time spent on the internet or those who studied IT as a subject in school time, indicating the most important influencing factor in eHealth literacy skills was positive attitudes towards the internet use rather than the socio-demographic indicators. Positive attitudes towards using the internet in health predict the continuity of use of eHealth resources (Paige et al., 2018); therefore, the development of eHealth literacy skills and the introduction of eHealth interventions are feasible when students have positive attitudes towards using the internet in health. Consequently, the introduction of the above interventions for nursing professionals in Sri Lanka is timely.

4.1. Limitations of the study

There are several limitations of this study that could influence the results. This study was carried out in one nursing school. Therefore, findings could not be generalised to other settings. As we used the self-reported method to assess eHealth literacy skills, actual eHealth literacy skills may be different. Additionally, the use of Likert questions forces respondents to choose an answer rather than providing an open response.

5. Conclusion

This study examined eHealth literacy skills among the first year to third year nursing students from a selected Nursing School attached to the Ministry of Health, Sri Lanka. This study concludes that nearly half of the nursing students held inadequate eHealth literacy skills, particularly finding credible and reliable information. Students show adequate skills in using the internet, and they hold positive attitudes towards using the internet in accessing health information and health decision making. Positive attitudes towards the internet, particularly the use of the internet in healthcare are the main influencing factors for good eHealth literacy skills among nursing students. There is a need for the nursing curriculum to be reviewed with greater emphasis on how to include eHealth literacy concepts into the basic nursing curriculum.

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Conflicts of interest

There are no any competing interests related to the preparation of this manuscript.

Ethical approval

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References

- Arcury, T.A., Sandberg, J.C., Melius, K.P., Quandt, S.A., Leng, X., Latulipe, C., Bertoni, A.G., 2018. Older adult internet use and eHealth literacy. *J. Appl. Gerontol.* 1–20. <https://doi.org/10.1177/0733464818807468>.
- Ghasemi, A., Zahediasl, S., 2012. Normality tests for statistical analysis: a guide for non-statisticians. *International Journal of Endocrinology and Metabolism* 10 (2), 486–489. <https://doi.org/10.5812/ijem.3505>.
- Gilmour, J.A., 2007. Reducing disparities in the access and use of Internet health information. A discussion paper. *Int. J. Nurs. Stud.* 44 (7), 1270–1278. <https://doi.org/10.1016/j.ijnurstu.2006.05.007>.
- Grady, A., Yoong, S., Sutherland, R., Lee, H., Nathan, N., Wolfenden, L., 2018. Improving the public health impact of eHealth and mHealth interventions. *Aust. N. Z. J. Public Health* 42 (2), 118–119. <https://doi.org/10.1111/1753-6405.12771>.
- Hanik, B., Stollefson, M., 2011. E-health literacy competencies among undergraduate health education students: a preliminary study. *International Electronic Journal of Health Education* 14, 46–58.
- Ivanitskaya, L., O'Boyle, I., Casey, A.M., 2006. Health information literacy and competencies of information age students: results from the interactive online Research Readiness Self-Assessment (RRSA). *J. Med. Internet Res.* 8 (2), e6. <https://doi.org/10.2196/jmir.8.2.e6>.
- James, D.C., Harville, I.I.C., 2016. eHealth literacy, online help-seeking behavior, and willingness to participate in mhealth chronic disease research among African Americans, Florida, 2014–2015. *Prev. Chronic Dis.* 13. <https://doi.org/10.5888/pcd13.160210>.
- Kim, S.H., Son, Y.J., 2017. Relationships between eHealth literacy and health behaviors in Korean adults. *CIN: Computers, Informatics, Nursing* 35 (2), 84–90. <https://doi.org/10.1097/CIN.0000000000000255>.
- Kindig, D.A., Panzer, A.M., Nielsen-Bohlman, L., 2004. *Health Literacy: A Prescription to End Confusion*. National Academies Press.
- Mitsutake, S., Shibata, A., Ishii, K., Oka, K., 2012. Association of eHealth literacy with colorectal cancer knowledge and screening practice among internet users in Japan. *J. Med. Internet Res.* 14 (6) (E153). doi: [10.2196/jmir.1927: 10.2196/jmir.1927]).
- Norman, C.D., Skinner, H.A., 2006a. eHEALS: the eHealth literacy scale. *J. Med. Internet Res.* 8 (4), e27. <https://doi.org/10.2196/jmir.8.4.e27>.
- Norman, C.D., Skinner, H.A., 2006b. eHealth literacy: essential skills for consumer health in a networked world. *J. Med. Internet Res.* 8 (2), e9. <https://doi.org/10.2196/jmir.8.2.e9>.
- Paige, S.R., Stollefson, M., Krieger, J.L., Anderson-Lewis, C., Cheong, J., Stopka, C., 2018. Proposing a transactional model of eHealth literacy: concept analysis. *J. Med. Internet Res.* 20 (10), e10175. <https://doi.org/10.2196/10175>.
- Park, H., Lee, E., 2015. Self-reported eHealth literacy among undergraduate nursing students in South Korea: a pilot study. *Nurse Educ. Today* 35 (2), 408–413 (<http://dx.doi.org/10.1016/j.nedt.2014.10.022>).
- Park, H., 2016. eHealth literacy skills among undergraduate nursing students in the US and South Korea. *Nursing Informatics* 899–900. <https://doi.org/10.3233/978-1-61499-658-3-899>.
- Park, H., Moon, M., Baeg, J.H., 2014. Association of eHealth literacy with cancer information seeking and prior experience with cancer screening. *CIN - Computers Informatics Nursing* 32 (9), 458–463. <https://doi.org/10.1097/CIN.0000000000000077>.
- Rathnayake, S., Athukorala, Y., Siop, S., 2016. Attitudes toward and willingness to work with older people among undergraduate nursing students in a public university in Sri Lanka: a cross sectional study. *Nurse Educ. Today* 36, 439–444. <https://doi.org/10.1016/j.nedt.2015.10.007>.
- Richtering, S.S., Hyun, K., Neubeck, L., Coorey, G., Chalmers, J., Usherwood, T., Redfern, J., 2017. eHealth literacy: predictors in a population with moderate-to-high cardiovascular risk. *JMIR Human Factors* 4 (1). <https://doi.org/10.2196/humanfactors.6217>.
- Robb, M., Shellenbarger, T., 2014. Influential factors and perceptions of eHealth literacy among undergraduate college students. *Online Journal of Nursing Informatics* 18 (3), 1–8.
- Schulz, P.J., Fitzpatrick, M.A., Hess, A., Sudbury-Riley, L., Hartung, U., 2017. Effects of eHealth literacy on general practitioner consultations: a mediation analysis. *J. Med.*

- Internet Res. 19 (5). <https://doi.org/10.2196/jmir.6317>.
- Semasinghe, W., 2009. Social development of Sri Lanka: achievements and challenges. *Journal of Social Sciences–Sri Lanka* 1 (3), 282–308.
- Shamian, J., 2014. The role of nursing in health care. *Revista brasileira de enfermagem* 67 (6), 867–868 (<http://dx.doi.org/10.1590/0034-7167.2014670601>).
- Silber, D., 2003. The case for eHealth. In: Maastricht. European Institute of Public Administration, The Netherlands.
- Stellefson, M., Hanik, B., Chaney, B., Chaney, D., Tennant, B., Chavarria, E.A., 2011. eHealth literacy among college students: a systematic review with implications for eHealth education. *J. Med. Internet Res.* 13 (4), e102. <https://doi.org/10.2196/jmir.1703>.
- Tissera, S., Silva, N., 2017. Self-reported eHealth literacy among undergraduate nursing students in selected districts of Sri Lanka. *Stud Health Technol Inform* 245 (1339) (doi:10.3233/978-1-61499-830-3-1339).
- Tubaishat, A., Habiballah, L., 2016. eHealth literacy among undergraduate nursing students. *Nurse Educ. Today* 42, 47–52 (<http://dx.doi.org/10.1016/j.nedt.2016.04.003>).