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Relationship between Health Literacy and Proper Antibiotic Use Awareness in Tehran 2019-2020

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Abstract

Background: Improper use of antibiotics is one of health care problems that can lead to side effects or antibiotic resistance without benefit. This study aimed to evaluate the association between health literacy and knowledge on appropriate use of antibiotics in a population sample from Tehran.

Methods: This was a cross-sectional, descriptive-analytic study on adults aged between 18 and 65 years. Health literacy was measured by the Health literacy for Iranian Adults (HELIA: Health Literacy for Iranian Adults) questionnaire, and awareness about proper antibiotic use was evaluated by a checklist designed based on a literature review and expert's opinion in domains of knowledge and attitude. Both an online Google Forms questionnaire and a paper questionnaire completed by outpatients from particular clinics in Tehran's north, west, or center were used to collect the data. SPSS Version 22 was used to analyze the data.

Results: Out of 359 participants, 59.6% were women, and 66.8% had a university education level. Internet and health care workers were the main sources of health information. The mean score of health literacy was 71.4 out of 100, and 67.4% of the respondents had excellent or sufficient health literacy. The mean antibiotic awareness score was 10.5 out of 13, and the score in the domain of attitude was higher than knowledge. There was a significant relationship between health literacy and awareness about proper antibiotic use ($P < 0.001$). Health literacy was significantly higher in women ($P = 0.001$), people with higher education levels ($P = 0.001$), and financial sufficiency ($P = 0.0038$). Also, there was a significant relationship between awareness about proper antibiotic usage and age ($P = 0.007$) and financial sufficiency ($P < 0.001$) of the respondents. The online questionnaire users were not different in terms of their health literacy, but they were more educated and aware of antibiotics.

Conclusion: The level of health literacy and awareness about the proper use of antibiotics in this study was good. level of health literacy was closely related to knowledge about the proper use of antibiotics, thus, it seems that promoting health literacy may increase awareness about proper antibiotic use.

Keywords: Health Literacy, Antibiotic, Awareness

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Introduction

Improper use of antibiotics is one of health care problems. Antibiotic use without indication or without recommendation of a health care professional may cause treatment failure, side effects like diarrhea, fungal infections, allergic reactions, or antibiotic resistance without harboring any therapeutic benefits. Antibiotic resistance leads to

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↑What is "already known" in this topic:
Improper use of antibiotics is one of health care problems that results in treatment failure, side effects, and antibiotic resistance. Antibiotic resistance results in more hospitalization, deaths, and extra cost on health care systems worldwide. Antibiotic misuse and its associated side effects can be decreased by educating people about appropriate antibiotic use. There is little information on the relationship between health literacy and antibiotic awareness.

→What this article adds:
The level of Health literacy is closely related to knowledge about proper antibiotics use. It seems that promoting health literacy may have effects on the proper use of antibiotics. The internet and social media are 2 popular and highly efficient ways to find health-related information. Modern technology users might be more knowledgeable or have greater education levels, but they might not be more health literate.

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difficulties in future treatment plans when antibiotic use is necessary (1, 2). According to the 2012 World Health Organization report, antibiotic resistance in Europe is responsible for 2500 more deaths and 1.5 billion Euro extra cost each year on the health care system (3).

According to research by Thorpe et al published on 2018, costs of treating antibiotic-resistant infections in the United States doubled between 2002 and 2015 and exceeded 2.2 billion Dollars annually (4). Resistant infections are responsible for an estimated 700,000 deaths annually worldwide, and which, if no action taken, could result in cumulative cost of 100 trillion Dollars by 2050 (5). Most cases of improper use of antibiotics are due to upper and lower respiratory infections (2). In the United States, 75% of antibiotic use is for 5 acute respiratory infections, including nonspecific respiratory tract infections, acute bronchitis, sinusitis, otitis media, and pneumonia (2).

According to a research done by Ghari et al on physicians in Tabriz, Iran, parents pressure physicians to prescribe antibiotics for their ill kids results in an increase in antibiotic utilization in the community (6). Reducing unnecessary patient expectations and demands for antibiotics can be achieved by education about the possible risks associated with antibiotic use (2).

Health literacy is the capacity to obtain, understand, evaluate, and interpret primary health information and services that are needed for appropriate health decision making (7). Health literacy is a package of skills that include reading, listening, evaluation, decision-making, and ability to use these skills in health situations, which is not necessarily related to level of education or general reading ability. Therefore, it is different from awareness or being informed (7). Health literacy affects how patients and health care providers interact, how they take care of themselves, and how they use the health care system. It has been shown that inadequate health literacy leads to improper use of the health care system. In fact, knowledge and awareness by themselves are insufficient to alter behavior in relation to health care issues (8).

Many studies have been done globally and in Iran on antibiotic awareness or health literacy level in different social groups or people with different types of medical conditions. Other studies were done on the relationship between health literacy and the ability of people suffering from different kinds of chronic illnesses like hypertension, diabetes, dyslipidemia, or rheumatologic problems to handle their illness and reach better quality of life. However, few studies globally have investigated the relationship between health literacy and awareness about antibiotics or antibiotic resistance. In a study by Mostafa et al in 2018 on nonmedical students in Cairo, Egypt, students with high levels of awareness about antibiotic resistance had sufficient health literacy and good level of antibiotic knowledge (9). Also, a study done by Muflih et al during the COVID19 pandemic in Jordan concluded that sufficient health literacy is related to high awareness about antibiotics and antibiotic resistance (10). Salam et al (2016) conducted a study in Berlin, Germany, to compare health literacy levels and awareness of antibiotics and antibiotic resistance among those who have used antibiotics or not in the previous year (8).

The aim of this study was to investigate proper antibiotic use awareness and its relationship with health literacy in a sample of Tehran population.

Methods

A cross-sectional descriptive-analytical study was conducted among a sample of residents of Tehran. Adults aged 18 to 65 who could read and write Farsi and who had lived in Tehran for the previous year met the inclusion criteria. Exclusion criteria included being a temporary resident of Tehran or traveler, not being interested in taking part in the study, and being a medical professional or student.

A convenience sample of residents of Tehran was sought simultaneously by an online questionnaire designed in google forms or a paper questionnaire between October 2019 and July 2020. The link of the online questionnaire was shared via social media groups. Paper questionnaires were filled by outpatients of teaching medical facilities affiliated with Iran University of Medical Sciences located in central or west part of Tehran and also outpatients of Dr Bahonar hospital, which is a semi-private hospital located at north of Tehran.

The study tool consisted of a 54-item questionnaire in 3 parts. The first part includes 8 demographic questions. The second part belongs to the Health Literacy for Iranian Adults (HELIA) instrument designed and validated by Montazery et al in 2014 to measure health literacy in Iranian adults living in urban areas (7). This 33-item, 5-choice test assesses health literacy in 5 areas: decision-making, reading, comprehension, assessment, and access. The results are scored from 0 to 100. This tool categorizes the participants in 4 groups of health literacy level: excellent, sufficient, not quite sufficient, and insufficient. The third part is a 13 item checklist based on literature review (1, 8), expert's opinion and World Health Organization multi country awareness survey about antibiotic resistance (11) to measure the knowledge and attitude of participants about proper antibiotic use. The questionnaire was anonymous with an assurance of confidentiality, and prior to filling out the paper version, verbal consent was obtained. The proposal of the study was reviewed by institutional review board of Iran University of Medical Sciences and approved with the following ethic code: IR.IUMS.FMD.REC.1398.381. Lastly, a total of 359 cases, 182 paper and 177 online questionnaires were included for analysis.

Statistical Analysis

SPSS Version 22 was used to analyze the data. Quantitative data with a normal distribution, such as health literacy, were compared using the K-S test, t test, and analysis of variance test; for quantitative data without a normal distribution, such as antibiotic awareness, the Mann-Whitney test or the Kruskal-Wallis test were employed. The relationship between quantitative continuous variables was assessed by the Spearman correlation test. The chi-square test was employed to analyze the qualitative

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data.

Results

Of 359 participants in the study, almost 6 out of 10 were women. The mean age was 42.2 ± 10.4 years. The minimum education level was 5 years (primary school) and the maximum was 20 years (doctorate degree). The mean years of education was 14.8 ± 3.2 years and 240 (66.8%) of participants had university education, which it was more in men than women—104 out of 142 (73.2%) versus 136 out of 213 (63.9%). Table 1 contains more details about demographic characteristics of the participants. The internet was the most popular source of health information for 256 (71.3%) individuals and then health care professionals for 228 (63.5%) individuals.

The mean score of health literacy was 71.4 ± 12 out of 100, with the highest mean score (81.4 ± 14.1) in the field of understanding and the lowest mean score (62.3 ± 18.2) in assessment. Additionally, 56 (15.6%) and 186 (51.8%) individuals had excellent and sufficient health literacy, respectively. More details are presented in Table 2.

The mean score of antibiotic awareness was 10.48 ± 2.2 out of 13 (80.6%), with 6.12 ± 1.6 out of 8 (76.5%) in knowledge and 4.36 ± 1 out of 5 (87.2%) in attitude; thus, there were higher scores in attitude in this population. The result of the Spearman test showed a significant relationship between health literacy and awareness about proper antibiotic use but the relationship was weak ($P < 0.001$; r = 0.255).

Health literacy was higher in women ($P = 0.001$), which was due to significantly higher scores in reading ($P = 0.007$), comprehension ($P = 0.007$), and decision ($P < 0.001$) domains; nonetheless, the score differences in access ($P = 0.346$) and assessment ($P = 0.054$) domains

Table 1. Demographic characteristics of the participants and their relationship with health literacy and antibiotic awareness (n=359)

Variable	N(%)	Health literacy Mean (SD)	Health literacy difference between categories *P*-value	Antibiotic awareness Mean(SD)	Antibiotic awareness difference between categories *P*-value
Gender			0.001*		0.209*
Female	214(59.6)	73.07(11.6)		10.57(2.2)	
Male	145(40.4)	68.94(12.1)		10.35(2.1)	
Total	359(100)				
Age			0.64**		<0.001**
18-30	57(15.9)	70.42(11.7)		9.49(1.9)	
31-40	112(31.2)	72.38(11.6)		10.51(2.3)	
41-50	109(30.4)	70.97(12)		10.93(2.1)	
51-65	81(22.5)	71.30(12.6)		10.55(2.1)	
Total	359(100)				
Education			0.012**		<0.001**
Primary	6(1.7)	65.33(8.9)		7.16(1.2)	
Secondary	109(30.7)	68.29(12.6)		9.70(2.1)	
Associate or Bachelor's	141(39.7)	72.45(11.7)		10.78(2.1)	
Master's or Doctorate	99(27.9)	73.58(11.2)		11.13(2)	
Total	355(100)				
Marriage			0.379*		0.992*
Single	90(25.1)	70.85(12.1)		10.50(2)	
Married	269(74.9)	71.60(12)		10.46(2.2)	
Total	359(100)				
Employment status			0.52**		0.378**
Unemployed	13(3.6)	72.80(13.7)		9.90(2)	
Housewife	106(29.6)	70.51(12.2)		10.20(2.3)	
Student	7(1.9)	75.80(8.8)		10.80(2.2)	
Employee	79(22)	71.52(10.6)		10.95(1.9)	
Self employed	125(34.8)	70.87(12.7)		10.45(2.2)	
Retired	29(8.1)	75.20(11.4)		10.44(2.1)	
Total	359(100)				
Financial sufficiency			0.001**		<0.001**
Sufficient	163(45.5)	73.38(11.2)		10.95(2)	
Partially sufficient	166(46.4)	70.50(12.2)		10.32(2.2)	
Insufficient	29(8.1)	64.65(12.4)		8.90(2.4)	
Total	358(100)				
Insurance coverage			0.54*		0.196*
Yes	300(84)	71.83(11.3)		10.54(2.2)	
No	57(16)	68.72(15)		10.16(2.2)	
Total	357(100)				
Participation			0.972*		<0.001*
Online	177(49.3)	71.44(12)		11.19(1.9)	
Paper	182(50.7)	71.37(12)		9.80(2.2)	
Total	359(100)				

* Mann-Whitney Test
** Kruskal Wallis Test

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Table 2. Level of health literacy and domains in participants (n=359)

Health literacydomain N(%)	Health literacy level			
	Insufficient	Not quite sufficient	Sufficient	Excellent
Reading	56 (15.6)	63 (17.5)	137 (38.2)	103 (28.7)
Access	57 (15.9)	79 (22)	170 (47.4)	53 (14.8)
Comprehension	12 (3.3)	32 (8.9)	148 (41.2)	167 (46.5)
assessment	108 (30.1)	92 (25.6)	118 (32.9)	41 (11.4)
Decision	38 (10.6)	80 (22.3)	158 (44)	83 (23.1)
Health Literacy	16 (4.5)	101 (28.1)	186 (51.8)	56 (15.6)

Table 3. Score of health literacy and domains in different studies that used HELIA questionnaire in Iran

Study Domain Mean(SD)	Hamedani	Montazeri (11)	Mostafavi (12)	Joveini (14)	Solhi (13)
Reading	72.5(18.5)	66.3(23.4)	26.5(33.7)	59.4(25.2)	71(13.3)
Access	68.6(17.3)	64.7(20.8)	51.6(27.3)	69.5(19)	64.(8.7)
Understanding	81.4(14)	74.1(19)	51.6(26.8)	70(23.5)	76.2(10.2)
Appraisal	62.3(18.2)	64.1(20.4)	36.3(26.7)	62.9(22.1)	68.8(12.8)
Decision	72.1(15)	68.8(17.7)	70.1(19)	66.4(16.9)	67.1(11.8)
Total healthliteracy	71.4(12)	68.3(15.2)	53.4(19.8)	65.6(16.9)	69.4(8.8)

Table 4. Percent of correct answer to common questions about antibiotic awareness in different studies

Question	Percent of correct answer					
	Hamedani	Gualano (1)	Salam (8)	Gaarslev (17)	Mostafa (9)	Muflih (10)
Antibiotics can treat bacterial infections (true)	85.5	66.3	86.9	70		
Antibiotics can treat viral infections (false)	72.7	46.1	68.7	43.6		
Antibiotics always treat common cold (false)	84.7	50.3	60.2	80.5	27.2	56.8
Antibiotics always needed for illnesses with fever (false)	79.4				52.9	
I can get antibiotic from pharmacy and use it onmy own decision (false)	90.3		88.7			
I can use antibiotic that where prescribed for a friend or family member with the same symptoms(false)	93		77.1		61	82.2
I can use again antibiotic doctor prescribed me forprevious illness as long as I have same symptoms (false)	85.2					59
I take antibiotics until I feel better not allantibiotics prescribed by doctor (false)	77.7	52.9		61.5	62	81.5
Misuse of antibiotics results in antibiotic resistance(true)	88.3	73.1		73.7		

were nonsignificant.

Regarding employment, housewives scored the lowest on health literacy, while students and retirees had the highest health literacy. Those without a job scored the lowest on antibiotic awareness, while currently employed people had the highest antibiotic awareness.

For 12 out of the 13 questions of the antibiotic awareness checklist, correct answers dominated except for question number 5 (Penicillin injection always works better than oral antibiotic), with 61.3% of the participants choosing the wrong answer. It is noteworthy to note that almost all of the accurate responders to the antibiotic awareness checklist had greater levels of health literacy. With regard to awareness about antibiotic resistance, 88.3% believed that inappropriate use of antibiotics can lead to antibiotic resistance but the difference in health literacy was not significant between them.

There was no difference in age of people who used the paper questionnaire versus the online questionnaire. The mean years of education was 13.44 ± 3.4 years for users of the paper questionnaire and 16.27 ± 2.2 years for users of the online questionnaire. Although there was no significant difference in the level of overall health literacy between the 2 groups, users of the online questionnaire had higher scores in access domains ($P = 0.044$) and users of the paper questionnaire had higher scores in decision domains ($P < 0.001$). people who used the online questionnaire had higher antibiotic awareness levels ($P < 0.001$).

Discussion

Health Literacy

The mean health literacy score in our study was 71.4, with more than two-thirds of participants having excellent or sufficient health literacy, which is higher than other Iranian study results. The main reason can be higher education levels in our study subjects that is a proved influencing factor of health literacy (12-14). A study was done by Tehrani et al in 2007, which was one of the first investigations about health literacy in Iran and they used the Test of Functional Health Literacy in Adults questionnaire that made it the only study in our literature review with a different tool than ours to measure health literacy in Iran (12). The mean score of health literacy in Tehrani's study was 42.7%, and 56.6% of the participants had insufficient health literacy. In that population 17% were illiterate and only 15.6% had university level education. However, in our study, although the inclusion criteria did not allow illiterate people to participate, the least education level was the fifth grade of the primary school, and 66.8% of the participants had university education. In the study of Montazeri et al (13) in 2015, which used the same tool to evaluate health literacy, the mean score of health literacy was 68.3 that was lower than our study; also, the mean years of education was lower (11.96 vs 14.85). The study

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population of Mostafavi et al (14) were 54.5% illiterate and the mean score of health literacy was 53.4. Mostafavi brought up that higher health literacy in men can be as a result of higher education. Additionally, those with more education than a graduate degree had higher health literacy, according to the Maflih et al study (10). Samples from urban areas can have biases. Tehrani et al (12) and Mostafavi et al (14) found that health literacy was higher in urban populations than in nonurban ones, but Tehrani demonstrated that the difference was due to differences in education levels after controlling for confounding variables. The study conducted in an urban population of Tehran by Solhi et al (15) had a mean score of 68.42, which was the closest to our own health literacy. In comparison to other studies, both studies also showed a greater degree of education. Another reason could be the difference in time frames; our study was conducted at least 2 years after earlier research was reviewed, so interventions suggested by those earlier studies may have contributed to the higher health literacy in our study. Additionally, our sampling coincided with the peak of COVID-19 in Iran, which prompted attention, inquiry, and questioning in areas related to health information that may have raised health literacy levels.

In Tehrani et al (12) and Montazeri et al (13) studies, women's health literacy is substantially greater than men's, although in Mostafavi et al (14) study, health literacy is higher in men. There was no correlation between sex and health literacy in studies of Joveini et al (16) or Solhi et al (15), with the exception of a notable difference in comprehension and assessment domains between men and women in Solhi et al's study. Variations in the sample and time range may be the cause of these differences.

There was no difference between age and health literacy in our study but in Mostafavi et al (14) and Joveini et al (16) studies, with advancing age health literacy significantly decreased; conversely, in Solhi et al study (15), the health literacy was higher in people older than 46 years. In Montazeri et al study (13), the lowest health literacy was seen in the age group older than 55 years, with the highest health literacy in people between 35 to 45 years.

Similar to Montazeri et al (13) and Solhi et al (15) studies, we found that the understanding domain had the highest score. The assessment and access domains showed a lower score similar to Montazeri et al (13) study. Table 3 contains more information regarding how the health literacy domains varied between the studies that were examined using the HELIA questionnaire.

The Internet and medical professionals are the 2 main sources of health information accessed by our population. According to the Montazeri et al research (13), the most popular sources of health information were television and radio. Health care workers were found to be the most popular source of health information by Mostafavi et al (14) and Joveini et al (16) studies, whereas Solhi et al (15) reported using the internet as their primary source.

Proper Antibiotic Use Awareness

Awareness about the proper use of antibiotics in our study based on the checklist we created was 80.6% and our study population had more awareness in the field of attitude versus knowledge (87.2% vs 76.5%). Although a direct comparison with other studies on antibiotic awareness was not feasible due to differences in the questionnaires and scoring system, we found that the majority of the time, the right answer to similar questions in our study was higher. Details of comparison between answers to common questions in different studies about antibiotic awareness can be seen in Table 4.

In our study, there was a strong correlation between age and antibiotic awareness, with those over 30 years having a higher level of awareness (Table 1). Gaarslev et al (17) discovered similar results in Australia, showing that persons under 65 yeas more demanded antibiotics for the common cold and the flu, whereas Muflih et al (10) found the opposite, showing that younger people were more aware of the dangers of antibiotics. We did not find any relationship between sex and antibiotic awareness but in Muflih et al (10) study women had better antibiotic awareness. We found a relationship between antibiotic awareness and education level and financial sufficiency of family, but not with marital status and insurance coverage. Additionally, a study by Gaarslev et al (17) found a correlation between education level and antibiotic awareness, showing that those without a university degree were more likely to request antibiotics for the common cold and flu.

Iranians hold the incorrect belief that intramuscular penicillin is more effective than oral antibiotics, as evidenced by our results, which show that 61.3% of respondents selected the incorrect response. Interestingly, those who correctly answered the question had a significantly higher level of health literacy than those who did not.

Despite no difference in health literacy, antibiotic awareness was significantly higher in people who used the online questionnaire. This finding suggests that while individuals with greater familiarity with technology may have higher education and may possess greater knowledge and awareness of certain scientific topics, such as the use of antibiotics, they may not necessarily possess higher health literacy, which is defined as the capacity to evaluate, analyze, and apply the information. Similar research was not found with which to compare this result.

Relationship Between Health Literacy and Proper Antibiotic Use Awareness

In our study, we found a positive correlation between health literacy and awareness of appropriate antibiotic usage in terms of both knowledge and attitude. In a study of Mostafa et al, in Cairo, Egypt, on nonmedical university students, more than one-third (35.1%) showed sufficient health literacy, almost half (49.3%) had not quite sufficient health literacy, and 15.6% had insufficient health literacy (9). Only one-fifth (20.3%) of students had sufficient antibiotic awareness and these were mostly in advanced years of education (between third to fifth years). This can be as a result of more exposure and experience with disease and antibiotic use but this group did not have significant differences in health literacy. Only 7.8% of students had high levels of awareness about antibiotic resistance, and this was independently associated with

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student's sufficient health literacy and antibiotic awareness. Overall health literacy and antibiotic awareness reported low in that study but limiting samples to university student population resulted in not being able to generalize findings of this study to the general population.

The most comparable study to ours, with results that are likewise comparable, was conducted in Jordan by Mufih et al during the COVID-19 pandemic on adults over the age of 18 years, using an online questionnaire (10). In their study also women participated more, almost four-fifth (79%) had university education, and 61% were residents in urban areas. The Single Item Literacy Screener, created by Morris et al (18) in 2006, was used to assess health literacy. The World Health Organization questionnaire was used to assess knowledge of antibiotics and antibiotic resistance (11). In that study, less than two-thirds (62.6%) had sufficient health literacy, almost six-tenths (59.4%) had sufficient antibiotic knowledge, and more than half (52%) had sufficient knowledge about antibiotic resistance. The relationship between health literacy and knowledge about antibiotics and antibiotic resistance reported to be significant so that people with sufficient health literacy had 1.37 times higher antibiotic knowledge and 1.46 times higher knowledge about antibiotic resistance. The awareness of antibiotics was twice as high among those who used them only after speaking with medical professionals as among those who took them at random. Individuals who received COVID-19 vaccinations and those who did not get antibiotics to treat COVID-19 both shown a greater level of antibiotic awareness. Participants with health insurance were 1.38 times more likely to be knowledgeable about antibiotic resistance than those with no health insurance, but we did not find any relationships between health insurance and health literacy or antibiotic awareness in our study (Table 1). One drawback of their research was that it was limited to social media notifications, which could introduce non-response bias and distort the population that does not use the internet. Moreover, individuals who may be particularly worried about the topic of antibiotics may be more inclined to complete the survey, thus resulting in self-selection.

In 2016, Salam et al conducted a study in Berlin, Germany, to compare health literacy and antibiotic knowledge between people who used antibiotics over the past year or not (8). Health literacy levels in that study were close to our study, with 60.9% of participants having sufficient health literacy. Even though the study did not specifically examine the relationship between health literacy and knowledge about antibiotics, it did demonstrate that those with adequate health literacy used antibiotics 0.57 times less in the previous year; conversely, those who used antibiotics during that time had greater knowledge about antibiotics, possibly due to exposure to this topic. Finally, a contributing element to the appropriate use of antibiotics was highlighted: health literacy.

Strengths and Limitations of the Study

This study is one of the first studies globally to assess the relationship between health literacy and antibiotic awareness. By using 2 different methods of sampling, the study was able to include a varying sample of participants, including those without internet access and those unable to complete an online questionnaire.

The HELIA questionnaire that we used to measure health literacy is a self-report tool; thus, results may not be strong enough to determine the personal behavior of participants (7). Because of the COVID-19 pandemic we had limitations to run random sampling; thus, we used available sampling method. For those who participated online, we were unable to clarify items or answer any ambiguities.

Suggestions for Application of Findings

Based on the study's findings, it is recommended that, in addition to educational preparation for antibiotic knowledge, health literacy be promoted. Health literacy has a significant role in enhancing people's function in this area and preventing misbeliefs.

Since the internet is the most widely utilized source of health information, it is very important to regulate and supervise the scientific content on the internet and advise users to only use reliable scientific websites when seeking health information. A focus on health care professionals' training abilities and encouraging them to develop their interpersonal skills and responsiveness makes them a successful and influential source of health information, especially as health care workers are the next most often used source.

Conclusion

According to the findings of this study, the level of health literacy and awareness about the proper use of antibiotics in this sample was good. There was a relationship between health literacy and proper antibiotic use awareness. Improve health literacy can enhance one's knowledge about science-related subjects, such as appropriate usage of antibiotics that might help eliminate myths regarding the superiority of injectable antibiotics like penicillin.

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Ethics Approval and Consent to Participate

Ethical approval was granted by the board members of ethical committee at Iran University of Medical Sciences (Ethical code: IR.IUMS.FMD.REC.1398.381). The questionnaire was anonymous with assurance of confidentiality, and for the paper questionnaire verbal consent was obtained.

Conflict of Interests

The authors declare that they have no competing interests.

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References

1. Gualano MR, Gili R, Scaioli G, Bert F, Siliquini R. General population's knowledge and attitudes about antibiotics: a systematic review and meta-analysis. Pharmacoepidemiol Drug Saf. 2015;24:2-10.
2. Price EL, McKenzie TD, Metlay JP, Campargo CA Jr, Gonzales R. A computerized education module improves patient knowledge and attitudes about appropriate antibiotic use for acute respiratory tract infections. Patient Educ Couns. 2011;85:493-498.
3. WHO. The evolving threat of antimicrobial resistance. Options for action. http://whqlibdoc.who.int/publications/2012/9789241503181_eng.pdf.
4. Thrope KE, Joski P, Johnston KJ. Antibiotic resistant infection treatment costs have doubled since 2002, now exceeding 2 billion dollars annually. Health Aff (Millwood). 2018;37:4:662-669.
5. Holmes EAF, Hughes DA. Challenges for economic evaluation of health care strategies to contain antimicrobial resistance. Antibiotics. 2019;8(166).
6. Ghari T, Mohammadzadeh M, Davatgar Badie L. Evaluation of the effect of patient requests on antibiotics prescription by physicians in Tabriz. Razi J Med Sci. 2017;24(154):44-52.
7. Montazeri A, Tavousi M, Rakhshani F, Azin SA, Jahangiri K, Ebadi M, et al. Health literacy for Iranian adults (HELIA): development and psychometric properties. Payesh Journal of The Iranian Institute for Health Sciences Research. 2014;13(5):589-599.
8. Salam F, Ernsting C, Kuhlmey A, Kanzler M, Gastmeier P, Gallert P. Antibiotic use, knowledge and health literacy among the general population in Berlin, Germany and its surrounding rural areas. PLoS One. 2018;13:e0193336.
9. Mostafa A, Abdelzaher A, Rashed S, AlKhawaga SI, Afifi SK, AbdelAlim S, et al. Is health literacy associated with antibiotic use, knowledge and awareness of antimicrobial resistance among non-medical university students in Egypt? A cross-sectional study. BMJ Open. 2021;11:e046453.
10. Muflih SM, Al-Azzam S, Karasneh RA, Conway BR, Aldeyad MA. Public health literacy, knowledge, and awareness regarding antibiotic use and antimicrobial resistance during the COVID-19 pandemic: A cross-sectional study. Antibiotics. 2021;10:1107.
11. World Health Organization. Antibiotic resistance multi-country public awareness survey. Geneva, 2015. https://apps.who.int/iris/bitstream/handle/10665/194460/9789241509817_eng.pdf.
12. Tehrani Banihashemi SA, Amir Khani A, Haghdoust A, Alavian M, Asghari Fard H, Baradaran H, et al. Health literacy in five province and relative effective factors. Strides Dev Med Educ. 2007;4(1):1-9.
13. Tavousi M, Haeri Mehrizi A, Rafiefar S, Solimanian A, Sarbandi F, Ardestani M, et al. Health literacy in Iran: findings from a national study. Payesh Journal of The Iranian Institute for Health Sciences Research. 2016;15(1):95-102.
14. Chajaee F, Pirzadeh A, Hasanzadeh A, Mostafavi F. Relationship between health literacy and knowledge among patients with hypertension in Isfahan province, Iran. Electron.Physician. 2018;10(3):6470-6477.
15. Solhi M, Jormand H. Assessment of health literacy of municipal employees in Shemiranat, Iran. Electron.Physician. 2017;9(12):6072-6077.
16. Joveini H, Rohban A, Askarian P, Maheri M, Hashemian M. Health literacy and its associated demographic factors in 18-65-year-old, literate adults in Bardeskan, Iran. J Educ Health Promot. 2019;8.
17. Gaarslev C, Yee M, Chan G, Fletcher-Lartey S, Khan R. A mixed methods study to understand patient expectations for antibiotics for an upper respiratory tract infection. Antimicrob. Resist. Infect. control. 2016;5:39.
18. Morris NS, MacLean CD, Chew LD, Littenberg B. The Single Item Literacy Screener: Evaluation of a brief instrument to identify limited reading ability. BMC Fam. Pract. 2006;7(21).

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