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Health Information Seeking, Trust and Knowledge Adaptation: Empirical Evidence from Kuwait⁽¹⁾

Abstract

Aim of the Paper: With the explosion of digital information, the channel in which patients seek health information has changed extensively. This study explores the use, trust, and knowledge adaptation of different online and offline sources of health information.

Study Design: Using an online and offline survey methodology, data is analyzed using cross-tabulation procedures, followed by logistic regression models.

Sample and Data: A random sample of (506) residents of the Kuwaiti population is used.

Results: The Internet is now the primary trusted source of health information, even more so than physicians are. In addition, the Internet has a stronger knowledge adaptation of health information as compared to physicians and other offline sources of information.

Conclusion: The study highlights the shifted role of the physician and the new role of the Internet as a trusted health information source. Healthcare organizations should guide their efforts to manage better this new health information seeking behavior and guide physicians to be better informed.

Keywords: health information source, information seeking, trust, health communication, knowledge adaptation.

Introduction

Where are people seeking their health information from? And do online or traditional offline sources of health information lead to more knowledge adaptation? A few decades ago, people relied solely on traditional media to obtain health information, for example, reading newspapers and magazines, watching television, and seeking physicians' advice, as well as friends and family (Chen, Li, Liang, & Tsai, 2018). The rapid diffusion of the Internet has placed an unprecedented

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amount of health information within reach of individuals. Such availability of health information was not easily attainable in the past, regardless of its credibility, accuracy and reliability (Amante, Hogan, Pagoto, English, & Lapane, 2015; Bidmon & Terlutter, 2015; Tennant *et al.*, 2015). Around 80% of Internet users have searched for a health-related topic online, and this number is up from 62% in 2001 (Fox & Duggan, 2013).

To answer the above questions, most existing literature has focused on how different demographics differ in seeking and trusting health information sources. Age, education, and race have been found to have a differing impact on trusting the health information source (Smith, 2011; Hesse *et al.*, 2005). As an example, younger adults in the United States (US) are significantly less likely than older adults to consult a health specialist and are more likely to ask a friend or family (Hesse, Moser, & Rutten, 2010). Higher educated individuals in the US are more likely to consult health professionals compared with less educated individuals who are more likely to consult friends and family (X. Chen *et al.*, 2018). Thus far, only a few western populations have been explored, and it remains unclear how people seek health information and how different information channels are trusted and adapted (X. Chen *et al.*, 2018; Clayman, Manganello, Viswanath, Hesse, & Arora, 2010; Hesse *et al.*, 2005).

Traditionally, the physician is the most used and trusted source of health information for patients. However, individuals seek health information from other sources as well. Recent US reports and survey analysis (Brown-Johnson *et al.*, 2018; Thai *et al.*, 2018) have shown that, when seeking health information, most people ask: (1) health professionals, followed by (2) the Internet, (3) friends or family, and (4) other sources. However, when individuals were asked where they first went for their health information, the Internet was their first choice, and this choice rose over time (Hesse *et al.*, 2010). Still, a substantial population does not rely on the Internet as a trustworthy source (Hong & Oh, 2019; Wang, Walther, Pingree, & Hawkins, 2008). The trustworthiness of the Internet is questioned with 'fakeness' emerging from the internet's ranking of websites in search results, and its push potential to make information attractive through advertisements (Berger & Milkman, 2012; Archak, Ghose, & Ipeirotis, 2011). Thus, while the internet is an emerging channel for health information, replacing physicians and traditional health sources is still questionable (Hong & Oh, 2019; Czaja, Manfredi, & Price, 2003).

As the Internet becomes more integrated with our daily lives, it is now vital to better understand where users seek and adapt their health information knowledge from. Undoubtedly, the Internet is a significant source that aids in the spread of health information (Knoepfler & Turner, 2018). However, to what extent the

Internet influences health knowledge attained remains unclear. While previous literature has focused on western populations, this study extends it by examining where the Middle Eastern population, the Kuwaiti population in particular, is attaining their health information from. Furthermore, while previous studies have demonstrated that people tend to shape their attitudes and decisions based on health information from the sources they trust (X. Chen *et al.*, 2018; Clayman *et al.*, 2010), not many studies have examined the health knowledge attained and adapted from traditional sources (e.g. physicians, friends and family, media) as compared to health knowledge attained from online sources.

Viewing it from a knowledge adaptation theoretical perspective, this study examines the research questions with reference to the Kuwaiti population. Specifically, the study first examines where people are getting their health information from, and the level of trust towards that health information source. Next, the study compares the associations between health information sources and knowledge adaptation. For example, do people who get most of their health information from the Internet attain more knowledge than those who get most of it from traditional offline sources (e.g., doctors, family, and friends, etc.)? A primary online and offline survey was distributed and a health specialist panel was used to assess the knowledge adapted.

Overall, this study makes three main contributions. First, the study enriches the knowledge adaptation-based view (Argote & Miron-Spektor, 2011; Nonaka & Von Krogh, 2009) by providing a more fine-grained conceptual analysis of the relationship between seeking health information and knowledge adapted. The results of this study will help academics better understand the relationship between digital content and health knowledge adaptation. Second, the findings of this study will provide empirical evidence to possibly a new role for patients and a change in the role of physicians. This study will also provide empirical evidence to an unexplored country in terms of health information seeking and adaptation, and thus will extend the geographic reach of empirical research on the Middle East. Lastly, the study has several implications for practice. Understanding the change in patterns for both use and trust in health information sources is useful when designing health promotion messages for healthcare providers, health knowledge websites, as well as for physicians. The findings of this study will allow healthcare organizations to value and better understand the impact and effectiveness of different health information sources that individuals trust and use. In addition, physicians need to be better informed now with the type of information that patients already have.

Theoretical Background

This study draws upon two broad streams of literature. The first relates to research on sources of health information and trust. The second relates to the theory of knowledge adaptation of health information sources.

Sources of Health Information and Trust

Prior literature has shown that the choice of where to find health information varies by specific demographics (X. Chen *et al.*, 2018; Hesse *et al.*, 2010). Studies have shown that traditional sources of health information may vary by ethnicity (Rains, 2007; Dutta-Bergman, 2003), race (Rains, 2007; Dutta-Bergman, 2003), socioeconomic status (Hesse *et al.*, 2010; Hesse *et al.*, 2005), and acculturation (Thai *et al.*, 2018). Adults aged 18 to 29 are significantly less likely than older adults to consult a health specialist and are more likely to ask a friend or family (Hesse *et al.*, 2010). The level of education has varying impacts on where individuals seek health information. Higher educated individuals are more likely to consult health professionals compared with less educated individuals who are more likely to consult with friends and family (X. Chen *et al.*, 2018). In addition, black US patients, compared to white patients, had more considerable variability in their levels of physician trust (Do *et al.*, 2010). Those who are older, more educated, and have a larger household income are more likely to seek health information online (Anderson, 2004; Bernhardt, McClain, & Parrott, 2004; Cotten & Gupta, 2004).

When seeking health information, trust in the information channel is essential. Trust is an important factor between attaining health information and acting upon it (Clayman *et al.*, 2010). A major feature of trust is that it is relational, yet unequally distributed within societies (Gilson, 2003). This implies that the same health information would be perceived and trusted differently, depending on the source and demographics. This variance may impact health communication outcomes (Clayman *et al.*, 2010). Newspapers and health magazines, for example, have been recognized as the main source of health information for both the public and health professionals, but it is unclear whether people from various social groups use such sources differently for health information and whether or not they trust the information obtained (Yanovitzky & Blitz, 2000; Meissner, Potosky, & Convisser, 1992; Phillips, Kanter, Bednarczyk, & Tastad, 1991).

As shown in previous literature, demographic differences may affect where health information is sought and trusted. Health specialists and health organizations that provide health information messages through various sources are concerned about ensuring that the target population both uses and trusts

information from the sources consulted. Therefore, the first part of this study examines the differences in the use and trust of the most frequently cited sources of health information by various demographic populations in Kuwait. Results from this study will provide information to assist health specialists and health organizations on the sources most likely to be used and trusted by patients in the Kuwaiti population.

Health Information Sources and Knowledge Adaptation

Information seeking occurs when a variety of sources are available (Brashers, Goldsmith, & Hsieh, 2002). Health information may be obtained from formal sources such as healthcare providers, or informal sources (Rains, 2007) such as one's family and friends, or mass media sources like newspapers, magazines, and television (Napoli, 2001). Furthermore, prior research has demonstrated that individuals vary in their opinions about the quality of the different information sources (Johnson & Meischke, 1993; Johnson & Meishcke, 1992).

The use of the Internet as a source of health information continues to increase (Rains, 2007). Around two percent of all Internet websites provide some form of health-related information (Powell & Clarke, 2002). Significant Internet visiting populations use internet websites and social media (Duggan, Ellison, Lampe, Lenhart, & Madden, 2014), with increasing dependence as an information source or a primary knowledge avenue (Shearer & Gottfried, 2017; Gottfried & Shearer, 2016). Most of the internet searches around health seek to find solutions or practices to cure specific diseases, diagnostic, and treatment procedures (Maben-Feaster, Stansfield, Opipari, & Hammoud, 2018). Advantages of seeking health information online include a mass amount of information, easy access at any time, the potential for interactivity, social support, anonymity, and customizable information (Cline & Haynes, 2001). Further, there is a plethora of information available online.

However, studies also note that, irrespective of the plethora of knowledge provided by the Internet, trust on such media as a knowledge source and subsequent knowledge adaptation is still unclear (Hou & Shim 2010; Wang *et al.* 2008). Still, a significant population does not believe or rely on the internet as a trustworthy source. Recently, trustworthiness is questioned more with the 'fakeness' of the Internet emerging to be a central policy and practice debate. The Internet abounds in false advertisements in response to a search, and this has the potential to influence a user's knowledge adaptation process, thus aggravating the existing puzzle around online information spread (Dwyer & Martin, 2017). The credibility of contributed online information is questionable (Archak *et al.*, 2011), with the reality or push to

make the information attractive (Berger & Milkman, 2012). Within the realm that most search results are driven by keyword-based matches, ranks of websites, and advertisement potential, they inherently suffer from built-in biases to provide pushed knowledge than facts. Therefore, although the internet is emerging as the prominent media for health information sources, replacing traditional providers as a source is dubious (Czaja, Manfredi, & Price, 2003).

While the quality of Internet information and consumer evaluation of the information has been raised (Fox, 2011; Eysenbach, Powell, Kuss, & Sa, 2002), the information attained from digital sources seems to have a notable influence on individual behavior and adaptation of the health information (Fox, 2011; Morahan-Martin, 2004). Knowledge adaptation or knowledge conversion is the process by which individuals are affected by the experience of another (Argote, McEvily, & Reagans, 2003; Nonaka, 1994), which may be embodied in the mind of another or a knowledge artifact (Massey & Montoya-Weiss, 2006; Argote *et al.*, 2003). Knowledge artifacts (documents, diagrams, procedures, digital media) are intermediary mechanisms used to capture and provide experience to others. The success of knowledge adaptation hinges on both developing an understanding and the ability to apply knowledge in some local context (Åkerman, 2015; Casillas, Barbero, & Sapienza, 2015).

To answer the research questions of this study, the first set of analyses examines the level of trust towards the health information source, and the second set of analyses examines the health information source and its impact on knowledge adaptation as shown in Figure 1.

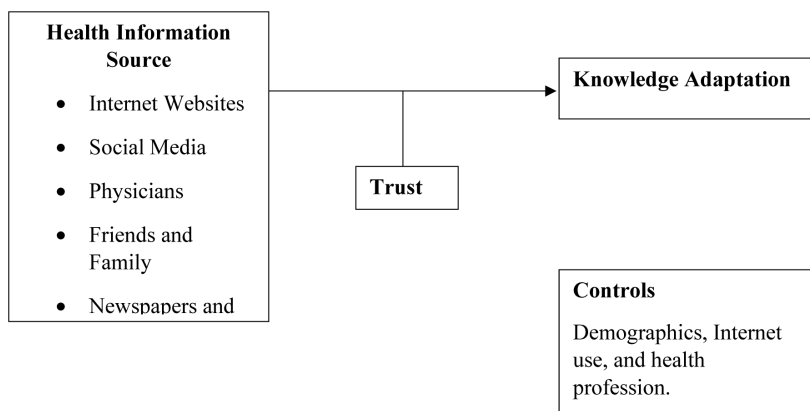


Figure 1: Conceptual Model for Knowledge Adaptation

Methodology

The data set comes from a primary survey data, which was developed and tested on the Kuwaiti population (the survey is presented in Appendix A). The survey's questions were adopted from previous literature (Hesse *et al.*, 2010; Hesse *et al.*, 2005). Offline and online surveys were conducted. Two hundred and fifty offline surveys were distributed to individuals selected at random in main public places such as shopping malls, coffee shops, and university campuses. The online survey was disseminated through social media channels via solicitation materials posted in public areas (shopping malls, coffee shops, and university campuses). The survey was conducted over two months from May 2017 to July 2017, and the sample was composed of 164 offline responses (offline response rate of 65.6%) and 342 online responses for a total of 506 responses.

Data and Variables

The main variables include source used, trust, and knowledge adaptation of health information sources. Table 1 displays the list of variables and their descriptions.

Table 1
Description of Variables

Variable	Description
KA_STEM	Numerical knowledge adaptation grade regarding stem cell therapy, the higher the more knowledgeable.
KA_UMB	Numerical knowledge adaptation grade regarding umbilical cord therapy the higher the more knowledgeable.
PHYSICIAN	Whether consulted doctor for health information.
INTERNETSITES	Whether used the Internet for health information
SOCIALMEDIA	Whether used Social Media for health information
FRIENDS_FAMILY	Whether consulted friends and family (non-specialists) for health information
NEWSPAPERS_MAGAZINES	Whether used newspapers or magazines for health information
TRUST_DOCTOR	Level of trust in doctors or health practitioners. From 1 (Not at All) to 4 (A lot).
TRUST_INTERNETSITES	Level of trust in online health information. From 1 (Not at All) to 4 (A lot).
TRUST_SOCIALMEDIA	Level of trust in social media health information. From 1 (Not at All) to 4 (A lot).
TRUST_FRIENDS_FAMILY	Level of trust in friends and family health information. From 1 (Not at All) to 4 (A lot).

Table 1 (Cont.)
Description of Variables

Variable	Description
TRUST_NEWSPAPERS_MAGAZINES	Level of trust in newspapers and magazines health information. From 1 (Not at All) to 4 (A lot).
TRUST	Level of trust in general health information
ISM_FREQ	Frequency of Internet Use including Social Media
HEALTH_SPECIALIST	Whether the user is a health specialist or not
AGE	Age.
GENDER	Female = 1 Male = 0.
INCOME	Income level
CHILD	Number of children
EDUCATION	Education Level

To determine source of health information used, responses were analyzed from the following survey question: “Thinking about all of the different ways of communicating and getting information what are the most important ways that you get medical and health information for yourself or for your family (newspapers and magazines, Internet, social media, friends or family, physicians such as doctors or other health specialists) [yes, no]?” As for trust in sources of health information, responses were analyzed from the survey question: “How much do you trust the information about health from each of the following (newspapers and magazines, Internet, social media, friends or family, doctors or other health specialists) [a lot, some, a little, not at all].”

Stem cell therapy and umbilical cord blood therapy were chosen as the context to test for health knowledge adaptation. These therapies have been prevalent in terms of marketing in Kuwait. These therapies are considered exclusive practices, such that they are not yet clinically established to be used entirely for treatment (Knoepfler & Turner, 2018). Both therapies are focused on regenerating and using cells to replace damaged cells and treat a disease for which currently, there are no sustainable cures (Ali & Al-Mulla, 2012). Given the potential of such therapies to cure diseases, many marketing efforts are being conducted by businesses. False advertisements and information for stem cell therapy practices on the internet are misleading. Hundreds of firms currently advertise a wide range of non-approved stem cell interventions, with many companies engaged in direct-to-consumer marketing of related treatments (Knoepfler & Turner, 2018). Patients fall prey to the advertisements to undergo these therapies and face adverse consequences. Examples include three women blinded by unproven treatments (Kuriyan *et al.*,

2017), or halt in the inexorable loss of vision (Mandai *et al.*, 2017), or with new tumors as a result of the treatments (Berkowitz *et al.*, 2016). Given the vast amount of misinformation on these therapies, they fall as an excellent context to test for knowledge adaptation attained from various sources. The knowledge adaptation variables were operationalized using several questions written by a panel of stem cell specialists, and the results of the respondents were used to derive the amount of knowledge adaptation for each practice.

Demographic variables included demographics identified in the literature including age (18-34, 35-64, 65+), education (did not complete high school, high school graduate, diploma, bachelor's degree, masters, PhD), gender, number of children, income (Less than 500KD, 500-1499KD, 1500-2500KD, 2500-4000KD, 4000KD+). Other controls include the level of trust in general health information (TRUST), frequency of Internet use including social media (ISM_FREQ), and lastly whether or not the individual is a health specialist (HEALTH_SPECIALIST).

Sample

One interesting phenomenon observed in the sample is the greater reliance on the online information source for health-related information. For instance, of the survey participants who answered the question about the primary sources of health and medical information, 43% reported consulting a doctor for health information, whereas 52% used the Internet or Social media.

Of the 506 participants, 56% were females, 48% were aged 18-34, 46% 35-64, and 6% greater than 65 years old. Analysis of the level of education showed 2% with less than a high school degree, 8% with a high school degree, 18% with a diploma degree, and 40% with a bachelor's degree, 20% with a Master's degree, and 12% with a PhD degree. Household income ranged from 4% earning less than 500KD, 33% earning 500KD-1499KD, 43% earning 1500KD-2500KD, 17% earning 2500-4000, and 3% earning 4000KD or more. Forty-three percent of the participants have no children, while the others have at least one child. Finally, 69% of the participants were non-health specialists, while the rest were health specialists.

Analysis

Cross-tabulation procedures are used to generate population-based estimates to investigate levels of trust in different information sources. Logistic regression models are conducted to investigate the relationship between sociodemographic measures and the level of trust for each of the health information sources. For these models, trust was defined as a dichotomous dependent variable, high trust (a lot or some) versus low trust (a little or not at all). The coefficients for this model are

expressed as odds ratios (OR), and 95% confidence intervals (CIs) are reported to indicate the precision of these estimates.

An Ordinary Least Squares (OLS) regression analysis was conducted to examine the impact of different information sources and the moderating impact of trust of the sources on knowledge adaptation. Formal specification of the knowledge adaptation model is as follows:

$$\begin{aligned} & (KA_{UMB}, KA_{STEMi}) \\ & = \beta_0 + \beta_1 INFORMATIONSOURCE_i + \beta_2 TRUST_INFORMATIONSOURCE_i \\ & + \beta_c Controls_i + \epsilon_i \end{aligned}$$

where *INFORMATIONSOURCE* is the main source of health information (newspapers and magazines, the Internet, social media, friends and family, physicians) and *TRUST_INFORMATIONSOURCE* is the amount of trust towards the health information source. *Controls* are control variables, including trust in public health information (TRUST), the general use of the Internet and of social media (ISM_FREQ), and several demographic variables including educational level (EDUCATION), age (AGE), income (INCOME), number of children (CHILD), whether the individual is a health specialist (HEALTH_SPECIALIST), and gender of the survey respondents (GENDER). OLS is used to estimate the β coefficients of the key parameters and employ robust standard errors. Last, ϵ are disturbances associated with each observation. All analyses were conducted using STATA v 15.1.

Results

The results on trust of sources for health information are listed in Table 2. Respondents expressed a high level of trust for information provided by: (1) the Internet, (2) physicians, and (3) social media in a descending order of values, compared with the other sources. Trust in the Internet as a health information source showed about 46.6% with a lot of trust, 29.6% with some trust, 13.2% with a little trust, and 10.6% with no trust at all. Physicians as a health source also showed a similar pattern with 40.4% with a lot of trust, 22.5% with some trust, 25.8% with little trust, and 11.3% with no trust at all. 32.5% of the respondents expressed that social media as a health source was trusted a lot, 37.1% with some trust, 20.5% with a little trust, and 9.9% with no trust at all. As for friends and family as a health source, only 18.8% expressed a lot of trust, 37.5% some trust, and the rest little or no trust. Lastly, newspapers and magazines were the least trusted health information source.

Table 2
Level of Trust in Specific Health Information across Information Sources among Kuwaiti Adults*

Source	A Lot	Some	A Little	Not at All
Physician	40.4 (37.4-45.6)	22.5 (19.6-27.3)	25.8 (20.4-28.6)	11.3 (9.7-15.5)
Internet Websites	46.6 (40.4 - 48.9)	29.6 (24.7- 31.1)	13.2 (10.1 - 17.8)	10.6 (7.2-12.4)
Social Media	32.5 (28.7- 36.8)	37.1 (32.2 - 40.6)	20.5 (12.3-29.5)	9.9 (5.3-11.5)
Friends & Family (non-specialists)	18.8 (16.9-21.1)	37.5 (31.3- 41.9)	25.8 (21.4-28.7)	17.9 (14.7 - 20.4)
Newspapers & Magazines	7.7 (4.8- 10.1)	24.4 (18.5 - 26.5)	32.2 (29.7 - 39.9)	35.7 (30.4 - 38.9)

* Data are given as mean percentage (95% confidence interval) of adults (weighted)

Table 3 displays the results from the logistic regression analyses in which the dichotomous outcome of high trust (“A lot “ or “Some”) vs. low trust (“A Little” or “Not At All”) was regressed on sociodemographic variables. From these analyses, several consistent patterns appeared. Trust in health information sources was dependent on age and gender. Women aged 18 to 34 and 35 to 64 years were generally more trusting of most sources. The Internet, as a trustful health information source, had a notable difference by age, viz. individuals aged 18 to 34 years were almost twelve times more likely to trust it, and individuals aged 35 to 64 years were almost six times more likely, and those 65 years or older had some or a lot of trust in the Internet.

The level of education is also associated with trust of the Internet and social media as health information sources. Higher levels of education (i.e., high school education or greater) were more trusting of the Internet and social media than lower education people with less than high school. Furthermore, having children, compared to not having children, was also associated with trust of physicians and the internet as health information sources. Lastly, income had no significant impact on trust and health information sources.

Table 3
Data for High Level of Trust Regressed on Sociodemographic Characteristic by Information Source*

Characteristics	Physicians	Internet Websites	Social Media	Friends and Family (Non-Specialists)	Newspapers and Magazines
Age					
18-34	35-64	65 > =	2.7 (1.3-5)*	3.1 (2.6-4.6)*	1.0

Table 3 (Cont.)
Data for High Level of Trust Regressed on Sociodemographic Characteristic by
Information Source*

Characteristics	Physicians	Internet Websites	Social Media	Friends and Family (Non-Specialists)	Newspapers and Magazines
12.5 (8.2-16.6)*	6.2 (3.4-7.1)*	1.0	8.5 (5.2-12.8)*	5.2 (3.4-7.5)*	1.0
8.5 (5.2-12.8)*	3.2 (2.4-5.5)*	1.0	1.4 (1.0-2.1)	1.5 (1.2-2.0)*	1.0
Gender					
Female	Male	2.1 (1.4-3.2)*	1.0	4.2 (2.9-5.9)*	1.0
3.4 (2.1-4.5)*	1.0	2.6 (1.7-4.2)*	1.0	1.5 (0.9-3.1)*	1.0
Income					
500-1499	1500-2500	2500-4000	4000 > =	< = 500	1.4 (0.6-3.4)
1.5 (0.4-4.3)	1.5 (0.3-4.8)	1.6 (0.9-5.1)	1.0	1.2 (0.3-2.2)	1.3 (0.2-2.9)
1.5 (0.3-3.1)	1.8(0.5-3.6)	1.0	0.8 (0.4-2.3)	0.9 (0.2-2.6)	1.1 (0.7-3.1)
1.1 (0.9-3.2)	1.0	1.3(0.5-3.3)	1.1(0.2-2.6)	0.9(0.3-2.2)	0.6(0.2-1.1)
1.0	0.6 (0.2-0.8)	0.4 (0.1-0.7)	0.5 (0.2-0.7)	0.2 (0.0-0.4)	1.0
Children					
Yes	2.0 (1.3-3.1)*	4.3 (2.7-5.9)*	1.4 (0.7-2.4)	1.1 (0.6-1.8)	0.3 (0.1-0.7)
No T	1.0	1.0	1.0	1.0	1.0
Education					
High school	1.2 (0.6-1.4)	1.8 (0.5-2.3)*	1.5 (0.7-2.0)*	0.8 (0.2-1.2)	0.1 (0.0-0.7)
Diploma Ba-	1.5 (0.4-1.8)	1.9 (0.6-2.4)*	1.7 (0.8-2.2)*	0.7 (0.1-1.3)	0.4 (0.1-0.9)
chelor	1.5 (0.3-1.7)	2.1 (1.1-2.6)*	2.2 (1.4-2.8)*	0.9 (0.3-1.5)	0.5 (0.3-1.1)
Masters	1.6 (0.7-2.1)	2.2 (1.3-2.8)*	2.1 (1.5-2.4)*	0.8 (0.5-1.6)	0.3 (0.1-0.8)
PhD	1.4 (0.6-0.9)	2.6 (1.6-2.9)*	1.9 (1.3-2.2)*	0.7 (0.4-1.2)	0.2 (0.0-0.5)
< High school T	1.0	1.0	1.0	1.0	1.0
-					

*Data are given as odds ratio (95% confidence interval).

*Significant at $p < 0.01$

T Reference

Table 4 shows the results of the OLS regression models for the two knowledge adaptation outcome variables (Ln_KA_UMB and Ln_KA_STEM). The results show that the $Ln_KA_Umbilical$ model explains around 35.9% of the variance, and the $Ln_KA_StemCells$ model explains around 37.5% of the variance.

The results show that the health information source variable, *PHYSICIAN*, which indicates whether the user consulted the doctor for health information, is

positively and significantly associated with knowledge adaptation outcome variables Ln_KA_UMB and Ln_KA_STEM ($\beta = 0.382, p < 0.10$; $\beta = 0.243, p < 0.05$ respectively). This result indicates that users who consulted health information from doctors were associated with 38.2% more umbilical cord blood therapy knowledge adaptation and 24.3% more stem cell therapy knowledge adaptation units than those who did not consult a doctor for health information. This positive association with knowledge adaptation outcome variables Ln_KA_UMB and Ln_KA_STEM is even stronger for *INTERNETSITES*, which indicates whether the user consulted the Internet for health information, ($\beta = 0.572, p < 0.01$; $\beta = 0.834, p < 0.01$ respectively). This finding indicates that users that consulted health information from the Internet were associated with 57.2% more umbilical cord blood therapy knowledge adaptation and 83.4% more stem cell therapy knowledge adaptation units than those who did not consult the Internet for health information. Another significant and positive health information source is *SOCIALMEDIA*, which indicates that users who consulted health information from the Social Media were associated with 34.3% more umbilical cord blood therapy knowledge adaptation and 39.6% more stem cell therapy knowledge adaptation units than those who did not consult Social Media for health information. Friends and family, and newspapers and magazines had no significant impact on knowledge adaptation. These results highlight the *INTERNETSITES* as the strongest health information source, followed by *PHYSICIANS* and *SOCIALMEDIA* for knowledge adaptation.

The level of *TRUST* in general health information has a positive and significant impact on knowledge adaptation outcomes Ln_KA_UMB and Ln_KA_STEM ($\beta = 0.513, p < 0.01$; $\beta = 0.422, p < 0.01$ respectively). Furthermore, the level of trust with the health information source variables show that *TRUST_INTERNETSITES*, *TRUST_SOCIALMEDIA*, and *TRUST_PHYSICIAN*, are all positively and significantly associated with knowledge adaptation outcomes, displaying positive and significant moderation effect of trust on these health information outcomes. In particular, *TRUST_INTERNETSITES* had the strongest effect on knowledge adaptation outcomes followed by *TRUST_SOCIALMEDIA*, and lastly *TRUST_PHYSICIAN*. However, there were no significant moderation effects of trust on friends and family, and newspapers and magazines as health sources. These results show the importance

of trust as a moderator of health information sources (*INTERNETSITES*, *SOCIALMEDIA*, and *PHYSICIANS*) for knowledge adaptation.

Lastly, some controls require attention. Respondents who had a higher level of education and more children were positively associated with knowledge adaptation outcomes. Health specialists were positively and significantly associated with knowledge adaptation outcome variables. Respondents who used the Internet and Social Media more often were also positively and significantly associated with knowledge adaptation outcome variables.

Table 4
OLS Regression Models

DV: Knowledge Adaptation (KA)	Description	Ln_KA_UMB	Ln_KA_STEM
Variables		OLS b/se	OLS b/se
PHYSICIAN	Whether consulted doctor for health information	0.382* (0.20)	0.243** (0.11)
INTERNETSITES	Whether used Internet for health information	0.572*** (0.08)	0.834*** (0.08)
SOCIALMEDIA	Whether used Social Media for health information	0.343*** (0.11)	0.396*** (0.10)
FRIENDS_FAMILY	Whether consulted friends and family (non-specialists) for health information	-0.063 (0.10)	0.034 (0.13)
NEWSPAPERS_MAGAZINES	Whether used newspapers or magazines for health information	-0.055 (0.10)	-0.049 (0.09)
TRUST_PHYSICIAN	Level of trust in doctors or health practitioners	0.004*** (0.00)	0.007*** (0.00)
TRUST_INTERNETSITES	Level of trust in on-line health information	0.538*** (0.20)	0.508*** (0.19)
TRUST_SOCIALMEDIA	Level of trust in social media health information	0.418*** (0.015)	0.482*** (0.051)

Table 4 (Cont.)
OLS Regression Models

DV: Knowledge Adaptation (KA)	Description	Ln_KA_UMB	Ln_KA_STEM
Variables		OLS b/se	OLS b/se
TRUST_FRIENDS_FAMILY	Level of trust in friends and family health information	0.759 (1.37)	0.576 (1.31)
TRUST_NEWSPAPERS_AGAZINES	Level of trust in newspapers and magazines health information	0.024 (0.13)	0.040 (0.09)
TRUST	Level of trust in general health information	0.513** (0.25)	0.422*** (0.02)
ISM_FREQ	Frequency of Internet Use including Social Media	0.194* (0.10)	0.221** (0.10)
HEALTH_SPECIALIST	Whether the user is a health specialist or not	0.041** (0.02)	0.005*** (0.01)
AGE	Age group	1.886 (1.39)	1.346 (1.33)
GENDER	Female	0.119 (0.20)	0.102 (0.10)
INCOME	Income level	1.266 (1.57)	1.240 (1.52)
CHILD	Number of children	0.037*** (0.01)	0.041*** (0.01)
EDUCATION	Education Level	0.243** (0.11)	0.232*** (0.08)
_cons	Constant	0.037 (0.72)	0.116 (0.69)
N	No. of observations	484	484
Chi-sq.	Chi-Square Statistics	30.514**	38.313***
R-sq.	R-square Statistics	0.359	0.375

*p < 0.10, **p < 0.05, ***p < 0.01

Discussion

The current study examined the relationship between health information sources, trust, and knowledge adaptation. It addressed gaps in the previous literature by examining the trend among the adult Kuwaiti population, a broad array of sources, and the knowledge impact of the different sources.

Contributions

This article makes three main contributions: empirical, theoretical, and practical. Empirically, the study identified the health information sources used and trusted by an unexplored population. In particular, the Kuwaiti population is now using and trusting the Internet as a leading and primary source of health information, even more so than doctors and specialists. After physicians, social media is used as the main source of health information. In addition, there are significant differences in the source used and trusted by various demographics. This study shows that older (but younger than 65), females, those with more education are more likely than other populations to use and trust digital sources of information such as the Internet and Social Media, compared to offline sources of information such as physicians, family and friends, newspapers and magazines. Higher levels of education also trust the internet and social media even more so than physicians and other traditional sources of health information.

These findings empirically indicate a shift in the Kuwaiti population use and trust of health information sources. Mainly, there is a change in the physicians' role, with the Internet emerging as a primary trusted source of health information. One might ask as to whether Internet-based health information is better than that of a physician who has more than eight years of medical education? The answer is probably no. However, this shift has become increasingly popular due to the increase in use and ease of access to the Internet (Jacobs, Amuta, & Jeon, 2017). With the advancement of smartphones, tablet computers, and other mobile terminals, health information can be obtained from the Internet at any time and place (Ren, Deng, Hong, & Zhang, 2019; Bender, Jimenez-Marroquin, & Jadad, 2011; Barak, Boniel-Nissim, & Suler, 2008). The advantage of the Internet in terms of ease of access at any time and place is probably the main reason why people value Internet-based health knowledge as compared to that of a physician. The Internet has the potential to assist in the decentralization and democratization of health and medical knowledge from traditional health specialists to other sources (Scheibling, Gillett, & Brett, 2018). It may also reduce inequalities through its

potential to support healthcare for all (Copeland, Wong, Jones, & Edmunds, 2019; Grande & Sherman, 2018).

Theoretically, the study argues: (1) knowledge is adapted differently from varying sources and (2) trust moderates this relationship. Thus, it enriches the knowledge adaptation based view of health information seeking (Argote & Miron-Spektor, 2011; Nonaka & Von Krogh, 2009; Massey & Montoya-Weiss, 2006) by providing a fine-grained analysis of the relationship between knowledge adapted, trust and various health information sources. In particular, the findings show that digital sources of information (Internet and Social Media) and physicians as health information sources relate to positive knowledge adaptation. In addition, this study indicates that the more trusting the user is toward the digital source, the higher the knowledge adaptation. This finding means that, although there is a disparity in terms of the credibility of digital information sources (Keselman, Smith, Murcko, & Kaufman, 2019), there is a positive relationship suggesting that the population has the ability to seek digital health information from credible websites and digital sources.

Finally, this study makes several practical contributions and has several implications for many healthcare parties in Kuwait. The findings show that, for patients, the Internet has become a major source of health information in the Kuwaiti population. The Internet can improve patients' understanding of their medical conditions, treatment options, and self-efficacy (Tan & Goonawardene, 2017). In addition, it can empower patients to make health decisions and talk to their physicians, thus resulting in a more patient-centered interaction.

As patients have better access to health information via the Internet, they will be expected to be more engaged in health decision-making. Thus, traditional models of the patient-provider relationship and communication strategies should be revisited in Kuwait to adapt to this changing demographic. However, the increase in the use of other sources for health information, besides health professionals, has implications that involve the accuracy and understanding of health information for patients.

Physicians in Kuwait now need to spend more time with patients to interpret Internet findings and medical treatment options. Physicians need to utilize more empathetic listening to understand problems and explain treatment options given patients' more expansive information (Li, Ashkanasy, & Ahlstrom, 2014). Physicians should also embrace openness to online health information, and should encourage patients to discuss online information and allow them to

communicate their Internet research. Such openness and encouragement will enhance the patient-physician relationship (Sommerhalder, Abraham, Zufferey, Barth, & Abel, 2009; Broom, 2005; Murray *et al.*, 2003). Furthermore, the finding indicating that the Internet has a stronger impact on knowledge adaptation than physicians points to a new critical role of the Internet as a primary source of health information, thus shifting the role of the physician to a secondary source. The Internet can provide more information than the physician can, as the physician may be limited in terms of time spent with the patient, which, in turn, has an impact on knowledge adaptation of the patient. This important finding further highlights the need for physicians to provide more information and spend more time with patients. Patients are now far more knowledgeable, and physicians may no longer be seen as the only trusted source in helping patients. Physicians should expand their understanding of patients' Internet-based health-seeking behavior by obtaining information from health websites themselves and providing better communication with patients.

Healthcare providers should now be aware of the Internet-informed patient. Thus, healthcare providers should help patients sort through the information derived from the Internet information offered by patients and guide them to reliable and accurate health websites (T. Lu, Xu, & Wallace, 2018; X. Lu, Zhang, Wu, Shang, & Liu, 2018). Healthcare providers in Kuwait such as the Ministry of Health should take advantage of the impact of the Internet by providing valuable information online that can assist patients and link them to credible health related websites.

Health knowledge websites have now a very strong role in the knowledge adaptation of patients. Thus, these websites need to ensure that the information provided is easy to interpret and accurate.

Lastly, health colleges need to adapt to this shift by educating their students on how to deal with patients who come with knowledge from the Internet. Also, courses such as 'health informatics' should be integrated into formal health education to adequately prepare the health professional for an Internet-informed patient.

Limitations and Future Research

Limitations of the study include those presented by the dataset. A cross-sectional survey was used to collect data from respondents. Thus, changes in patient trust and experience that were associated with the health information source might not have been captured. Future studies may aim to assess how patient trust and knowledge change over time. In addition, while knowledge adaptation was evaluated in stem cell and umbilical cord blood therapies only, future studies

could expand the generalization of the findings by assessing the knowledge in other medical contexts. Furthermore, although the sample met the characteristics of a typical Kuwaiti citizen, the sample was obtained through online and offline surveys of people; thus, there might have been specific demographics that were missed. Therefore, replications and extensions of this work are needed to verify and validate the results, and to fully understand the impact of digital information sources on knowledge adaptation in the Kuwaiti population. Lastly, a related future study that would take this investigation a step forward could look at whose advice better helped a patient with an illness: a physician's or Internet-based advice.

Conclusion

Which health information sources are mostly used, trusted and adapted by Middle Eastern cultures? This study uncovers the importance of the new role of the Internet as a primary trusted source of health information, which replaces the physician's traditional main role. In addition, digital sources of information such as the Internet was found to have an even stronger impact on knowledge adaptation than that of physicians. In conclusion, this article offers an important message - that the Internet and other digital sources of information have dramatically altered the way individuals gather and behave towards health-related information. Therefore, all health-related organizations, as well as physicians, need to alter and better manage the way health information is delivered to patients, as patients are now more informed than they used to be. In practice, this study highlights the importance of longer, empathetic listening to patients and their questions about treatment options (Groopman, 2007).

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Appendix A : Survey

About Me

1. Age: 2. Gender: Male__ Female__ 3. Marital status: Married __, Single__, Divorced__, Widowed__
4. Nationality: Kuwaiti__, 5. Education: High school graduate__, Associate Degree__, Bachelor's degree__, Master's degree__, PhD__, Other __
6. My field of studies is in: 7. Monthly Income: 100-499 KD__, 500-999 KD __, 1000-1999 KD __, 2000-2999KD __, 3000-3999KD __, 4000-4999 KD, 5000-5999KD __, 6000KD or higher __, Prefer not to disclose __
8. How often do you use the Internet? Every day__, 2-3 times a week__, Once a week__, Once a month__, Less than a week__, Never__
9. Do you use social media? (Check all that apply) Twitter__, Facebook__, Instagram__, LinkedIn__, None__
10. How often do you use social media? 3 hours a day or more__, 1-2 hours a day__, 30 mins a day__, Once a day__, Few times a day__, Once in 3 months__, Less than a week__, Few times a month__, Once a month or less__, Never__

Trust and Confidence

We would like to assess in general how you feel towards the general public as well as healthcare practitioners

From a scale on 1-5 (1 being strongly disagree and 5 being strongly agree), please answer the following:	1. Strongly Disagree	2. Disagree	3. Neither Agree nor Disagree	4. Agree	5. Strongly Agree
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14. In general, most people can be trusted.
15. In general, I am very careful dealing with people.
16. In general, most people try to be fair.
17. Most people in the healthcare system will try to take advantage of you if they get a chance.
18. I am confident in hospital doctors.
19. I am confident in health information I find on the internet.
20. I believe that the doctors interest is in the care of the patient above the interest of his own financial benefit.

From a scale on 1-5 (1 being strongly disagree and 5 being strongly agree), please answer the following:	1. Strongly Disagree	2. Disagree	3. Neither Agree nor Disagree	4. Agree	5. Strongly Agree
21. Thinking about all of the different ways of communicating and getting information what are the most important ways that you get medical and health information for yourself or for your family:	22. If you had a health related question, who would you ask first?				
- newspapers and magazines [yes, no]	- newspapers and magazines [yes, no]				
- Internet [yes, no]	- Internet [yes, no]				
- social media [yes, no]	- social media [yes, no]				
- friends or family [yes, no]	- friends or family [yes, no]				
- physicians such as doctors or other health specialists [yes, no]	- physicians such as doctors or other health specialists [yes, no]				
23. Before seeing a doctor I check the following for more information (Choose all that apply):	24. After seeing a doctor I also check the following for more information (Choose all that apply):				
- newspapers and magazines [yes, no]	- newspapers and magazines [yes, no]				
- Internet [yes, no]	- Internet [yes, no]				
- social media [yes, no]	- social media [yes, no]				
- friends or family [yes, no]	- friends or family [yes, no]				
- physicians such as doctors or other health specialists [yes, no]	- physicians such as doctors or other health specialists [yes, no]				
25. Instead of going to the doctor I use the following sources of information on myself for certain health issues:	26. Have you ever used websites to check out health related information? Yes__, No__				
- newspapers and magazines [yes, no]	27. Have you ever used social media to check or ask about health related information? Yes__, No__				
- Internet [yes, no]					
- social media [yes, no]					
- friends or family [yes, no]					
- physicians such as doctors or other health specialists [yes, no]					

28. 'How much do you trust the information about health from each of the following:

Source	A lot	Some	A little	Not at All
Newspapers & Magazines				
Internet				
Social Media				
Friends and Family				
Physicians/Health Specialists				

Stem Cells Knowledge

Stem cells have gained tremendous attention from the media and public in the last decade. We would like to investigate the public knowledge on stem cells.

29. A stem cell is: A cell that can differentiate to 30. In general, do you know what a stem cell is? other types of cells___, A cell that can treat all Yes___, No___ diseases and disorders___, A medication that is 31. There are many types of stem cells: Yes___, prescribed by doctors to treat diseases, I don't No___, I don't know___ know___

Stem Cells Treatment Benefits

Select the appropriate answer	Yes	No	I don't know
32. Stem cells can cure neurological disorders like Alzheimer's and Parkinson's diseases			
33. Stem cells can cure diabetes			
34. Stem cells can cure spinal cord injuries and paralysis			
35. Stem cells can cure heart diseases			
36. Stem cells can cure cancer			
37. Stem cells can stop the process of ageing			
38. Stem cells are involved in bone marrow transplant			
39. Stem cells can cure infertility			
40. Stem cells therapies are very safe			
41. Have you heard about Stem cell medical Centers in Kuwait?			
42. Have you heard about any stem cells research being performed in Kuwait?			
43. Have you come across any stem cells awareness campaigns in Kuwait?			
44. Have you heard of medical centers that treat patients with stem cells outside of Kuwait?			
45. The stem cell centers you heard of where in which countries? Fill in the blank _____			
46. The diseases and disorders these centers claimed to treat with stem cells include (You can choose more than one answer): Alzheimer's disease___, Parkinson's disease___, Multiple Sclerosis (MS)___, Cerebral Palsy___, Spinal cord injuries including (Paralysis)___, Epilepsy___, Autism___, Other nervous system diseases___, Cancer___, Diabetes___, Blindness___, Blindness___, Stroke___, I have not heard of such centers___			

-
47. Do you know, or heard of anyone who went to such centers, or wanted to go? Yes__, No__, Not sure__
48. Have you visited websites of centers offering stem cell therapies? Yes__, No__
49. You heard about stem cell centers from (Choose all that apply): Internet websites__, Social Media (Twitter, Facebook, Instagram, etc.)__, TV__, Newspapers and magazines__, Friends and family (non-specialists)__, Specialists__, I haven't heard of such centers__
50. If you had a stem cell related question, who would you ask or refer to first? Internet websites__, Social Media (Twitter, Facebook, Instagram, etc.)__, TV__, Newspapers and magazines__, Friends and family (non-specialists)__, Specialists__, Other__
51. If you ever had a disease that cannot be treated with normal medical therapies, would you consider stem cell therapy? Yes__, No__
-

Umbilical Cord Blood Knowledge

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52. Do you know what umbilical cord blood is? Yes__, No__, Not sure__
53. Have you heard of umbilical cord blood banking? Yes__, No__
54. Umbilical cord blood contains stem cells: Yes__, No__, I don't know__
55. You heard about umbilical cord blood from (Choose all that apply): Internet websites__, Social Media (Twitter, Facebook, Instagram, etc.)__, TV__, Newspapers and magazines__, Friends and family (non-specialists)__, Specialists__, I haven't heard of such centers__
56. Would you store the cord blood of your new born? Yes__, No__, Not sure__
57. You consider storing your infant cord blood sample as: Investment in their health__, Waste of money__, Unethical__, Extravagance__
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Umbilical Cord Blood Treatment Benefits

Select the appropriate answer	Yes	No	I don't know
58. Umbilical cord blood can cure leukemia.			
59. Umbilical cord blood can cure neurodegenerative diseases such as Parkinson's and Alzheimer's.			
60. Umbilical cord blood can cure diabetes.			
61. Umbilical cord blood can cure paralysis.			
62. The amount of umbilical cord blood collected after birth is sufficient to treat adults.			
63. Umbilical cord blood can treat the baby from any genetic diseases he might carry.			
64. The stored umbilical cord blood is sufficient to cure diseases that might affect the baby later in adulthood.			

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65. If you had umbilical cord blood questions, who would you refer to first? Internet websites__, Social Media (Twitter, provided in the Kuwait? Yes__, Facebook, Instagram, etc.)__, TV__, Newspapers and magazines__, Friends and family (non-specialists)__, Specialists__, Other__
66. Is the cord blood banking service provided in the Kuwait? Yes__, No__, I don't know__
- 67 I trust the information I receive from agencies that offer umbilical cord blood banking. Yes__, No__
68. As a citizen or a non-citizen living in Kuwait, how do you rate the government (health authorities) efforts in public health awareness campaigns? Poor_ Moderately Poor__, Neutral__, Moderately Good__, Good__
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الملخص

البحث عن المعلومات الصحية والثقة وتكيف المعرفة: دليل تجريبي من الكويت

أبرار رضا الحسن

جامعة الكويت

هدف الدراسة: مع انتشار المعلومات الرقمية، تغيرت القناة التي يبحث فيها المرضى عن المعلومات الصحية على نطاق واسع. تستكشف هذه الدراسة استخدام مصادر المعلومات الصحية المختلفة عبر الإنترنت والمصادر الاعتيادية وثقتها وتحويلها للمعرفة.

منهجية الدراسة: استخدام المنهج المسحي؛ حيث تم التحليل باستخدام إجراءات الجدولة المتقاطعة، وب نماذج الانحدار اللوجستي.

البيانات وعينة الدراسة: تم استخدام عينة عشوائية من (506) من سكان الكويت.

نتائج الدراسة: تبرز نتائج الدراسة أن الإنترنت هو الآن المصدر الرئيسي الموثوق به للمعلومات الصحية أكثر من الأطباء. بالإضافة إلى ذلك، فإن شبكة الإنترنت لديها معرفة أقوى بتحويل المعلومات الصحية مقارنة بالأطباء ومصادر المعلومات الأخرى غير المتصلة بالإنترنت.

الخاتمة: تبرز النتائج الدور المتغير للطبيب والدور الجديد للإنترنت كمصدر موثوق به للمعلومات الصحية. ينبغي لمؤسسات الرعاية الصحية توجيه جهودها لإدارة هذه المعلومات الصحية الجديدة لدى المرضى وتوجيه الأطباء ليكونوا على دراية أفضل.

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