# The Status of Electronic Health Literacy in people with Hearing Impairment: Content Analysis Approach

## ABSTRACT

**Background and Objective:** People with hearing impairments have not accessed well to health information sources compared to people with normal hearing. The study aims to show the status of electronic health literacy in persons with hearing impairments.

**Materials and Methods:** The methodology was content analysis based on of Graneheim, B. Lundman's pattern. Thirty-five participants with hearing impairments and 14 persons with normal hearing were selected. Sampling started with the purposive method and continued until data saturation. A total of 76 semi-structured interviews were made and analyzed using MaxQDA 10.4.15.1.

**Results:** The current state of electronic health literacy in people with hearing impairment was emerged as a theme, included three main categories contains poor electronic health literacy, underlying causes for poor electronic health literacy, and consequences of low electronic health literacy in persons with hearing impairment. Poor electronic health literacy consists of poor online health information seeking skills, poor understanding, and processing of online health information, and poor evaluation of online health information. Four main subcategories for poor electronic health literacy were unequal access to conventional health information, incongruous health communication, lack of considering persons with hearing impairment in producing health education programs, and poor electronic health information sources for persons with hearing impairment. In addition, consequences of low electronic health literacy are composed of two subcategories, including reliance on available information sources and the promotion of misconceptions in the deaf community.

**Conclusion:** Low theoretical and applied knowledge about various aspects of health might be the main factor in people with hearing impairments that influences their nature of deafness and obstacles to access health information sources Online content generation fitting the needs of those persons recommended creating access to health information for them. In addition to this, the development and enhancement of information searching skills, understanding and processing, evaluation, and use of online health information are essential.

**Paper Type:** Research Article

**Keywords:** Electronic Health Literacy, Persons with Hearing Impairments, Health literacy, Health promotion, Communication

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## Introduction

The concept of eHealth literacy is defined as the ability to "seek, find, understand, and appraise health information from electronic sources and apply the knowledge gained to addressing or solving a health problem "Electronic health literacy is a concept consisting of health literacy and electronic health (1). Health literacy includes a multidimensional concept based on individual's knowledge and motivation. Health literacy is the individual's ability and skills to obtain health information, understand and process information, and evaluate and use information to make the best health decisions in three dimensions of health, including the prevention of disease, health care, and health promotion and improving the quality of life (2,3).

Electronic health literacy has drawn everyone's attention to obtain the required knowledge and skills for understanding and using preventive and therapeutic health information (4).

The Internet is a valuable and effective source to obtain health information and help individuals to maintain and improve their personal health information via making effective health decision (5); however, many users have access to quality medical and health information. Consequently, there is a possibility of accessing misleading information for those with limited informational literacy (6). In addition, the ability to distinguish reliable health information (e,g. online information from academic, and governmental websites) from public comments, personal views, and advertisements are important (7).

Poor access to reliable sources of health information leads to poor health knowledge and performance. Studies have shown poor access to health information in persons with hearing impairment (PswHI) (8, 9). A previous study reported low health literacy in PswHI is about seven times higher than persons with normal hearing (PswTH) (10). According to studies, one of the barriers to access health services and information in PswHI is communication (11, 12).

The Internet empowers the PswHI's strengthens assertiveness (13), and increases their effective interaction, and authority (14) (20). In addition, the findings of Thorén et al. showed that the use of the Internet in PswHI is 1.74 times higher than PswTH (15).

Information and communication technology is critical for persons with disabilities. The European Union (EU) Communications Committee stated that people with disabilities have the same citizenship rights and they must have access to information technology and involve in the information society (16).

Given the effects of deafness on the interpersonal relationships, psychosocial health, quality of life and economic independence (17), and low health literacy in PswHI (18-21), and also the Internet popularity for exchanging and sharing information in PswHI, this qualitative study was aimed to show the status of electronic health literacy among PswHI in Iran. In addition, more interviews were conducted with family members and teachers of the PwHI to assess their perspectives.

## Method

This qualitative research was conducted using conventional content analysis with the pattern of Graneheim and Lundman (22, 23). This study is a part of a larger study, which aimed to develop an improve model of electronic health literacy for D/deaf people in Iran.

Given the perspective of the current classification of deafness from persons with hearing impairment, we considered both Deaf and deaf groups in participants. The Deaf referred to a linguistic minority with their unique culture.

The deaf group considers deafness as a medical condition (24).

Face-to-face interviews with PswHI were conducted in In specialized schools for the students with hearing impairment and non-governmental D/deaf organizations such as the Iranian Association for D/deaf, and the Iranian Association of D/deaf families. These organizations provide a diversity of services as education, rehabilitation, and social, cultural and recreational services to enroll PswHI. Likewise, we interviewed with individuals with normal hearing who they have working experience with PswHI in their workplaces or by phone. Interviews with those in other provinces were conducted either using social media, or over the phone.

The diversity of demographic characteristics enriches qualitative data; therefore, participants were invited to participate in the research based on their degrees of deafness, age groups (15 < years), education, and occupational, economic and social groups. Participants with hearing impairment were from diverse geographical regions of Tehran (capital of Iran) and others provinces in Iran such as Alborz, Isfahan, West Azerbaijan, Khuzestan, Gilan, Mazandaran, Markazi, and Kermanshah. Inclusion criteria for participants with hearing impairment were having practical experience with computers and the Internet and exclusion criterion was unwillingness to continue to participate in the interview. For PswTH, inclusion criteria were the work experience with the Internet, computers, and more than 5 years work experience with PswHI.

Purposeful sampling was performed until data saturation. In sum, 76 interviews were conducted with 49 participants (PswHI =35, PswTH =14,). Table 1 shows the frequency and percentage of demographic data related to both PswHI and PswTH. For consistency, the first author conducted all the interviews using semi-structured interview guides for the PswHI and PswTH. The interview guide was created based on the definition of electronic health literacy from the perspective of Norman and Skinner (3). The list of questions was approved by two faculty members and the understandability level of interview guide was approved by teachers working at special schools for the students with hearing impairments (n = 3), the head of the Iranian Association for D/deaf families, and one board member of the Iranian Association for D/deaf. Interview guide was piloted in the first interviews and some interview questions were modified. Some questions were "where do you find health questions from (e.g. oral health, obesity, and weight control) or diseases (diabetes, cancer)"?; "how do you use the Internet to find answers to your health and therapeutic questions?"; how much do you think information on the Internet is useful and understandable?"; "what are the problems you face while searching for information on the Internet?", and "how can you make sure of the correctness of information on the Internet? ".

PswTH interview guide includes the following questions: "how do PswHI use the Internet to find answers to health and therapeutic questions?"; "how much do you think the information on the Internet is useful and understandable for PswHI?"; "what are the problems PswHI face while searching for information on the Internet?", and "how can PswHI make sure of the correctness of the information on the Internet?".

The duration of each interview was different based on the participants' willingness to respond. Each interview lasted an average 40 minutes. Interviews with PswTH were recorded by a digital voice recorder with the permission of interviewees.

This study was started via observation based on the conventional content analysis approach (23). We transcribed all text of the interview and nonverbal communication and field notes. The condensed meaning units were obtained and the underlying meaning of the units was interpreted. The initial codes were derived and similar codes also formed sub-categories. Then, we classified categories under a specific theme.

Data were analyzed using MaxQDA 10.4.15.1.

To ensure credibility, the interviewer stayed in the place of study from the first of January to the end of October 2016. Three initial interviews were conducted to make sure the questions are easy to understand for the PswHI and their results were not included in the final analysis. The researchers did not know the participants before the interview.

Member checking was conducted by most of the participants after the interview to ensure the accurate reflection of their statements. Moreover, to enhance the data quality, both PswHI and PswTH were invited to participate in the study.

Peer checking was performed by a faculty member of the health policy, other than the research team, who was fluent in qualitative research. Some parts of interviews, codes, and categories were analyzed and approved after some minor amendments by them.

T.N. collected and analyzed the data systematically and presented all field notes, memos and transcriptions, and code lists to A.Sh.T. and F.S. to ensure similarity between interviewees' statements and interviewer interpretations. T.N. had three years' experience in neighboring and working with friends with a deaf family member. The authors had postgraduate experience in qualitative data analysis and using MaxQDA to manage qualitative research skills to code and interpret qualitative data.

Both PswTH and PswHI were invited on purpose. Also, all the research processes and the original participants' statements were documented in detail. All interviews entirely analyzed and coded by T. N, then tables and notes were referred to the A.Sh.T. Some parts of the interviews were randomly selected and coded by F.S. for conformability. During the meetings, four irrelevant codes were omitted and more appropriate codes were replaced. The research team reached a final agreement about sub-categories and categories after a meeting and discussion. In addition, the interview along with observations allowed researchers to be sure about the accuracy of statements that made by interviewees.

### Ethical considerations

The Research Ethics Committee of the Iran University of Medical Science has approved the initial plan of the research (IR.REC.2014-105-2209). The aim of the study has been explained, and a consent form was obtained before the interview. In addition, handwritten notes, and transcribed scripts have been de-identified, and numeric codes used instead.

### Results

### Demographic characteristics

A total of 35 PswHI and 14 PswTH participated in the study. The average age of the PswHI was 29.11 years, and the average age was 42.71 years for PswTH. The youngest and oldest PswHI were 15 and 57 years old, respectively, and the youngest and oldest PswTH were 28 and 57 years old, respectively (Table 1). According to Table 1, most of the PswHI were female (65.7%) and had less than ten years of experience working (25.7%). Most of the PswTH were female (85.7%) and had more than 20 years of experience working (50%).

**Table 1: Demographic profile of interviewees**

| Demographic characteristics | | PwHI1 N (%) | PwTH2 N (%) |
|---|---|---|---|
| Gender | Male | 12 (34.3) | 12 (85.7) |
| | Female | 23 (65.7) | 2 (14.3) |
| Age (years) | ≥20 | 9 (25.7) | 0 (0) |
| | 21–30 | 10 (28.6) | 1 (7.1) |
| | 31–40 | 12 (34.3) | 2 (14.2) |
| | >40 | 4 (11.4) | 11 (78.7) |
| Education | Student | 11 (31.4) | 0 (0) |
| | Diploma | 7 (20) | 1 (7.1) |
| | Associate | 1 (2.9) | 0 (0) |
| | Bachelor | 12 (34.3) | 9 (64.3) |
| | Master's | 4 (11.4) | 1 (7.1) |
| | Ph.D. | 0 (0) | 3 (21.43) |
| Working years of experience (years) | Student (unemployed) | 11 (31.4) | 0 (0) |
| | Unemployed adult | 7 (20) | 0 (0) |
| | <10 | 9 (25.7) | 3 (21.43) |
| | 10–20 | 4 (11.4) | 4 (28.57) |
| | >20 | 4 (11.4) | 7 (50) |

1 Persons with Hearing Impairment
2 Persons with Typical Hearing

Result from observation and interviews showed that PswHI'sfamily members, teachers, and sign language interpreters indicated that PswHI randomly search for information. They could not also understand subjective and complicated medical concepts due to poor general literacy and cognitive skills. They also are not aware of the evaluation criteria, including the accuracy and the quality of online health information. Unfortunately, these conditions can be set up for PswHI not having good conditions in terms of health knowledge and only rely on the superficial shell of health information and probably promote their misperceptions about health. Observation of real performance of participants with hearing impairment in search and read retrieved online health information showed that a poor understanding of contexts and subjective concepts are the most critical

problem of low electronic health literacy in PswHI that affects health information retrieval and its processing and application. Persons with hearing impairment could not refine health information alone due to limited basic and health vocabulary and weaknesses in reading and understanding unless learning about health topics is done in a directed way and tailored to those personal needs.

Our findings showed that the status of electronic health literacy was defined based on three main theme including poor electronic health literacy, underlying causes, and consequences of poor e-health literacy in PswHI. The first theme consists of poor health information-seeking behavior, processing of online health information, and weakness in its evaluation (Table2).

## Main Category 1. Poor electronic health literacy in PswHI

Most participants with hearing impairment do not have adequate skills for finding, processing, evaluating, and using available health information and had problems to formulate - a good search strategy. For example, a participant with hearing impairment said that "(…) I can't find the answer to my questions on the Internet (…)" (18-year-old, girl with hearing impairment)

The majority of the persons with hearing impairment retrieved information incidentally due to a general search of inaccurate terms in the Google search engine.

The findings showed that PswHI with lower education could not carry out alone purposeful seeking for electronic health information. In this regard, a field note indicates the performance of a student in seeking health information:

"I asked a student to find information about any intended disease and explain the understood parts after reading it in the presence of a teacher. Student: ear operation. Teacher: you mean

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Table ۲: Poor Electronic Health Literacy in PwHI and its related sub–categories

| Theme | The Status of Electronic Health Literacy in PwHI | | |
|---|---|---|---|
| **Main Category** | **Poor Electronic Health Literacy in PwHI** | | |
| Subcategories | subcategory 1 | subcategory 2 | subcategory 3 |
| | poor health information-seeking behavior | poor understanding and processing of online health information | poor evaluation of online health information |
| Codes | searching inaccurate and incomplete free text in search engines <br> refusing to read the lengthy texts without the picture <br> incidental retrieving information than accurate information <br> having difficulty with searching for needed online health information <br> having difficulty with formulating appropriate questions <br> not having the right search strategy, <br> not being aware of what they should search for <br> not having background knowledge of health-related issues <br> not being able to search for particular health-related topics | having poor reading skills <br> having Persian grammatical errors <br> having a poor understanding of the text <br> having poor critical thinking <br> having difficulty in understanding abstract health-related concepts, having a superficial understanding of health-related concepts <br> being sufficient to use the superficial knowledge <br> having a poor understanding of health and medical vocabulary, misunderstanding of medical concepts <br> having difficulty with unfamiliar words used in written health messages <br> having difficulty with medical text and reading comprehension <br> having a limited medical vocabulary, <br> being complaint of the difficult content | being strongly trust in all online health information <br> comparing online information regardless of the credibility of the sources <br> being not familiar with credible health-related websites or portals <br> spending a lot of time to find information, <br> applying retrieval information in practice to ensure its accuracy <br> being sufficient to read first links and users opinion than reliable information, <br> accepting invalid online retrieved information <br> using accessible information on the net in practice <br> sharing retrieved information with friends |

cochlear implant? Student shakes her head as a sign of approval. The student types cochlear implant in Persian in the Google search engine with the help of teacher and presses the Enter button., (…)(field note)".

Accurate health information retrieves if searching in a directed way with the presence of a knowledgeable individual. A teacher confirmed this issue and stated "… These children (with hearing impairments) do not have the ability to particularly search the Internet by themselves. They find the overall information." (38-year-old, female teacher with typical hearing)

Participants with hearing impairment had difficulty with reading health information and unwillingness to read a health-related text entirely. They could not describe what they read. In this regard, observing the performance of a student in seeking health information is mentioned here.

I asked a student to explain what she read about ear operation, mean cochlear implant.

Student said nothing. She started at her teacher and me for a while. After a while she said it is hard. (…)" (field note).

Interviewees with normal hearing believed that PwHI has a limited lexicon; therefore, electronic health information sources should develop in plain text to better transfer concept to them. Online health information is mainly in written form and beyond the comprehension level for deaf people because deaf people suffer from poor reading, writing, verbal, and language skills. There are some statements as follows:

"… Kids with greater hearing impairment will have more limited channels for receiving information and that is why their vocabulary treasure is limited." (42-year-old, female teacher with typical hearing)

"(…) Internet requires vocabulary because it has a lot of explanations; (…) our children (with hearing impairments) cannot use the explanations on the Internet a lot." (44-year-old, female teacher with typical hearing)

"I think the Internet does not have good explanations, for example, it has talked about heart beat in this section but my students are unlikely to know what a beat is." (41-year-old, female teacher with typical hearing)

"I had a case of a pregnant woman where she asked me as to how a child could come out of this tiny hole (referring to the navel). I even had a case where the person did not know how to use suppository (did not know that it should not be eaten)." (43-year-old, male Psychotherapist / Sex-dialogue with typical hearing)

"Abstraction cannot be explained to PwHI by seeing. How should I teach them a subjective concept? These are not tables and chairs and other stuff that can be learnt by watching." (50-year-old, female faculty member with typical hearing)

Participants mostly searched their intended information in the Google search engine and even were not aware of existence of credible online health information in some cases. For example, a participant with hearing impairment said that "the Google is basically a search engine itself, for example (if) I search for Diabetes, (…).

Participants with hearing impairment named Wikipedia as the most credible online health information sources. For example, a participant with hearing impairment said that the Google has different sources. The most complete one is Wikipedia." (34-year-old, male electrical engineer with hearing impairment)

"I use the information from reliable sources such as Wikipedia." (33-year-old, male office worker with hearing impairment)

Interviewees with hearing impairment mistakenly considered online medical and health information to be correct … and judged about the contents after comparing various sites in a few cases.

"(…)I am sure the Internet is true when compare several sites" (28-year-old, male teacher with hearing impairment)

A way to determine the accuracy and quality of information among the PswHI is to act on it. For example, a 27-year-old, male teacher with hearing impairment said that "(…) We will understand whether the retrieved health information from the Internet is true or not only by acting based on it." In addition, a 36-yeqr-old, female teacher with hearing impairment said that

"(…) we can partially determine the correct content by reading content from different sites with different opinions. We also read user opinions and this helps us to find out whether that content is right or wrong."

Interviewees with hearing impairment were not familiar with the criteria for assessing the quality of online health information. Most of them did not consider those criteria based on

the observation of the researcher.

"(…) A reliable website is always a reliable one, always. There is the logo of an Institute at the bottom of the website … but I have never checked this for health websites" (21-year-old, male IT man with hearing impairment)

"(…) We cannot understand reputation of website. I use several websites to see if the answers are the same. That is my criterion." (44-year-old, male electrical engineer with hearing impairment)

Interviewees with hearing impairment spent a lot of time and energy getting the information due to the lack of awareness of quality standards and reputable sites. For example, a 34-year-old, a male worker with hearing impairment, a 52-year-old, a female retired teacher with hearing impairment, and a 34-year-old, unemployed female with hearing impairment would refer to books to ensure the accuracy of online information.

Main Category 2. Underlying causes of poor electronic health literacy

The second main category include four subcategories as follow the lack of sufficient electronic health information; the lack of awareness of PwHI needs in the production of health education programs; the lack of access to conventional health information in PswHI, and the lack of verbal communication with health care providers (Table 3).

Most interviewees believed that PswHI do not have access to public information sources such as environmental talks and the mass media. Therefore, PswTH are intentionally or unintentionally exposed to different information channels such as radio, television, and public discussions. For example, a 28-year-old girl with typical hearing said that "PswHI do not use radio or television or have health information like us. For

**Table 3: Underlying causes of poor electronic health literacy in PwHI and its related sub-categories**

| Theme | The Status of Electronic Health Literacy in PwHI | | | |
|---|---|---|---|---|
| Main category | Underlying causes of poor electronic health literacy in PwHI | | | |
| | subcategory 1 | subcategory 2 | subcategory 3 | subcategory 4 |
| Subcategories | the lack of access to conventional health information in PswHI | the lack of verbal communication with health care providers | the lack of awareness of PwHI needs in the production of health education programs | the lack of sufficient electronic health information |
| Codes | the lack of access to verbal incidental health-related information<br><br>the lack of access to medical discussion on TV, the lack of access to audio health information<br><br><br>the lack of public conversation in health-related topics | the lack of physicians and nurses fluent in lip-reading,<br>the lack of physicians and nurses fluent in sign language,<br>the lack of sign language interpreters in health care settings,<br>the lack of direct communication with the health care providers,<br>the lack of time to communicate with the physician in a visit | The lack of deaf-tailored health programs<br>the lack of subtitles in health discussion on TV<br>the lack of health information on TV in plain language<br>the lack of the presence of sign language interpreter<br>the lack of usefulness of sign language interpreter in small size in the screen, | the lack of specific electronic sources of health information<br><br>the lack of online health information in plain language<br><br><br>the lack of health information in sign language, |

example, we hear from each other that a disease has entered the country but they are deprived of this information exchange." In addition, a 57-year-old male with hearing impairment confirmed the above mentioned statement "(...) because we have a hearing problem and cannot obtain medical information from TV, radio, newspapers and or magazines as the cost is high."

Interviewees unanimously believed that individuals with normal hearing could communicate with their health care provider as a reliable health information sources, but PswHI are derived of this credible source. For example, a 36-year-old female teacher with hearing impairment told that "(...) Most doctors and nurses, especially doctors in their office are not in the mood; (they) talk fast, and leave (...). Doctors do not understand us, they get bored of sitting and listening to our words and are not in the mood to explain their words to us."

A 43-year-old male with typical hearing told "I think that doctors who are fluent in sign language or familiar with deafness are very, very limited. That is why bringing a normal hearing person along with patient with hearing impairments is considered to be enough."

The unfamiliarity of PswTH with deafness as an individual characteristic has led to a wide gap between various social groups and has led to silent separation of PswHI from the community. Moreover, they are deprived of the oral information flow and mass media. A 42-year-old female teacher with hearing impairment told that "(...) If they (PswHI) know how to deal with people (normal hearing), (normal hearing people) do not know how to communicate with them. These people (PswHI) refer to the nearest clinic to see a doctor. There is no special place for these people. There is no communication between the PswHI and the doctor. They mostly have their mothers along when consulting the doctor."

All interviewees believe that producers of health education programs do not pay attention to information that PsWhi need .

A 34-year-old, an unemployed female told that "(...) Having health information can greatly help in prevention but unfortunately the lack of access to health information is visible in some PswHI. Talks on TV do not favor the PwHI as there is a not sign language interpreter or subtitles that can help them become aware of health." A 57-year-old, a retired male teacher and a senior member of ... association told that "(...) Unfortunately, and frankly PswHI will understand nothing if subtitles are not shown during TV programs, unless a normal hearing person translates for them, which occurs rarely."

A 46-year-old female teacher with typical hearing told that "(...) Unfortunately, our country does not accept that sign language is the first language for PswHI."

A 27-year-old male teacher with hearing impairment told "(...) Right now, none of the medical/ health programs on TV can be used for them; subtitles can help to make these programs usable to a certain extent. Children with hearing impairments cannot understand many TV programs due to the lack of subtitles, translator and a high speed of lip movement. The camera not zooming in on the speaker's mouth is another deterrent."

Interviewees with typical hearing believed that the online health information is inadequate especially, for PswHI. For instance, a 45-year-old male school advisor with typical hearing said that "(...) health information on the net is generated by PswTH and it can be used by PswHI to a very small extent (...)." Moreover, a 46-year-old, a female faculty member with typical hearing told that "(...) There is currently no special information for PswHI on the Internet. We basically have no information about many

things, more so medical topics especially with regards to deafness. Even on the Internet there was nothing available for us a few years back, but it has begun to improve slowly. Now even Telegrams channels have advertising goals and NGOs share information with the aim of selling their products."

## Main category 3. Consequences of poor electronic health literacy

**Third main category compose** of two sub-categories, including reliance on available information and promotion of misconceptions in the deaf community (Table 4).

### Table 4: Consequences of poor electronic health literacy in PwHI

| Theme | The Status of Electronic Health Literacy in PwHI | |
|---|---|---|
| **Main Category** | Consequences of poor electronic health literacy in PwHI | |
| Subcategories | subcategory 1 | subcategory 2 |
| | Reliance on the closest and more convenient sources of health information | Promotion of misconceptions in PwHI |
| Codes | the lack of access to reliable sources of health information, | the lack of reasoned conversations on health issues, |
| | the lack of opportunity to obtain health information or advice form health professional, | the lack of a directed and ongoing discussion on a specific health issue in some groups, |
| | the lack of independence on others to get needed information, | the lack of assurance of the reliability of shared beliefs and information in health topics in some groups |

Analysis of interviews showed that PswHI chooses the most convenient way to accesshealth information. They often get the information they need from the closest and most reliable persons with normal hearing.

A 18-year-old student with hearing impairment told "(…) I ask my cousin when I want to know. I do not know how old he is but I know he is a student. I don't know what he is studying, I think it is Architecture."

A 16-year-old student with hearing impairment told"(…) I ask my mother when I have questions and she explains it in an understandable way. I don't ask my sister because she doesn't explain properly."

A 16-year-old girl with hearing impairment told"(…) I ask my mother, (since the) doctor doesn't answer well."

A 19-year-old girl with hearing impairment told"(…) I ask my niece my questions, she is an accounting student."

All interviewees stated that mutual communications do not exist in referral to doctor. PwHI complain about the lack of independence in health communication and understanding of doctor's statements.

A 36-year-old female teacher with hearing impairment told "I would not understand what the doctor says and I would (have to) take someone with me."

That is why PswHI obtain their needed health information from available sources of information including trusted individuals, books and the Internet.

The findings showed that PswHI tend to promote their own personal understanding from

information available and especially with regards to health. This is very important for people's lives due to the sensitivity and importance of health information. For example, the researcher started a discussion about individual health decision-making in one of the PwHI Telegram groups comprising mostly educated youth with hearing impairment. A discussion was made about immunization (e.g, influenza vaccination). A 34-year-old female with hearing impairment said that: "(…) Influenza vaccine is not good. It leads to illness itself. We should not use it (…)." In response to a user who said that she was vaccinated in the summer, another user adds "who said the vaccine is bad." That 34-year-old female told I do not know, maybe (…).

### Discussion and Conclusion

This study summarizes in a theme as the status of electronic health literacy in PswHI in three main categories, including poor electronic health literacy in PswHI, its underlying causes, and consequences.

Our findings showed that participants with hearing impairment search for online health information in Google and Wikipedia rather than in trustworthy websites. In a previous study (25) , deaf participants stated that they use the Internet to obtain online health information in different ways. Some of the participants search for health information in Google. Those who were familiar with the specific health-related website in advance use WebMD.

Our findings showed that participants could not access the online health information that they needed. They also did not complete the process of finding online health information by themselves. Online health information on the net is usually long full of specific medical vocabulary. Consistent with this finding, a previous study (26) indicated that the readability of the information

in Google is higher than students with hearing impairment; therefore, some students could not use Google properly.

The findings of Zeinali et al. (27) indicated the readability of online health information that produced by the Ministry of Health and Medical Education is at a difficult level. Given the limited vocabulary and the lack of knowledge of medical terms in PswHI, the current online health information does not fit PswHI's needs. That is why PswHI visited the first few records retrieved in Google and compare the records content to ensure the credibility of online information.

The findings showed that PswHI face problems when developing a search strategy for online health information, and they cannot independently carry out purposeful searching in electronic health information. The findings of Karras et al., noted that PswHI could not read English text and searching for online health information in English was done by others on their behalf who translate information from English into American Sign Language.

Our findings showed that most of the participants with hearing impairment were not aware of the quality online health information criteria. In some cases, sending a lot of time to find similar information on a topic and uncertainty of retrieved information led to use of health information which shared in social networks (e,g. Telegram and Whatsapp). It could be applied if they use credible health pages, channels, and groups. The findings of Jahanbaksh et al. (28) reported that dissemination of controversial news and misinformation leads to public anxiety regarding a specific health issue. According to Zeinali et al. (27), access to accurate, complete, and credible online health information could be facilitate decision-making health if this information were accurate, complete, and update.

In general, the knowledge gap in health is a

universal challenge for PswHI (8). For example, according to the literature, PswHI has limited knowledge about health-related topics, including cardiovascular diseases, cancer, sexual health, HIV, and oral health (29-34). The findings showed that PswHI has more limited access to health information. It is in line with the Folkins et al. study (31).

Our findings indicated that PswHI does not have the same conditions as PswTH in accessing sources of health information. They also face unequal conditions in random learning such as television shows, journals, posters, and public discussions. According to a previous study (35) most PswHI does not have access to information that is considered as general knowledge for PswTH from birth or childhood. For example, most of them did not know their medical family history because they did not inform about medical information which exchanged between their parents and doctor in their childhood.

Moreover, the finding of Blake et al. (36) indicated that most PswHI does not have good health conditions due to limited access to reliable information and their participation in health decisions is less than others. Major et al. also reported that most PswHI face problems to accesshealth information and health education programs. This challenges related to the lack of access to the public, radio programs, private and public conversations, and subtitled health education sections in television (37).

The PswHI stated that they could not communicate with health professionals as primary information sources due to language and communication barriers. They also declared health professionals are not fluent in communication skills with them both in lipreading or sign language. However, according to international laws, everyone has the right to receive health information related to his/her medical condition

based on his/her language. Based on Article 61 of the Health Act in South Africa and the convention on the rights of people with disabilities in 2006, health information should be easy to understand to deaf people (21, 38).

Our finding suggested that most of the PswHI usually refer to the closest family member, friends and trusted on normal hearing people (such as teachers and relatives) in case of needing health information. Our findings are consistent with a study in Spain (39) which showed that mothers are an available source of health information. A previous study (40) showed that in comparison with normal hearing individuals, most PswHI receive information related to acquired immune deficiency syndrome from friends (88%) and family (68 percent). Also, findings of Tamaskar et al. showed a significant difference between information resources in preventive medicine in two groups of deaf and people with normal hearing (P<0.05). they indicated that deaf people receive this information from meetings in the Association of the Deaf (0.9 percent compared with zero percent) (41).

According to Chininthorn et al. study (42) , the available sources of health information for PswHI in South Africa were consultation with a doctor without an interpreter. According to the report of the workshops that was held by Non-governmental organizations for the deaf and non-technical consultant, newspapers, deaf friends, parents of a deaf person, friends with typical hearing, events of the institute for the deaf, traditional healer, the Internet, and research team short message services are main sources to provide health information for PswHI. Usually, when people gain new information, they share it with others because they think others need this information too. Sharing information has positive implications, and the authenticity of opinions is one of those advantages (43). Given

the limited general and medical vocabulary in PswHI, sharing inaccurate information is possible; therefore, promoting their misconception in the community. It seems like creating in-person and virtual training opportunities in groups and guide form with the presence of a health education specialist can identify wrong health beliefs in the community and provide more explanation to pave the way for reforming misperceptions. Thus, increased awareness of deaf people about health issues and disease prevention lead to improve their quality of life.

Limitations: Interviews with students were concluded in a short time period due to limited cooperation of management in educational complexes and lack of agreement for further presence of researcher in schools. Participants were mostly educated and were living in Tehran. Thus, the findings might not be generalizable to all PwHI in Iran.

**Conclusion:** PswHI in Iran have poor health knowledge because they do not have access to sources of health information same as those with normal hearing due to the lack of electronic sources health information tailored to cognitive needs. Most of PswHI have difficulty in finding, understanding and evaluating health information and its implications, including reliance on available information and promotion of misconceptions in the deaf community were identified in this qualitative study. Generation of electronic health information sources and their inclusive distribution in the deaf community, effective communication, empowerment in searching and evaluation of deaf people seem to be essential to improve electronic health literacy among deaf people.

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