Health information-seeking behaviour on the Internet and health literacy among older Australians

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Abstract

Objective: This paper investigates the relationship between health information-seeking behaviour on the Internet and health literacy in the population of older Australians. Methods: Data was obtained from the Adults Literacy and Life Skills (ALLS) Survey conducted in 2006. Health literacy was assessed using a specific scale designed to measure health literacy proficiency. Internet usage for health information seeking purposes was elicited from responses to a direct question. Data were analysed using simple unweighted logistic modelling techniques with stratification by education levels. Results: Older people with medium level of education and had a higher health literacy proficiency were 4 times as likely to be frequent users of the Internet for the purposes of searching for health information (OR=3.7, 95%C.I.=1.3-10.3), and about 3 times as likely to be infrequent users, (OR=2.6, 95%C.I.=1.6-4.4) when compared to non-users. For higher education levels, only infrequent usage was significantly associated with health literacy. No relationships were found for lower education levels. It is important that health-related information for older people is offered according to their comprehensive ability. Conclusions: The results obtained suggest that there is a significant interaction effect between health information-seeking behaviour on the Internet and education levels, on health literacy. For those who had attained a post-secondary education level, there were significant associations between the exposure and outcome variables in a progressive manner with the strength of associations increasing from infrequent users to frequent users. This suggested a dose-response relationship between exposure and outcome.

Keywords: Health literacy; aged; health information seeking

1 Introduction

The Internet has been recognised as an increasingly important medium in terms of population health [1-2]. It has been recognised that the Internet is effective in providing health information to the public [3]. It has become a major healthcare resource particularly for the older population [4-5]. In the survey of health information-seeking behaviour on the Internet, Lorence and Park [4] reported that about 56% of older Internet users sought health information from the web in 2000. This proportion was further increased by about 14% by 2002. In the latest national study on health information-seeking in the US, Tu and Cohen [6] reported that health information-seeking behaviour on the Internet has increased sharply among elderly Americans aged 65 years or older.

Health literacy was first defined in the US Institute of Medicine 2004 report [7] as:

> "The degree to which individuals have the capacity to obtain, process and understand basic health information and services needed to make appropriate health decisions"

However, the World Health Organisation redefined it in 2007 [8] as:

> "The cognitive and social skills which determine the motivation and ability of individuals to gain access to, understand and use information in ways which promote and maintain good health"

In Nutbeam's [9] analysis on the concept of health literacy, these two definitions reflects two different approaches. The first approach, drawing upon Baker [10], considers health literacy as a set of individual capacities that may have influence on the health of individuals and clinical decision-making. In other words, health literacy could be seen as a potential risk factor that needs to be managed in such ways that the health literacy can be increased [9]. Another approach considers health literacy as an asset of the individual, similar to general literacy and numeracy, which can be acquired and accumulated as the result of education and learning [11]. Furthermore, based on his interpretation of the WHO definition, Nutbeam suggested that health literacy is not simply functional capacities, but also a set of skills that can be acquired for self-empowerment [9]. Either approach suggests that the extent of health literacy is a quantifiable as well as a modifiable characteristic of an individual.

In terms of knowledge on health literacy, particularly among older people, an earlier report by Williams [12] indicated that nearly two thirds of Americans aged 60 years or older had inadequate literacy skills and the majority (81%) of older patients could not understand basic medical information such as prescription labels. A recent review study on health literacy among geriatric patients also found that the health literacy level of older patients within the population of many countries was low [13].

The detrimental effect of poor health literacy on health has long been recognised [14-16]. It has been demonstrated that poor health literacy is associated with many diseases and health outcomes including cancer [17], asthma [18], and diabetes [19] among the older population.

As a modifiable potential mediating factor of health outcomes, some factors have been identified to be associated with health literacy. Cutilli [13] reviewed the literature and found that demographic variables associated with poor health literacy included lower education levels, lower income, and lower occupational status, in other words lower socioeconomic status. However, from the perspective that health literacy as a set of personal skills to be acquired for the purpose of self-empowerment, it would be logical to expect people to exhibit certain behaviours in order to achieve such a goal. For example, in order to improve one's literacy and numeracy skills, the individual would become involved in more reading or calculating exercises. In terms of the relationship between behavioural factors such as health information-seeking behaviour and health literacy, the literature has provided little data. As for the relationship between health information-seeking behaviour on the Internet and health literacy, particularly among the older population using a population-based information source, none has been found so far.

The aim of this exploratory study is to bridge the knowledge gap in examining the relationship between health information-seeking behaviour on the Internet and health literacy in the population of older Australians. It is hypothesised that older people who exhibit health information-seeking behaviour on the Internet would have a higher level of health literacy when compared to those who do not engage in such behaviour.

2 Methods

2.1 The Adult Literacy and Life Skills Survey (ALLS survey)

This study analysed data obtained from the Adults Literacy and Life Skills (ALLS) Survey conducted by the Australian Bureau of Statistics (ABS) in 2006. This was a nation-wide cross-sectional survey using a representative sample. Data were obtained from the ABS with institutional approval for using the data set for the study. Details of the survey methodologies were reported in the information paper published by the ABS [20].

2.2 Data collection, assessments of exposure and outcome

In total, the sample contained 8,988 private dwellings, hence 8,988 individual respondents aged between 15 and 74 years were recruited in the survey. Apart from demographics, the information collected included linguistic information, level of education, employment status, and personal income. Also collected were data on numeracy and literacy practices at work and in daily life, frequency of reading and writing activities, information and communication technology usage including the use of the Internet, particularly the use of the Internet for the purpose of seeking for health-related information. The survey also assessed the level of literacy, including health literacy of each participant using a standardised methodology. Details of the methods were reported by the ABS [20]. In summary, respondents were asked to complete a series of exercises using a standard task

booklet. These exercises were designed to provide an understanding of the numeracy and literacy skills including health literacy of the general adult population. Included in this study were elderly re-spondents aged between 60 and 74 years.

Of particular interest in this study was the health information-seeking behaviour on the Internet and its relationship with health literacy. Information on Internet usage for health information searching purposes was elicited from responses to the following questions: How often do you use the Internet to search for health-related information in a typical month? Responses to these questions were discrete answers including: daily, a few times a week, a few times a month, never, has never used the Internet, and has never used a computer.

The concept of health literacy was operationalised as the knowledge and skills required to understand and use information relating to health issues such as drugs and alcohol, disease prevention and treatment, safety and accident prevention, first aid, emergencies, and staying healthy [20]. In terms of assessment, it was measured using the specific scale designed to measure health literacy proficiency.

2.3   Data analysis

Data were analysed using the Stata V10.0 statistical software program [21]. Since all variables included in the study were categorical by nature, they were analysed accordingly. Due to a small number for health literacy levels 4 and 5, the outcome variable was dichotomised into lower (1 and 2) and higher (3 or higher) levels. For ease of analyses, the exposure variable was also regrouped into frequent user (daily and a few times a week), infrequent user (a few times a month), and never user/no access. Bivariate analyses were conducted to examine unadjusted associations between all variables of interest including health information-seeking behaviour on the Internet and health literacy. Chi-squared tests were applied to examine these bivariate relationships. Data were then subjected to multivariate analyses for the adjusted association between health information-seeking behaviour on the Internet and health literacy. For the inclusion of any variable in the multivariate analyses, the criteria of a bivariate association with $p<0.05$ was used. The adjusted Odds Ratio (OR) and the corresponding 95% confidence intervals (95%C.I.) for a higher level of health literacy were calculated using a simple unweighted logistic modelling technique. It was anticipated that there could be a significant interaction effect of education level and health information-seeking behaviour on health literacy, thus multivariate analyses were conducted with stratification by education levels.

As this was a study of an exploratory nature, there were no attempts to applying any weighting factors as recommended by the ABS.

3   Results

A total of 1815 respondents aged 60 years or above were surveyed in this national study. Of these, slightly more than half were females (n=1019, 56.1%), 40% were aged 60-64 years (n=733), 30% were between 65 and 69 years (n=547) and nearly 30% were aged 70-74 years (n=535). Slightly more than half (n=998, 55.0%) of these respondents resided in capital cities with the rest in other areas including inner regional areas and rural and remote areas. The majority (n=1193, 65.7%) were born in Australia, about 17% (n=307) originated from a mainly English-speaking country and the rest came from other countries. Among these older respondents, the majority (n= 1108, 61.0%) had a secondary education level or below, less than one third (n=494, 27.3%) had post-secondary education with about 12% (n=213, 11.7%) having a tertiary or above education level. In terms of financial status, the majority (n=1160, 63.9%) of these older people had a total weekly cash income that placed them in the top 40 percentile of cash income for the total sample, and 16.5% (n=299) were located at the lowest 30 percentile. More than a quarter (n=495, 27.3%) were still working for income. Slightly more than half were still married (n=1067, 58.8%) and still stayed with a partner (n=1023, 56.4%). For the majority (n=1523, 83.8%), English was their first language with less than half (n=823, 45.4%) perceived to have excellent English skills, and about a third reported to have good English (n=633, 34.8%).

In terms of the use of Information Technology, half (n=923, 50.9%) reported to have access to a computer at home and 748 (41.2%) had the computer connected to the Internet. This presented 81.0% of those who had a computer at home. Eight hundred and fifty two (n=852, 47%) reported to have used the Internet and 365 (20.1%) responded that they used the Internet for searching for health-related information. This included 45 (2.5%) who were frequent users. For the outcome of the study, namely health literacy, about one fifth (n=390, 21.5%) were classified as having higher levels of proficiency.

The bivariate associations between health information-seeking behaviour on the Internet, demographics, language ability, and health literacy were examined. Results were presented in Table 1. The unadjusted association between health information-seeking on the Internet and health literacy was significant, as were most of the demographic and

Variables	Results on test of association
Use of the Internet for health information	$\chi^2_2 = 178.46$, p<0.001
Demographics	
Age	$\chi^2_2 = 40.41$, p<0.001
Sex	$\chi^2_1 = 5.28$, p=0.022
Country of birth	$\chi^2_2 = 53.50$, p<0.001
Marital status	$\chi^2_1 = 5.25$, p=0.022
Household arrangement	$\chi^2_2 = 3.72$, p=0.156
Place of residence	$\chi^2_1 = 0.01$, p=0.949
Education level	$\chi^2_2 = 292.17$, p<0.001
Still working	$\chi^2_1 = 73.11$, p<0.001
Income	$\chi^2_2 = 11.45$, p=0.003
Source of income	$\chi^2_2 = 49.14$, p<0.001
Language ability	
First language	$\chi^2_1 = 55.14$, p<0.001
Self perception of English skills	$\chi^2_2 = 205.64$, p<0.001

Table 1: Unadjusted associations between use of Internet for health information, demographics, English ability, and health literacy among elderly people in Australia

language variables except household arrangement and place of residence. Most of these associations were highly significant (p<0.001). Hence, they were included in further regression analyses.

The results obtained from the multivariate analyses stratified according to education levels were also presented in Table 2. After adjusting for potential confounding variables including age, sex, marital status, employment, income, source of income, language ability and English as first language, different results were obtained for different education levels. As shown, significant associations between frequent as well as infrequent usage of the Internet for seeking health information and health literacy was found for participants with post secondary education level. For those who had a higher health literacy level, the likelihood to be frequent users of the Internet for seeking health information was about 4 times (OR=3.7, 95%C.I.=1.3-10.3) and the likelihood to be infrequent users was about 3 times (OR=2.6, 95%C.I.=1.6-4.4), when compared to those who had never used the Internet or who had no access at all. There was also a significant association between health information-seeking behaviour and a higher level of health literacy among those who had received the highest education level. However it only applied to infrequent users. For those who had a higher level of health literacy the likelihood for them to be infrequent users of the Internet for seeking health information was about four times (OR=3.6, 95%C.I.=2.2-5.9) when com-

pared to those who had never used the Internet or who had no access at all.

4 Discussion

This study aims to examine the relationship between health information-seeking behaviour on the Internet and health literacy among the older population in Australia. The results obtained suggest that there is a significant interaction effect between health information-seeking behaviour on the Internet and education levels, on health literacy. The associations between health seeking and health literacy varies according to the education levels of respondents. For those who had attained a post-secondary education level, there were significant associations between the exposure and outcome variables in a progressive manner with the strength of associations increasing from infrequent users to frequent users. This suggested a dose-response relationship in terms of the association between exposure and outcome.

Many possible reasons could be suggested for the results obtained. Different results have been obtained for different education levels. Older people with the lowest level of education may not understand the information disregarding how often they participate in health information-seeking behaviour. This is probably due to their lack of basic literacy. Studies have shown that most health-related information on the Internet is still very much limited to text based presentations that require higher literacy levels as well as being culturally and linguistically specific [22]. This indicates a mismatch between the information provided and the intended audience in terms of communication strategies such as using different means, including audio-visual, animation, and cartoons etc., to convey the message. Hence, regardless of the efforts these groups of older people put in, there would be no effect on their health literacy. The results obtained among those who have attained post secondary education levels suggest a positive dose response relationship between health information-seeking behaviour and health literacy. A possible reason is that this group of older people have acquired a basic level of general literacy via formal education and training, and have the ability to build up extra assets upon this foundation. Hence, according to the principal of literacy acquisition, the rate of comprehension is in direct proportion to the amount of reading or exposure to literature [23]. In the same manner, the more frequent the involvement in health information-seeking behaviour on the Internet, the higher the health literacy. For those who have attained the highest education levels, it would be prudent to assume that they have already acquired a rather high

Health information-seeking on the Internet	OR (95% C.I.)* Education		
	Secondary or below	Post secondary	University or above
Frequent user	0.7 (0.2-2.5)	3.7 (1.3-10.3)	1.3 (0.3-5.3)
Infrequent user	1.7 (0.9-3.4)	2.6(1.6-4.4)	3.6 (2.2-5.9)

*Table 2: Adjusted Odds Ratios (95% confidence intervals) for higher levels of health literacy of various degrees of health information-seeking behaviour by education levels. * = OR adjusted for age, sex, country of birth, marital status, employment, income, sources of income, English as first language, and English ability; Never used the Internet/No access to the Internet as the reference group.*

level of health literacy and a good knowledge of general health from different sources. For those infrequent users, their search for health information on the Internet will probably be disease or health condition-specific for personal knowledge or in the role of a caregiver. Hence, they may have gained extra knowledge in specific areas of health, and thus increased health literacy.

The results obtained from this study have a direct implication on the provision of health-related information on the Internet for older people, particularly in the area of communication strategies. As shown from the results of the current study, it is important that health-related information for older people is offered according to their comprehensive ability. This could be achieved by having the same health information content being presented at an appropriate literacy level for different groups of older audience. This may require having different Web pages within the same Web site for different levels of literacy. In terms of the mode of communication, different modes of communication may be needed such as having more animation and cartoon presentations aimed at older people with lower literacy levels, with the same information content. Another implication of the results is that concerted efforts should be made to improve health literacy proficiency by effective promotion of health information-seeking behaviour on the Internet. This would be most applicable for a group of older people with intermediate levels of education. As shown in the current study, the results suggested that this group of older people can benefit most from active involvement in health information-seeking behaviour on the Internet. To achieve this, health care professionals such as community health workers and general practitioners are in an advantageous position to encourage their elderly clients or patients to become more active in browsing the Internet for general health information, particularly information related to their own health in order to improve their general health literacy.

As in all studies, there are strengths and weaknesses in this study. This study utilised data collected from a population-based national survey. Participants of the

survey were randomly selected from the total target population using a validated and statistically proven methodology. This has provided confidence for the representativeness of the sample as well as the generalisation of the results obtained. The assessment of the outcome variable utilised a standardised and validated instrument commonly used world-wide. As part of an international study with more than 12 countries, cross validation on data collected can be achieved. Some potential limitations have been identified. First the assessment of the exposure, namely health information-seeking behaviour on the Internet, is restricted by using only a single question. The assessment on the frequency of Internet usage was too broad and there was no assessment on the duration, thus posing severe limitations on the exposure measurement. These short comings need to be addressed in any future studies on the same topic. Second, recall bias may occur in the assessment of the Internet use due to self-reporting. Finally, the strength of evidence provided by a study with a cross-sectional design is insufficient to draw any causal inference [24]. Due to the nature of the study, results obtained should be considered as exploratory and indicative of the relationship between health information-seeking behaviour on the Internet and health literacy among the older population. In order to confirm this relationship, a study of better design such as a randomised controlled trial should be conducted [25]. Furthermore, proper exposure assessments, including measurements on the frequency, duration of Internet use, and computer skills such as searching strategies should be conducted.

5   Conclusion

As more and more older people are accessing the internet for information, especially health related information; it is important for health information web page designers to consider the online information communication strategies that are the most suitable for this group of people. The development of such strategies will ensure older people of all education levels are able

to process, comprehend and retain the information presented on health web sites.

Acknowledgements

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Conflicts of Interest

There is no conflict of interest to declare.

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