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Assessing digital health literacy level among nurses in Jordanian hospitals

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ARTICLE INFO	ABSTRACT
	Nurses with a high level of digital health literacy (DHL) play a key role in providing high-quality patient care and promoting self-care activities. This study assessed DHL among nurses in Jordanian hospitals. A cross-sectional, descriptive study design was used. Data were collected targeting 238 nurses conveniently from both public and private hospitals. A standard pre-designed tool was used to collect DHL data composed of 21 questions divided into seven subscales, each one having three items. These subscales are operational skills, navigation skills, information searching, evaluating reliability, determining relevance, adding self-generated health content, and protecting privacy. Participants mostly achieved very desirable results in operational skills, information searching, and navigational skills, with a percentage of total scores of 82.5%, 90.6%, and 81.7%, respectively. None of the demographics were significantly different from the total DHL score (p>0.05). This study provides essential insight into healthcare professionals' DHL in Jordanian hospitals and their approach to seeking health information, determining relevancy and content, and maintaining privacy during the search for required information. Healthcare providers, including nurses, were at the frontlines in managing patients' information effectively. These results indicate that a program to promote DHL level and skills in healthcare providers would be useful. Policymakers, health educators and public health practitioners engaged in health literacy programs might use the results of this study for informed decision-making, as well as to improve and enhance DHL levels. **Keywords:** health literacy, nurses, computerization, Jordanian hospitals, navigation skills, operational skills, privacy, health information system

INTRODUCTION

Health literacy (HL) is a relatively new concept in health promotion, which has received attention due to its association with social determinants of health [1]. HL is an empowerment strategy that enables individuals to find the information they need, take charge of their health issues and accept responsibility for their actions [2]. With the rapid growth of health technology, HL is increasingly digitalized, which indicates that the primary role of patients and healthcare providers when managing health is easy to access reliable sources of information that correlate with effective communication between healthcare professionals and patients [3].

The negative impact of low HL among nurses is reported since the ability to learn, retain and utilize health information is greatly affected by HL and thus patient outcomes [4]. Nursing is the profession that is most lacking in knowledge, skills, and awareness about HL [5]. As patient advocates, nurses must join varying levels of HL among patients and their families to provide essential information about their care [6]. Also, lack of HL is recognized as a stronger predictor of poor health than age, income, employment, educational level, or race [7]. It has been found that people with inadequate HL have difficulty understanding labels and prescriptions, participating in medical decisions, following medical recommendations, and attending their follow-up appointments [8]. Individuals with inadequate or marginal HL have major challenges with poor self-care behaviors and receive fewer preventive measures, leading to increase causes of mortality [9].

In the context of technology or electronic information sources, digital health literacy (DHL) is known as the expansion of HL to comprehend and solve any health condition [10]. Effective and equitable digital health transformation has many benefits including greater access capacity, improved quality of care, health-promoting activities–such as the prevention and treatment of chronic diseases–and an increase in procedural health knowledge [11, 12]. Finding, evaluating, appraising, integrating, and using health information from electronic sources are only a few of the specific skills that DHL demands [13]. DHL requires healthcare providers to be familiar with the concept of digital health and to have the skills to teach relevant concepts and skills to patients effectively [14]. In the study [15], which investigating the e-health literacy of nursing students in Jordan, students were found to have a moderate level of self-perceived e-health literacy. However, the same study reported that the nursing students were unable to evaluate the resources and could not differentiate between high- and low-quality resources of information [15].

In all contemporary technological civilizations, DHL is essential due to the quick changes in the information landscape resulting from websites and social media [16, 17]. Healthcare professionals, including nurses, play a key role in developing the desired level of HL among patients [18]. To facilitate patients' and patients' families' access, nurses must be aware of the health information sites and capable of evaluating pertinent information effectively [19].

Additionally, nurses must have the basic skills and strategies for using the Internet and DHL and be able to evaluate the reliability of these resources [20]. For example, the study [3] in southern Iran assessed the level of DHL among healthcare workers including physicians, health information technologists, nurses, radiologists, and laboratory and pharmacy workers. The results indicated that healthcare providers had a desirable level of health transformation and desirable and very desirable levels of skill in terms of protecting privacy, operational skills, navigational skills, information searching, adding content, determining data relevance and evaluating data reliability. In addition, there was a significant relationship between healthcare workers' DHL and their level of education and job classification [3].

Nurses' knowledge of DHL is one of the most crucial variables in fostering patients' DHL [11]. By adopting effective online search techniques and encouraging improved staff collaborations when providing treatment, healthcare professionals with high DHL levels are better able to easily access reliable health data, which helps them make better health-related decisions [21]. Therefore, nurses must understand how to use the Internet and assess the reliability and trustworthiness of any sites they use effectively [5], as they are the frontline in managing complex patient situations and have significant potential to advance the profession in practice, education, administration, and policy [22].

HL and DHL are regarded as an emerging topics of investigation due to the complexity of health systems. Therefore, adequate HL is necessary to deal with complicated health information [3]. Considering the role of DHL in healthcare professionals in improving health outcomes, minimizing the time required to refer to a healthcare provider, managing the patient's clinical symptoms, and monitoring the patient's diet and other behaviors [23], assessing DHL level among nurses is a requirement to obtain baseline data about nurses technological skills in managing patient's information. Some studies that examined DHL among healthcare workers found inadequate electronic HL, such as planning to promote health-behavioral activities and self-management [24, 25]. However, little is known about the level of DHL of nurses working in Jordanian hospitals. Hence, the purpose of this study was to evaluate the level of DHL among Jordanian nurses.

MATERIALS AND METHOD

Design

A cross-sectional, descriptive study design was used in this study.

Sample and Sampling

A total of 238 nurses participated in the study. All nurses were employed in the selected hospitals, held a nursing bachelor's, diploma, and higher educational degrees, worked directly with the patients, and agreed to participate in this study. Non-nursing healthcare workers were excluded from the study. A relatively large sample size was chosen since the concept of HL is a new concept that needs an investigation if it is an empowerment strategy for nurses to locate the correct information and to help the patients achieve their best self-management strategies. Participants were recruited using a convenience sampling technique. The data was collected by preparing an electronic questionnaire through a specialized Internet website-Google forum (via docs.google.com/form). This e-questionnaire enabled the participants to review and answer the questionnaires more conveniently. A timeframe was set for participation in filling out the questionnaire for two weeks. After the expiration of the period, the form was deactivated.

Settings

The study was conducted in public and private hospitals in both the northern and middle regions of the country, including Amman, Irbid, and Al-Mafraq cities. Data were collected from five hospitals, two were private hospitals with a capacity of 55 and 120 beds, respectively. The other hospitals were public hospitals; the first hospital was the teaching hospital in North Jordan. The remaining two teaching hospitals serve the adult population with bed capacities of 86.0% and 70.0%, respectively, and are located in Irbid City [26].

Instruments

A standard pre-designed questionnaire for assessing DHL was used for this study [11]. This questionnaire was designed to assess DHL and has been previously validated in different populations and countries [3, 27]. The questionnaire is composed of two parts; the first contains socio-demographic variables including sex, age, educational level, work experience, and hospital. The second part consists of 21 questions divided into seven subscales, each one having three items. These subscales are operational skills (use the keyboard of a computer or a mouse, use the buttons or links and hyperlinks on websites), navigation skills (lose track of a website or the Internet, know how to return to a previous page, click on something and get to see something different than expected), information searching (make a choice from all the information found, use the proper words or search query to find the information looking for, find the exact information looking for), evaluating reliability (decide whether the information is reliable or not, decide whether the information is written with commercial interests, check different websites to see whether they provide the same information, determining relevance (to decide if the information found is applicable, apply the information found in daily life, to use the information found to make decisions about health), adding self-generated health content (clearly formulate question or health-related worry, express opinion, thoughts or feelings in writing, write message), and protecting privacy (find it difficult to judge who can read along, share private information, share some else's private information).

A four-point Likert scale with response options ranging from "very difficult"=1 to "very easy"=4 is used to rate items within the following subscales: operational skills, searching for information, evaluating reliability, determining relevance, and adding health content. However, navigational skills and preserving privacy subscales are rated on a four-point scale

Table 1. Sample demographic characteristics (n=238)

Category	M (SD)	Frequency (%)
Gender		
Male		63 (26.5)
Female		175 (73.5)
Age		
20-30		88 (37.0)
31-40		111 (46.6)
>40		39 (16.4)
Clinical experience (years)	8.66 (7.19)	
Education level		
Diploma		27 (11.3)
Baccalaureate		179 (75.2)
Higher education		32 (13.5)
Hospital type		
Public		108 (45.4)
Private		130 (54.6)

(from "never"=1 to "always"=4). The total score for each subscale is calculated by adding the scores and averaging them. For an average of less than 20.0% of the total score, the skill would be assessed as very undesirable; between 21.0% and 40.0% the skill would be undesirable; 41.0% to 60.0% as average; between 61.0% and 80.0% as desirable; and between 81.0% and 100.0% would be considered very desirable [3].

DHL tool was used in several studies, which showed that Cronbach alpha=0.87 revealing acceptable reliability [3, 11]. Besides, Cronbach's alpha=.803 in the current study for the studies items, which is showing an acceptable reliability. The English version of the tool was used in the data collection.

Data Analysis

Completed questionnaires were coded, and then the data were analyzed using the statistical package for the social science version 26. Descriptive statistics, such as means, frequencies, standard deviation, frequencies, and percentages, were used to summarise sample characteristics and the total score for subscales. To examine the difference in the mean score of HL for participants' characteristics, Mann-Whitney U and Kruskal-Wallis tests were conducted. Finally, Spearman's correlation coefficient was used to explore the relationship between continuous variables.

RESULTS

Demographical Characteristics

A total of 238 nurses completed the questionnaires. The majority were female (73.5%), aged between 31 and 40 years, with an average of 8.66 (standard deviation [SD]=7.2) years of experience. Most of the nurses had bachelor's degrees (n=179, 75.2%) and were working in private hospitals (n=130, 45.4%) (**Table 1**).

Digital Health Literacy Domains

The percentages of the total score in each subscale are presented in **Table 2**. The total score of the questionnaire was 84. Nurses mostly achieved very desirable results in operational skills (mean [M]=96.2, SD=11.7), information searching (M=94.4, SD=15.8), and navigational skills (M=52.8, SD=14.3) with a percentage of total scores of 82.5%, 90.6%, and 81.7%, respectively. Evaluating data reliability (M=71.5, SD=28.1), determining data relevancy (M=78.1, SD=15.8), and adding content (M=76.8, SD=18.5) produced desirable results of 66.5%, 68.5%, and 78.5%, respectively. However, protecting privacy (M=44.7, SD=16.2) was within average, reaching a value of 55.3%.

Comparing Total Scores of Digital Health Literacy With Gender and Type of Hospital

Data were not normally distributed, and they were skewed to the right as evidenced by examining the histogram for the total score. The normality tests were significant (p<.05), therefore, the null hypothesis that the data was not normally distributed was accepted. Hence, non-parametric tests (Mann-Whitney U test) were used to examine the mean difference between gender and type of hospital for the total score of DHL. No significant difference was found in the mean rank of the total score either for gender (U=5154.5, p=.483) or type of hospital (U=6483.5, p=.358). **Table 3** details the results of the Mann-Whitney U test.

Total Scores Digital Health Literacy With Age and Educational Level

Kruskal-Wallis test was conducted to assess the differences in the mean rank of the total score of nurses' age and educational level. No significant differences were found between the mean rank of the total score for HL, nurses age ($\chi^2[2]$=.350, p=.839), and educational level ($\chi^2[2]$=.608, p=.738) (**Table 4**).

Correlation Between Digital Health Literacy and Years of Experience

Spearman's correlation was computed to assess the relationship between years of experience and total scores of DHL. There was no significant correlation between the two variables (r=0.014, p=.825).

DISCUSSION

With information technology, DHL is the key component for empowering patients and nursing staff in self-care and improving the quality of nursing care [3]. Healthcare workers are one of the primary sources of information for the general public, particularly the nursing staff.

Table 2. Domains of digital health literacy questionnaire of nurses (n=238)

Variable	Percentage of domain total score	Mean [35]	Situation
Operational skills	82.5	96.2 (11.7)	Very desirable
Information searching	90.6	94.4 (15.8)	Very desirable
Evaluation data reliability	66.5	71.5 (28.1)	Desirable
Determining data relevancy	68.5	78.1 (15.8)	Desirable
Navigation skills	81.7	52.8 (14.3)	Very desirable
Adding content	78.5	76.8 (18.5)	Desirable
Protecting privacy	55.3	44.7 (16.2)	Average

Table 3. Mann-Whitney U test to compare total scores digital health literacy with gender & hospital type (n=237)

Item	Sub-item	Mean rank	Mann Whitney U test	p-value
Gender	Male	63.0	5,154.5	.483
	Female	174.0		
Hospital type	Public	114.5	6,483.5	.358
	Private	122.7		

Table 4. Kruskal-Wallis test to compare total scores digital health literacy with age & educational level

Item	Sub-item	Mean rank	Kruskal-Wallis test	p-value
Age	20-30	120.3	.350	.839
	31-40	120.1		
	>40	113.1		
Educational level	Diploma	127.9	.608	.738
	Bsc	117.3		
	Higher education	121.3		

Therefore, nurses' HL is a crucial component of the management system, which has a large impact on the management of patient relationships with high-quality nursing care [28]. Modern nursing care focus on the holistic aspects of patient care that improve the concept of patient centered-care that could be improved through adopting the best health strategies for improving DHL [29]. However, the findings of the current study provide essential aspects of nursing professional characteristics and patient outcomes.

This study demonstrated that the level of DHL among nurses in Jordanian hospitals was very desirable in terms of operational and navigational skills and information searching, which was consistent with the study [3], that was conducted in Zahedan City in five hospitals including 375 healthcare workers, which reported that healthcare workers had very desirable results for operational skills related to the use of computers and webpage sources. Navigational skills refer to the correct orientation of webpage sources to find the appropriate information. The results for navigational skills in the current study were very desirable as the nurses in Jordanian hospitals had great potential for improving patients' self-care [30]. This result was consistent with a study that assessed the attitude of healthcare workers toward information systems and included 407 respondents and found high digital literacy among staff members [31], and a positive attitude toward digital information systems. Also, it was reported that poor HL among nurses could adversely affect the safety and quality of patient care due to poor engagement in the information system.

This study found a desirable level of DHL in evaluating the reliability and validity of the information on webpages and other healthcare information devices, determining the relevance and usefulness of the data in a clinical context, and using the content to formulate the text messages and express opinion, feelings, thoughts and share this with patients in a comprehensible way. These results were consistent with the results of the study [3], which found desirable results for healthcare workers in adding content, determining data relevancy, and evaluating data reliability. These results were also consistent with the study [32], which was aimed at evaluating the level of DHL among information technologists and healthcare specialists. The study recruited 113 healthcare workers from two German universities who reported that only a few individuals from the healthcare fields had low HL. This discrepancy in the results could be related to the use of different scales to measure DHL and also the different health populations from different healthcare sectors.

The last item, which is related to the protection of patient's privacy while accessing health information systems, was found to be average. This result was inconsistent with the study [3], which found that protecting privacy was a very desirable result, considering the major challenges and the sensitivity of this issue in any healthcare institution. Facilitating healthcare access to information is a professional skill to protect patients' privacy, which is an essential prerequisite for healthcare workers and will improve patient quality of care. This study found that protecting privacy could be related to a defect in the electronic system or the lack of knowledge about the crucial aspects of this item. Therefore, it is necessary to consider strategies to improve DHL of nurses regarding the protection of patient privacy.

No significant association with the level of DHL total scores were found for age, gender, hospital type, educational level, and years of experience. These findings were inconsistent with the study [3], which found that the total level of DHL was strongly affected by educational level and job category–healthcare workers with a diploma had a lower DHL level compared with healthcare professionals with a bachelor's degree or higher educational level. It was also found that paramedics and radiologists had a lower level of DHL compared with physicians and nurses, which could be explained by the direct nature of their role in caring for the patients and using the digital health system to provide care. Also, other studies have found educational level and years of experience revealed as strong predictors in determining the level of DHL [25, 33, 34].

Additionally, these results were inconsistent with the study [26], which found a strong correlation between electronic HL and age: a better level of HL was demonstrated with increased age. Hospital type was also significantly correlated with DHL: the largest hospitals had a lower level of DHL as they do not have sufficient time to update their information due to the large numbers of referrals received for patients.

Limitations

The results of the current study need to be interpreted with consideration for the following limitations. Firstly, the sample size was relatively small, and the non-experimental cross-sectional research design may restrict the study's generalisability. Secondly, the level of DHL in the current study was evaluated using a self-reported tool assessment, so future studies should use performance-based evaluation criteria to evaluate the actual level of DHL among nurses.

Clinical Implications

The following implications could be applied based on the findings of the current study

(1) improve DHL competencies among nurses and nursing students using various digital tools in healthcare institutions,

(2) conducting training courses to improve DHL competencies by utilizing critical thinking skills, and

(3) mediating the role of DHL with other factors.

CONCLUSIONS

The current research was conducted to assess DHL among nurses in Jordanian hospitals. This study provides essential insight into nurses' DHL. Modern nursing care highlighted the patient as a holistic person that should be cared for from all aspects. This concept improves patient-centered care strategies by adopting the best health strategies for improving DHL.

Although the level of nurses' overall HL was found to be at the desired level, participants were relatively far from achieving the very desirable or desirable levels in the categories related to protecting privacy. Healthcare providers, including nurses, were frontlines in managing patients' information effectively. Based on this research, it is suggested that a program to promote DHL level and skills should be implemented. Policymakers, health educators and public health practitioners engaged in HL programs might use the results of this study for informed decision-making, as well as to improve and enhance DHL levels. HL requires individual and system preparedness to resolve complex real-life issues to acquire necessary health information and adopt protective behaviors.

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