

INTERNET USE, ONLINE HEALTH INFORMATION SEEKING BEHAVIOR AND ELECTRONIC HEALTH LITERACY AMONG DENTAL AUXILIARY PERSONNEL IN MALAYSIA

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Abstract. Dental auxiliary personnel are a source of health information for their customers, so they need to be able to access appropriate health information in a timely manner through the internet (eHealth literacy). In this study we aimed to determine the online health information-seeking behavior, eHealth literacy, and factors associated with eHealth literacy among dental auxiliary personnel (dental therapists, dental technologists and dental surgery assistants) in Pahang, Malaysia in order to determine if this group is prepared to educate their patients appropriately. The study was conducted during February-April 2021. Study subjects were randomly sampled from all working government dental auxiliary personnel in the study area during the study period and asked to participate in the study. Those on maternity or sick leave were excluded from the study. The minimum number of study subjects determined to be needed for the study was 358. An additional 98 subjects were included to cover for missing information. Each study subject was asked to complete an online questionnaire asking about demographic data, internet access and use, online health-seeking behavior, perceived overall and oral health and an eHealth Literacy Scale (eHEALS) study instrument evaluating eHealth literacy. The completed instrument had a possible score of 8-40 points. For the purpose of this study, a score ≥ 26 was defined as the subject having good health literacy and < 26 as having poor health literacy. Data were analyzed using descriptive, ANOVA and Kruskal-Wallis tests. A total of 456 subjects completed the study instrument and were included in the study: 76.3% ($n = 348$) female. The mean (\pm standard deviation (SD)) age of study subjects were 36.3 (± 7.6) years. The subjects were comprised of 53.5% ($n = 244$) dental surgery assistants, 31.1% ($n = 142$) dental therapists and 15.4% ($n = 70$) dental technologists. About half (55.9%) of subjects ($n = 255$) obtained their health information from other sources while the others obtained their

health information through the internet and social media. The mean (\pm SD) eHealth literacy score among study subjects was 30.5 (\pm 3.9), which overall was considered to have good health literacy. Only 8.8% of subjects ($n = 40$) had poor eHealth literacy and 91.2% ($n = 416$) had good eHealth literacy. Some 11.6% of subjects ($n = 53$) lacked confidence in using online health information, 31.1% ($n = 142$) lacked skills in evaluating online health information and 5.9% ($n = 27$) had difficulty determining quality of online health resources. The factors significantly associated with good eHealth literacy (≥ 26) were frequently searching the internet for health information ($p < 0.001$), the perception of the subject they had good health ($p = 0.003$) and the perception of the subject they had good oral health ($p = 0.023$). In summary, the proportion of subjects with good eHealth literacy in our study was high and was related to perceptions about their own overall and dental health. However, there is a need for eHealth literacy training in the study population to improve their ability to be a source for health information for their patients, especially among those who perceive their own overall health, and their dental health is not adequate. Further studies are needed to determine what type of program is necessary to improve this deficiency.

Keywords: health literacy, eHEALS, health information, health-seeking behavior, internet, dental auxiliaries

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INTRODUCTION

The internet allows easy access to information, products and services. In 2016, there were 24.6 million registered internet users in Malaysia and by 2018 this number had increased to 28.7 million users; an estimated 85% of Malaysians use the internet to access information and media (MCMC, 2018). Unlike traditional health literacy, internet obtained health information (eHealth) literacy requires

the users to know how to access appropriate health information on the internet. Norman and Skinner (2006) defined eHealth literacy as the *“ability to seek, understand and appraise health information from electronic sources and apply the knowledge gained to address or solve a health problem”*.

Relying on the internet for health information can be challenging since the quality and accuracy of the information accessed may not be reliable on all websites and may even

contain misinformation (Lewandowsky *et al*, 2012). Misinformation can lead to incorrect beliefs and even unhealthy behavior as seen with misinformation about some infectious diseases and vaccines used to prevent them (Wang *et al*, 2019). Better eHealth literacy leads to better online health information acquisition and healthy decisions and behavior (Mazlan *et al*, 2021). A previous study found good eHealth literacy was associated with better health behavior among nurses and health workers which is necessary for their own health outcomes and even the health behavior of their patients (Cho *et al*, 2018).

In the Malaysian government healthcare setting, dental auxiliary personnel are divided into three groups: dental therapists, dental technologists, and dental surgery assistants (Nor *et al*, 2013). Unlike the private sector, government dental auxiliary personnel are employed by the Public Service Department and registered with respective allied health bodies. Part of their duty is to provide oral health education to patients. Dental therapists often treat school aged children and dental surgery assistants assist dentists in the clinic and in oral health promotion activities (Nor *et al*, 2013). They are the primary oral health persons encountered when people seek dental services. Dental technologists design and construct appliances in the laboratory and their other duties include providing

technical support and purchasing dental supplies and equipment, requiring them to be up to date on the latest dental health treatments (Public Service Department Malaysia, 2020). Due to their duties, it is important for dental auxiliary personnel in Malaysia to have acceptable eHealth literacy. Poor eHealth literacy may result in obtaining misinformation and influence their own health behaviour and health education of the public (Lewandowsky *et al*, 2012; Vogel, 2017).

The ability to access health information is not enough. Those who are eHealth literate need the skill to find, use and evaluate these appropriate resources and distinguish misinformation from truth and then educate the public. Dental auxiliary personnel need eHealth literacy to stay up to date in their field. They need to know what kind of information and sources are being accessed by the public in order to guide the population in obtaining correct and adequate health information.

The prevalence of good eHealth literacy among dental auxiliary personnel in Malaysia is unclear. In this study we aimed to determine the online health information-seeking behavior, eHealth literacy and factors associated with eHealth literacy among dental auxiliary personnel (dental therapists, dental technologists, and dental surgery assistants) in Pahang, Malaysia in order to determine if this group is prepared to educate their patients appropriately.

MATERIALS AND METHODS

Study location

We conducted this cross-sectional study among dental auxiliary personnel (dental therapists, dental surgery assistants and dental technologists) working in government dental clinics in Pahang, Malaysia during February-April 2021. Government dental auxiliary personnel were chosen because their roles are broader than those in the private sector and involve public education. Pahang state was selected for the study area because it is the largest state in Peninsula Malaysia, consisting of 11 districts and varies geographically.

Study design and participant recruitment

The minimum number of subjects determined to be necessary for the study was calculated using a single population proportion formula with a finite population correction (Naing *et al*, 2006) and determined to be 358. Study subjects were randomly sampled from all working government dental auxiliary personnel in the study area during the study period and asked to participate in the study. Those on maternity or sick leave were excluded from the study.

Subjects were divided into 3 groups: dental therapists, dental surgery assistants and dental technologists and subjects from each group were randomly recruited from each of the

11 districts in Pahang State until the number of subjects needed for the study was obtained.

This study was approved by the Medical Ethics Committee, Faculty of Dentistry, Universiti Malaya [DFC02019/145(P)] and the Medical Research and Ethics Committee, Ministry of Health, Malaysia [NMMR-20-2865-57275(IIR)]. Permission to conduct the study was obtained from the Oral Health Program, Ministry of Health Malaysia, Pahang State Health Department, and District Dental Department. Informed consent was obtained from all study subjects prior to inclusion in the study. No personally identifiable information was obtained from the study subjects.

Study instrument

Each subject was asked to complete two online questionnaires: the first questionnaire asked about sociodemographic data, internet access and use, online health-seeking behavior and subject perceived health status and consisted of two items on a 4-point Likert scale ranging from 1 (poor) to 4 (excellent). The second questionnaire was the eHealth Literacy Scale (eHEALS) instrument (Norman and Skinner, 2006) assessing eHealth literacy and consisted of eight items measured using a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) with a total score range of 8-40. The eHEALS focuses on how to search, appraise, utilize,

and integrate information gained from the internet. The eHEALS was modified from a previously tested version (Shiferaw and Mehari, 2019). The questionnaire was forward and backward translated from English to Malay by two independent translators. The instrument was then reviewed by 2 public health dental specialists for validation. The instrument was then pilot tested on 25 dental auxiliary personnel not involved in the main study giving a Cronbach's alpha of 0.89.

Data analysis

Data collected were analyzed using the Statistical Package for Social Sciences (SPSS) version 26 (IBM Corporation, Somers, NY). Descriptive and categorical data were summarized using frequencies and percentages. The eHEALS scores were reported as means \pm standard deviations (SD). For this study, good eHealth literacy was determined to be an eHEALS score of ≥ 26 and poor eHealth literacy as a score of < 26 (Velazquez-Pimentel *et al*, 2019). We used the Chi-square test and independent t-test to examine categorical variables and the One-way ANOVA and Kruskal-Wallis tests to determine significant associations between selected sociodemographic characteristics and internet use and the mean eHEALS score. We also used correlation analysis to identify factors significantly associated with eHealth literacy. A p -value < 0.05 was considered statistically significant.

RESULTS

Demographics

A total of 456 subjects were included in the study: 76.3% ($n = 348$) was female. The mean (\pm SD) age of study subjects was 36.3 (± 7.6) years. About half (53.5%) of the subjects ($n = 244$) were dental surgery assistants, 15.4% ($n = 70$) were dental technologists and 31.1% ($n = 142$) were dental therapists. Almost half (49.8%) of the subjects ($n = 227$) had a basic training certificate and 49.3% ($n = 225$) had a diploma, while the remaining 0.9% ($n = 4$) had a degree.

Only 8.8% of subjects ($n = 40$) had poor eHealth literacy and 91.2% ($n = 416$) had good eHealth literacy.

One hundred percent of subjects ($n = 456$) reported having internet access, 57.2% ($n = 261$) used smartphones, and the remaining 0.7% ($n = 3$) used laptop, desktop or tablets to access it. Up to 42.1% ($n = 192$) used more than 2 devices for internet access. Almost two-third (62.9%) of subjects ($n = 287$) actively sought health information on the internet and 23.5% ($n = 107$) sought it on social media.

Up to 61.8% of subjects ($n = 282$) perceived they had good overall health and 56.6% ($n = 258$) perceived they had good oral health (Table 1).

eHealth Literacy

The mean (\pm SD) eHealth literacy

Table 1

Study subject socio-demographics, internet use and perceived health status

Variable	Poor eHealth literacy (N = 40) <i>n</i> (%)	Good eHealth literacy (N = 40) <i>n</i> (%)	<i>p</i> -values*
Gender			0.566
Male	8 (20.0)	100 (24.0)	
Female	32 (80.0)	316 (76.0)	
Occupation			0.639
Dental technologist	6 (15.0)	64 (15.4)	
Dental surgery assistant	26 (65.0)	218 (52.4)	
Dental therapist	8 (20.0)	134 (32.2)	
Education level			0.059
Certificate	27 (67.5)	200 (48.1)	
Diploma	13 (32.5)	212 (50.9)	
Degree	0 (0.0)	4 (1.0)	
Monthly household income in MYR			0.725
<MYR 2,500	6 (15.0)	63 (15.2)	
MYR 2,501-3,170	0 (0.0)	0 (0.0)	
MYR 3,171-3,970	0 (0.0)	0 (0.0)	
MYR 3,971-4,850	7 (17.5)	53 (12.7)	
MYR 4,851-5,880	6 (15.0)	49 (11.8)	
>MYR 5,880	21 (52.5)	251 (60.3)	
Devices used to access the internet			0.117
Smart phone	29 (72.5)	232 (55.8)	
Laptop/desktop/tablet	0 (0.0)	3 (0.7)	
>2 devices	11 (27.5)	181 (43.5)	

Table 1 (cont)

Variable	Poor eHealth literacy (N = 40) n (%)	Good eHealth literacy (N = 40) n (%)	p-values*
Hours spent on the internet per day			0.853
1 - 4	25 (62.5)	224 (53.8)	
5 - 8	9 (22.5)	123 (29.6)	
9 - 12	4 (10.0)	51 (12.2)	
13 - 18	1(2.5)	8 (1.9)	
>18	1 (2.5)	10 (2.4)	
Frequency of using the internet to search for health information			<0.001
Never/seldom	8 (20.0)	21 (5.1)	
Sometimes	17 (42.5)	123 (29.6)	
Usually	13 (32.5)	138 (33.2)	
Frequently	2 (5.0)	134 (32.2)	
Source of health information			0.060
Internet search engine	14 (35)	80 (19.2)	
Social media	7(17.5)	100 (24.0)	
Official health organization website	0 (0.0)	0 (0.0)	
Health personnel (doctor, dentist)	19 (47.5)	236 (56.7)	
Does internet information affect health decisions?			<0.001
No	21 (52.5)	69 (16.6)	
Yes	19 (47.5)	347 (83.4)	
Previously suggested a website to a patient?			<0.001
No	29 (72.5)	182 (43.8)	
Yes	11 (27.5)	234 (56.3)	

Table 1 (cont)

Variable	Poor eHealth literacy (N = 40) <i>n</i> (%)	Good eHealth literacy (N = 40) <i>n</i> (%)	<i>p</i> -values*
Is internet information trustable?			0.001
No	6 (15.0)	14 (3.4)	
Yes	34 (85.0)	402 (96.6)	
Self-perceived health status			0.003
Poor	3 (7.5)	6 (1.4)	
Satisfactory	4 (10.0)	77 (18.5)	
Good	31 (7.8)	251 (60.3)	
Very good	2 (5.0)	82 (19.7)	
Self- perceived oral health status			0.023
Poor	1(2.5)	1 (0.2)	
Satisfactory	3 (7.5)	58 (13.9)	
Good	29 (7.3)	229 (55.1)	
Very good	7 (17.5)	128 (30.8)	

MYR: Malaysian Ringgit (USD1.00 = MYR4.40)

**p*-value for association with good eHealth literacy

Poor eHealth literacy is when eHealth Literacy Scale score (eHEALS) <26 while Good eHealth literacy is when eHEALS ≥26

level among study subjects overall was 30.5 (±3.9), which is considered good. Five of the questions on the eHEALS instrument were answered by >80% of the subjects as being in total agreement. The eHEALS statement with the highest percentage of subjects who had total agreement (89.3%; *n* = 407) was: "I know how to use the internet to answer my questions about health". The eHEALS statement

in which the greatest percentage of subjects (11.6%) had total disagreement (*n* = 53) was: "I feel confident in using information from the internet to make health decisions". The eHEALS statement with the highest percentage of subjects who answered they were unsure (31.1%, *n* = 142) was "I can tell good quality health resources from poor quality health resources on the internet" (Fig 1).

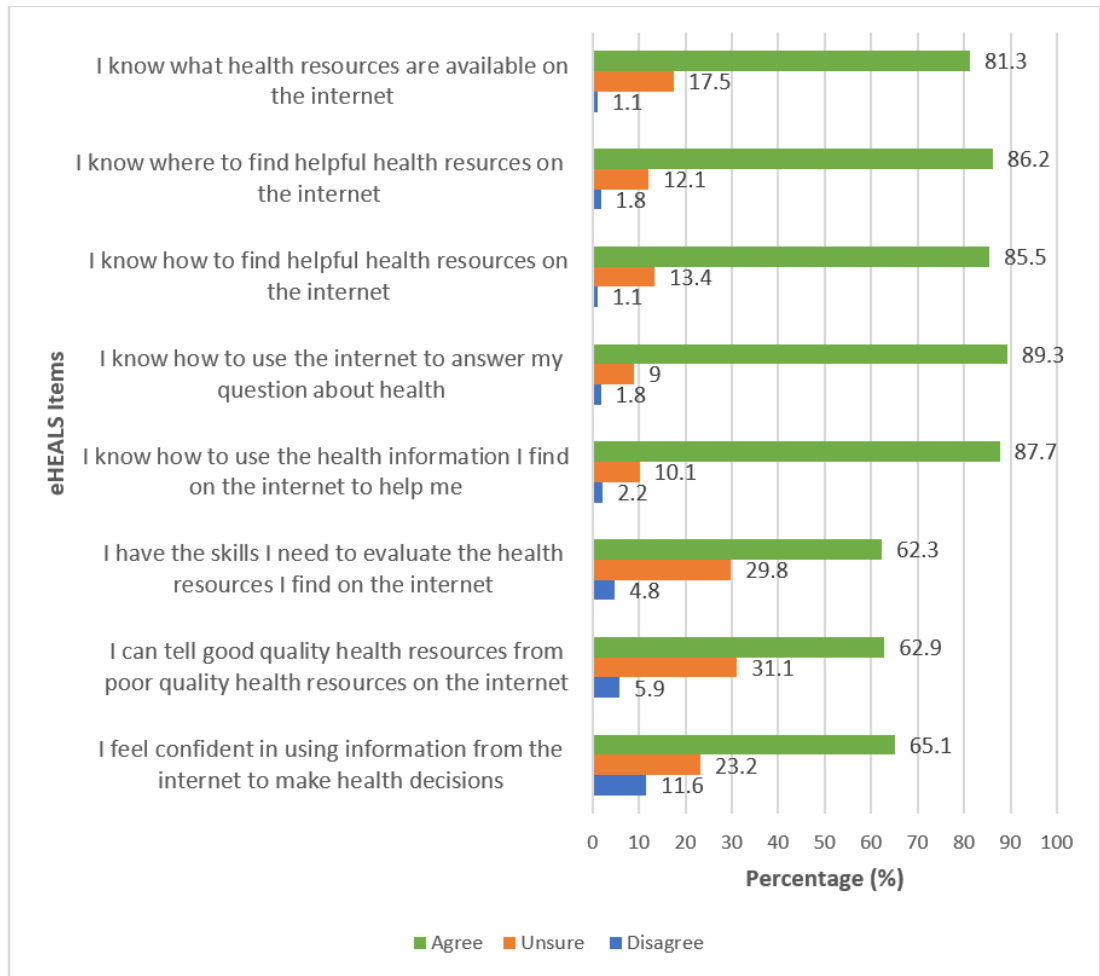


Fig 1 - Percentage of responses to an individual item of eHEALS
eHEALS: eHealth Literacy Scale

Association between level of eHealth literacy and sociodemographic characteristics

The factors significantly associated with having good eHealth literacy were frequently using the internet to

obtain health information ($p<0.001$), trusting the information on the internet ($p=0.001$), having previously suggested a website to a patient ($p<0.001$), having self-perceived good overall health ($p=0.003$) and

self-perceived good oral health ($p=0.023$) (Table 1). The mean (\pm SD) eHealth literacy score among participants was 31.3 (\pm 3.8) for dental therapists, 30.2 (\pm 4.2) for dental surgery assistants and 30.2 (\pm 3.2) for dental technologists. The mean (\pm SD) eHealth literacy score among those with a diploma (31.1 ± 3.7) was significantly ($p=0.003$) higher than among those with a certificate (29.9 ± 4.07) (Table 2).

eHealth literacy and online health-seeking behavior

There were significant positive associations between 1) a good eHealth literacy score and regularly accessing health information platforms ($p=0.02$) and between 2) a good eHealth literacy score and frequently using the internet to search for health information ($p<0.001$) (Table 3).

Table 2
Mean eHEALS score by job, income and education level

Variables	eHEALS scores (mean \pm SD)	<i>p</i> -value
Job		
Dental technologist	30.2 \pm 3.2	0.021
Dental surgery assistant	30.2 \pm 4.2	
Dental therapist	31.3 \pm 3.8	
Monthly household income in MYR		
<2,500	30.7 \pm 4.6	0.541
3,971-4,850	29.9 \pm 4.4	
4,851-5,880	30.4 \pm 3.8	
>5,881	30.7 \pm 3.7	
Education		
Certificate	29.9 \pm 4.1	0.003
Diploma	31.1 \pm 3.7	
Degree	32.5 \pm 3.0	

eHEALS: eHealth Literacy Scale; MYR: Malaysian Ringgit (USD1.00 = MYR4.40); SD: standard deviation

Table 3

Association between selected variables and the eHEALS results

Variables	eHEALS scores (mean \pm SD)	<i>p</i> -value	Correlation coefficient	Sig (2-tailed)
Source of health information				
Search engines	29.5 \pm 3.8	0.02	0.216	0.000
Social media	30.7 \pm 3.9			
Healthcare personnel (doctor/ dentist)	30.8 \pm 3.9			
Frequency of using the internet to search for health information				
Never/seldom	28.4 \pm 1.0	0.000	0.125	0.008
Sometimes	29.8 \pm 0.3			
Usually	30.5 \pm 0.3			
Frequently	31.8 \pm 0.3			

eHEALS: eHealth Literacy Scale; SD: standard deviation; Sig: significant

The mean (\pm SD) eHEALS score was significantly ($p=0.02$) higher among subjects who obtained information from healthcare personnel (30.8 \pm 3.9) than from the internet (29.5 \pm 3.8). The lowest mean (\pm SD) eHealth literacy score was among those who answered they never or seldom searched for health information online (28.4 \pm 1.0) and the highest eHealth literacy score was among those who answered they frequently searched for health information online (31.8 \pm 0.2).

eHealth literacy and self-perceived health status

We found significant positive associations between a good mean

eHealth literacy score and having good self-rated health ($p<0.001$) and between having a good mean eHealth literacy score and having good self-rated oral health ($p<0.001$). A higher mean (\pm SD) eHealth literacy score was seen among those who perceived themselves as having good overall health (32.5 \pm 3.5) and very good oral health (31.8 \pm 4.2) than those who perceived themselves as having poor overall health (26.8 \pm 5.6) and poor oral health (23.0 \pm 9.9) (Table 4).

DISCUSSION

In our study, all the subjects reported having internet access. This

Table 4

Association between mean eHEALS score and self-perceived overall health and self-perceived oral health

Variables	eHEALS scores (mean \pm SD)	<i>p</i> -value	Correlation coefficient	Sig (2-tailed)
Self-perceived health status				
Poor	26.8 \pm 5.6	0.000	0.229	0.000
Satisfactory	30.4 \pm 3.3			
Good	30.1 \pm 3.9			
Very good	32.5 \pm 3.5			
Self-perceived oral health status				
Poor	23.0 \pm 9.9	0.000	0.215	0.000
Satisfactory	30.5 \pm 3.1			
Good	29.9 \pm 3.7			
Very good	31.8 \pm 4.2			

eHEALS: eHealth Literacy Scale; SD: standard deviation; Sig: significant

could be attributed to the growth of mobile technology and the Malaysian government's effort in offering accessible and affordable internet service throughout the country (MCMC, 2018; Kamarudin *et al*, 2022). A similar finding was reported from in studies from Africa (Osei Asibey *et al*, 2017) and the Philippines (Camiling, 2019).

Despite the availability of health information on the internet, most of the subjects obtained their information from healthcare professionals. This could be because the subjects worked closely with healthcare professionals and it was easier for them to obtain

this information from their colleagues. However, most subjects stated they trusted the internet as a source of health information.

In our study, subjects preferred to use social media as a source for health information, similar to previous studies (Von Muhlen and Ohno-Machado, 2012). None of the subjects obtained health information from official health websites, which contradicted with a previous study of Malaysian pharmacists who stated they only obtained their health information from reputable health websites (Ong *et al*, 2018). Social media websites are more user-friendly

and interesting than official health websites (George *et al*, 2013). This is concerning due to the large amount of unregulated information on social media which increases the risk of obtaining misinformation compared to information from official health websites.

In our study, most subjects stated online health information helped them make health-related decisions but did not feel confident in differentiating between poor and good quality information, putting them at risk for obtaining misinformation, which can be misleading even for health professionals (Zhang *et al*, 2021).

The mean \pm SD eHealth literacy score among our study subjects (30.5 ± 3.9) was higher than among healthcare professionals in Ethiopia (27.8 ± 5.7) (Shiferaw and Mehari, 2019). This difference is likely due to differences in study populations and various other factors specific to the studies.

Our results showed a higher eHealth literacy score among dental therapists (diploma level) than dental surgery assistants (certificate level). Subjects with a higher education level may be more adept at utilizing electronic devices and possibly more concerned about their health making them more likely to search the internet for health information. These findings are similar to those from other studies (Alhuwail and Abdulsalam, 2019; Hesse *et al*, 2005; Jacobs *et al*,

2017; Shiferaw and Mehari, 2019). In Malaysia, dental therapists are given more specialized training than dental surgery assistants, exposing them to additional sources of information on health and possibly improving their eHealth literacy level.

In our study, those who frequently obtained health information online had greater eHealth literacy levels than those who did not, except for those who obtained health information from other health professionals. Similar studies from the United States (Choi and Dinitto, 2013; Tennant *et al*, 2015) and the Netherlands (van der Vaart *et al*, 2011) reported greater eHealth literacy among those who obtained health information online than those who did not. The lack of confidence among our subjects about judging reliable and unreliable health information websites could be a reason why those who sought health information from health professionals had higher eHealth literacy scores than those who sought health information on the internet, which was not seen in the studies from the United States and the Netherlands referenced above.

In our study, subjects with good perceived overall health and good perceived oral health had higher eHealth literacy scores than those who had poor perceived overall health and poor perceived oral health. A possible reason for this is that people who are

health literate may have better self-care behavior and know how to access information about how to have better health.

A first limitation of this study was that it only included dental auxiliary personnel from government dental clinics in Pahang and did not include personnel from the private sector or other sectors (*eg*, armed forces) in Pahang. A second limitation of this study was that the data were self-reported, subject to recall bias (misremembering) and social desirability bias (giving responses the subject thinks the investigator wants or what they think is socially appropriate). A third limitation of the study was the eHEALS only reports subject self-perceived skills rather than actual skills. A fourth limitation of the study was our data were not comparable to other studies due to differences in the study design, instrument, population and questionnaire wording.

In summary, most study subjects were internet users and had good eHealth literacy. Most did not feel confident in distinguishing between good and poor-quality online health information. Subjects who obtained health information from healthcare colleagues had better eHealth literacy scores, confirming the inability to determine online health information quality. Subject with good self-perceived overall health and oral health had better eHealth literacy.

We conclude eHealth literacy can be improved by educating subjects in selecting good quality online health information, especially among those with a self-perception of having poor overall and oral health. Further studies are needed to determine what type of education program can help accomplish this.

ACKNOWLEDGEMENTS

The authors express their gratitude to the Pahang Oral Health State Department and the Ministry of Health Malaysia for their assistance with this study. We also thank the study subjects for their kind cooperation with this study.

This study was funded by the University of Malaya Dental Postgraduate Research Grant (DPRG/27/21).

CONFLICT OF INTEREST DISCLOSURE

The authors reported no conflicts of interest.

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