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Assessment of Environmental Literacy: A Case Study of Yazd Citizens' Awareness, Attitudes, and Practices in 2017

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ABSTRACT

Introduction: With regard to the importance of the environment in sustainable development along with environmental literacy among citizens, the present study aimed to assess the levels of environmental literacy among citizens residing in the city of Yazd, Iran.

Methods: In this descriptive--analytical study, the sample size was determined based on the Cochran formula of 410 individuals. The data selection tool was also a researcher-made questionnaire comprised of items on demographic characteristics information as well as levels of awareness, attitudes, and practices concerning the environment such as air pollution, waste management, etc. Face validity verified by 10 qualified individuals as the faculty members and Reliability was confirmed by Cronbach's alpha coefficient of 0.93. The collected data was analyzed using the SPSS 22. In this study, significance level was considered as 0.05.

Results: awareness score was statistically significant in terms of age, level of education, and employment status ($p<0.05$). However, attitudes were only in a significant relationship with employment status ($p=0.004$). The relationship between practice score was also statistically significant with regard to age, marital status, and area of residence ($p<0.05$). A significant relationship was further observed between age and level of income and level of awareness, but there was no significant relationship considering attitudes ($p>0.05$). Moreover, a positive correlation was found between awareness, attitude, and practice scores ($0.323\geq r \geq 0.28$, $p<0.001$).

Conclusion: Although awareness among Yazd citizens on some environmental issues was at low levels, in general, their awareness specifically regarding health issues stemming from air pollution was proper. In view of the importance of environmental factors, it is necessary to conduct various research studies to identify and control these factors and find proper solutions.

Keywords: Environmental Literacy, Awareness, Attitude, practices, Yazd

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Introduction

Environmental education refers to the process of training individuals on environmentally-relevant issues to achieve solutions to deal with them, to obtain the required knowledge and skills to gain positive attitudes towards the environment, and to increase motivation in explaining environmental issues (1, 2). The concept of environmental literacy was first introduced in 1968 by Charles representing individuals' knowledge and awareness in relation to the environment (3). Essentially, environmental literacy stands for the understanding of interactions between natural systems and human-social ones (4).

Over recent years, this subject matter has been identified as one of the most prominent sections of environmental education. In this respect, four main areas of environmental literacy take account of environmental knowledge, environmental attitudes, environmental behavior perception, and environmental concerns (5).

The emergence of environmental issues is also associated with human occupation of the environment. Over the past century, factors such as rapid population growth, urbanization, and industrialization of communities has thus had detrimental effects on the environment (6, 7).

Currently, humans are facing a set of environmental issues such as global warming, ozone depletion, and extinction of species that are all affecting life sustainability. The most vital strategy to deal with such environmental threats is to educate people (5).

Besides, the environment provides the necessary materials and the required energy to meet basic human and community needs, and all human activities depend on a sound and sustainable environment. In general, at least one activity performed by the human being can have positive or negative effects on the environment. In this regard, environmental pollution and degradation are now evident as the negative consequences of human activities (7). In addition, the effect of these consequences on the economy and the livelihood of communities should not be neglected. Although, today, many people consider themselves as the environment advocates by virtue of their positive attitudes, they do not behave positively in preserving the environment. Essentially, humans are both the victims and the causes of environmental degradation, such that this era is deemed as the era of environmental crisis. In this regard, environmental illiteracy is what exacerbates this crisis (8).

Nowadays, environmental organizations and institutions are assumed responsible for protecting the environment and maintaining sustainable productivity. Protecting the environment can thus reduce environmental costs incurred by these organizations. Consequently, environmental literacy has become a vital issue among researchers. In general, it is argued that the level of knowledge and perceptions of each individual on environmental issues is related to the desire to participate in environmentally related programs, which is necessary for environmental protection. Although there is a need to change attitudes towards the environment, the education available in this field is insufficient (9, 10). People are only taking measures in preventing the destruction of these resources once they become aware of the value of natural resources and the environment (4, 11).

The most important objective of environmental education is to promote environmental literacy and to reach an improved quality of the environment as well as the development of a sustainable environment (10). Environmental education can also aid individuals to raise awareness and perceptions, and to improve attitudes regarding human activities and the environment (4, 12). According to Lillah, lack of knowledge and awareness concerning environmental issues has restricted any type of individual or organizational measures in relation to the environment (13).

Considering the importance of the environment and its vital role in sustainable development, the present study aimed to assess the levels of environmental literacy (i.e. awareness (namely, knowledge), attitudes, and practices) among

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citizens residing in the city of Yazd, Iran, on the subject of environmental issues and challenges such as air pollution, waste management, water resources scarcity, soil pollution, etc. in 2017.

Methods

In this analytical study, the levels of environmental literacy (i.e., awareness (namely, knowledge), attitudes, and practices) among residents in the city of Yazd, Iran, regarding environmental challenges and issues was assessed. The sample size was determined by 410 individuals as citizens aged over 18 years living in the city of Yazd based on the Cochran formula. Sampling was further done using the Multi-stage sampling method and three clusters were randomly selected and systematic sampling was performed inside the cluster.

The data collection tool was a researcher-made questionnaire consisting of two sections, namely, a demographic characteristics information checklist and a questionnaire related to environmental literacy (i.e., awareness (namely, knowledge), attitudes, and practices). Face validity verified by 10 qualified individuals as the faculty members and Reliability was confirmed by Cronbach's alpha coefficient of 0.93. The awareness questionnaire consisted of 10 items assessing the level of awareness about issues related to water, air, waste, sewage (domestic/municipal wastewater), as well as green areas and parks, urban industries, energy and fuel consumption in homes, industrial development and relevant pollution, and city cleanliness. For each item, the correct and incorrect answers were respectively scored as one and zero. The total score of this questionnaire was from zero to 10 and this interval was divided into three parts of poor awareness, moderate awareness, and high (i.e. proper) awareness. Higher scores could thus indicate higher levels of awareness. The attitude questionnaire was similarly comprised of 15 items, scored using a five-point Likert-type scale (viz. totally agree, agree, undecided (viz. neutral), disagree, totally disagree) such that the maximum score was 75 and the minimum one was 15. The attitude categorization was further obtained based on the mean of an individual's total score (in two groups of less than average and equal to/greater than average). The practice questionnaire was correspondingly made up of 24 items, scored using a four-point Likert-type scale (namely, always, usually, sometimes, never) such that the maximum and minimum scores were respectively by 96 and 24, whereas the higher score could show more favorable practices.

The collected data was analyzed using the SPSS 22 software through descriptive statistics along with Mann-Whitney U test, Kruskal-Wallis test, and Chi-Square test in addition to Spearman's correlation coefficient (r). In this study, significance level was considered as 0.05.

Ethical Considerations

This study was confirmed by the Ethics Committee (ethics code: IR.SSU.SPH.REC.1395. 164) affiliated to the School of Public Health at Shahid Sadoughi University of Medical Sciences, Yazd, Iran.

Results

In this study, a total number of 404 questionnaires were completed and assessed. Based on the obtained results, 55.4% (n=224) of the respondents were male. As well, 53.5% of the study participants were married. In terms of age, the majority of these individuals (40.1%) were in the 18-to-27-year-old age group. With regard to level of education, most of the participants had at least a Bachelor's degree (31.2%). Students also had a higher share of the employment status frequency distribution (33.4%). With respect to area of residence, 64.1% of these individuals were residing in District 2. Moreover, 51.3% (n=207) of the respondents believed that the main environmental issues in the city of Yazd were water deficiency and pollution. Besides, 28.8% (n=116) of the cases stated that Iran's main electricity source was coming from fossil fuels. The bulk of the participants (73.7%, n=298) similarly considered colors, solvents, and batteries as hazardous waste and only 30.4% (n=123) of the respondents believed that bricks

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and industrial furnaces were the causes of air pollution in the city of Yazd. Moreover, 79% (n=319) of the participants deemed that recent droughts had affected air pollution. In addition, 61.4% (n=248) of the individuals reflected on compressed natural gas (CNG) as a less polluting fuel. Only 46.9% (n=189) of these individuals believed that waste needed to be buried upon collection. As well, 47.3% (n=191) of the participants considered uncontrolled use of agricultural fertilizers, industrial activities, and sewage (domestic/municipal wastewater) as the reasons for soil contamination. Additionally, 60.3% (n=244) of the respondents stated that unsanitary dumping of waste was the main cause of soil and water pollution. Furthermore, 36.8% (n= 149) of the participants thought that three factors of population, excessive water resources usage, and drought were the main reasons for reduction of available water resources.

Based on the results outlined in Table 1, representing the relationship between awareness, attitudes, and practices among the study participants in terms of demographic characteristics, there is a statistically significant relationship between awareness score and age (p=0.037) level of education (p=0.004), and employment status (p=0.033). The relationship between practice score and age, marital status, and area of residence were also statistically significant (p<0.05).

Table 1. Interquartile Range and Median scores of individuals' awareness, attitudes, and practices

Category		Awareness		Attitude		Practice	
		*IQR	Median	IQR	Median	IQR	Median
Gender	Male	3	5	10	65	11	66
	Female	3	5	8	64	١١	66
	p**	0.274		0.106		0.739	
Marital status	Single	2.75	5	10	64	11	65
	Married	3	5	8	64	10	67
	**P	0.037		0.356		< 0.001	
Age (years old)	18-27	2	5	9	63	١١	٦٥
	28-37	3	5	11	64	10	69
	38-47	4	5	9	65	8	65
	48-57	2	4	8	64	9	67.5
	58-68	2	4	9	65	11	72
	p***	0.037		0.356		< 0.001	
Level of education	Illiterate	2	5	7	62.5	9	69.5
	Under high school diploma	3	5	10	65	10	66
	Associate's Degree	3	5	8	65	10	65
	Bachelor's degree	4	5	9	65	13	68
	Master's degree and PhD	3	5	9	63	11.25	66
	p***	0.004		0.626		0.449	
Occupation	Employee	3	5	10	64	9	66
	Academic	3	5	9.25	63	11	66
	Student	3.5	3.5	8.5	62	14.5	65.5
	Housewife	2.75	5	7.25	65.5	7.75	68
	Self-employed	3	5	9	65	13	67
	p***	0.033		0.004		0.677	
Area of residence	District 1	3	5	9	64	10	66
	District 2	3	5	9	64	11	65
	District 3	5	5	9	63	14	73
	p***	0.12		0.438		0.031	

* Interquartile Range
** Mann-Whitney U test
*** Kruskal -Wallis Test

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Table 2 presents descriptive statistics of awareness, attitude, and practice scores. The mean and SD values of these scores were respectively 4.92±2.17, 66.53±7.7, and 66.81±7.78. The results indicated that the attitude score obtained by the majority of the participants (51.5%) was lower than moderate level, but awareness and attitude scores were mostly moderate (Table 3).

Table 2. Mean±SD of awareness, attitude, and practice scores

Variable	Mean	SD	Min	Max	25th percentile	50th percentile	75th percentile
Awareness	4.92	2.17	0	10	3	5	6
Attitude	66.53	7.7	43	90	61	66	72
Practice	66.81	7.87	43	91	61	66	72

Table 3. Frequency of awareness and attitude scores

	Variable	No.	%
Attitude	<Mean	208	51.5
	>Mean	196	48.5
Awareness	Poor	162	40.1
	Moderate	191	47.3
	High (Proper)	51	12.6
Total		404	100

A significant relationship was observed between age, level of income, and level of awareness but there was no significant relationship with regard to attitudes (p>0.05). No significant relationship was also reported between gender, level of education, marital status, area of residence, level of awareness, and attitude (p>0.05). With refer to Table 4, a significant relationship was found between level of attitude and occupation whereas such a relationship was not approved concerning level of awareness.

Table 4. Relationship between occupation and attitudes

Occupation	Attitude	<Mean	>Mean	P*
Employee	N	52	46	
	%	53.1	46.9	
Academic	N	79	56	
	%	58.5	41.5	
Student	N	12	4	0.014
	%	75	25	
Housewife	N	18	20	
	%	47.4	52.6	
Self-employed	N	47	70	
	%	40.2	59.8	

*Chi-square

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Since awareness, attitude, and practice scores did not follow a normal distribution, Spearman's rank correlation coefficient was utilized to assess relationships. Table 5 shows a positive and significant correlation between awareness, attitude, and practice scores.

Table 5. Correlation between awareness, attitude, and practice scores

Variable		Awareness	Attitude	Practice
Awareness	Correlation Coefficient	1		
	p			
Attitude	Correlation Coefficient	0.323**	1	
	p	0.000		
Practice	Correlation Coefficient	0.292**	0.28**	1
	p	< 0.001	< 0.001	

** Significance level of 0.01 in Spearman's rank correlation coefficient

Discussion

Given the importance of protecting the environment and its fundamental role in sustainable development as well as reducing the detrimental effects of human activities on the environment, environmental literacy is currently regarded as an essential factor. Among all behaviors, knowledge is also regarded as a tool to surpass psychological barriers such as ignorance and aberration. For this reason, it is vital to measure individuals' prior knowledge (14). This study aimed to assess environmental literacy (i.e., awareness (namely, knowledge), attitudes, and practices) among citizens residing in the city of Yazd, Iran, in relation to environmental issues and challenges in 2017.

The study results also demonstrated that the level of awareness in 47.3% of the participants regarding the environment was moderate, which was approximately similar to the findings reported by Aminrad et al. (15) and Oguz and Kavas (16) with reference to the adequate or inadequate nature of the individuals' environmental awareness. However, these results were not consistent with the findings obtained by Hooshmandan Moghadam Fard et al. and Salehi, reporting higher levels of awareness (17, 18).

Today, extensive mass media and communication technologies that are available as well as existence of several environmental crises are making governments invest significantly in producing television, radio, and printed programs in this field, so higher levels of awareness would seem more likely. Maybe the reason for moderate levels of awareness is that the subject of energy is specialized and less general, which entails lower levels of awareness with regard to this subject. In terms of assessing the use of mass media (with emphasis on television), enhancing teachers' environmental literacy by Shobeiri et al. (2012) correspondingly showed a statistically significant relationship between watching mass media and levels of knowledge, attitudes, practices in general and teachers' environmental literacy (19). The results of the survey by Mesdaghinia correspondingly meant that over 80% of people had gained awareness through television whereas newspapers and social dialogues as means of awareness were the next ones, suggesting the prominent power of television in informing individuals about environmental health issues (20). Therefore, it seems more beneficial to make use of this medium in progressing health programs, namely, health education, and to produce appealing environmental documentaries in which experts explain relevant issues at the end of the programs.

Over recent years, following the widespread acceptance of virtual networks, it is recommended to create groups or channels on social networks in order to utilize mobile phones efficiently and acquire adequate information appropriate to

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users' age and levels of education to provide and share necessary information as well as informative environmental content.

Based on the given assessment, 51.3% of the respondents believed that the most prominent environmental issue in the city of Yazd was water deficiency and pollution. As well, 28.8% of the individuals declared that the most important source of electricity in Iran was fossil fuels. The results of the research conducted by Shobeiri et al. (2015) on teaching energy literacy to operationalize environmental behavior also showed a significant relationship between energy literacy, energy saving, and environmental protection. Moreover, teaching energy literacy was directly correlated with the mentioned factors. Therefore, enhancing the levels of energy literacy among students could enhance the levels of energy saving, environmental behaviors, and environmental protection (5, 12, 19).

Referring to the studies by Karimzadegan and Meiboudia along with Erdogan et al. on the analysis of academic education goals with the approach of environmental literacy components in Iran and Turkey, the most favorable way to provide environmental awareness during childhood is through the production of a new and independent syllabus in this field (4, 21). Social education textbooks should further allow for students' emotional tendencies towards the environment and cognitive skills they utilize to deal with environmental issues. In addition, a study conducted by Karatekin (2012) on environmental literacy in Turkey primary schools social studies textbooks had shown that such textbooks had not sufficiently addressed environmental literacy components (6).

Besides, the practice score was also at a moderate level, which was predictable since environmental protection should not be expected from individuals with this inappropriate level of awareness. It should be assumed that people often exhibit behaviors that are not environmentally friendly even with high levels of environmental literacy because they may think that their behavior will not affect the environment (14).

In a study by Owusu on environmental literacy among employed students in Ghana in 2017, environmental literacy had been relatively inadequate and most respondents were merely familiar with the term corporate social responsibility (CSR), resulting in a higher average score in all cases, whilst water use, waste management, global warming, and renewable and non-renewable natural sources had been recorded above the overall average score (10).

The attitude score of most respondents in the present study was lower than moderate level, which was inconsistent with the results of the study by Saribas et al. (2014) on the relationship between environmental literacy and self-efficacy beliefs towards environmental education. They had further reported relatively high levels of attitudes, concerns, and environmental issue perceptions even though they did not possess environmental literacy or sufficient self-efficacy in relation to the environment (5).

In the present study, there was no significant relationship between gender, level of education, marital status, area of residence, level of awareness, and attitudes. Salehi Emran et al. (2008) had similarly assessed primary school teachers' environmental knowledge, attitudes, and skills in Mazandaran Province, Iran, showing positive attitudes in female teachers compared with their male counterparts. Furthermore, male teachers' environmental literacy had been higher compared with female ones (18). Arbaat et al. (2011) had also reported a significant relationship between gender in terms of knowledge, awareness, and practices in relation to the environment. However, there was a significant difference in attitudes among female students compared with their male peers (22). In the study by Marzban et al., women's awareness had been also reported higher compared with males (23). This was also true among married individuals compared with singles. Evans et al. had further conducted a study in New York, the United States, in which awareness with regard to environmental risks

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among women residing in Manhattan had been high (24).

The awareness score was statistically significant in relation to age, level of education, and employment status. In this study, it was observed that students enrolled in the field of science had higher awareness compared with those in other fields, but there was no significant relationship between students of other fields in terms of attitudes and practices (22).

In this study, occupation was additionally considered as an effective factor in levels of awareness even though it did not shape attitudes. The results of an assessment on pre-employed teachers' environmental literacy in Turkey, as a measure for the development of teacher training programs by Tuncer et al. (2009), had also revealed that efforts to revitalize the curriculum in Turkey were promising. In addition, teachers' environmental background prior to employment could be positively related to their environmental literacy and attitudes (25). The opportunities and facilities offered and the sense of efficiency may thus play an effective role in promoting environmental literacy (8).

Based on the study results, awareness, attitudes, and practices of the participants concerning some environmental issues seemed to be inadequate. Considering that environmental risks are increasing at local and global scales and environmental pollution particularly air pollution is continuously growing due to various reasons e.g. rapid population growth, higher number of cars, non-standard cars in terms of environmental criteria, etc. in Iran, especially in large cities, and given the role of environmental factors regarding community health due to the expansion of automated life specifically in major cities, it is necessary to conduct various research studies to identify and control these factors. Intervention studies identifying appropriate solutions and operationalizing them are of extremely high priority in this regard.

It is of note that cultural beliefs also provide a broad stage to improve the management of environmental issues. Therefore, understanding and identifying practices in various cultures may be vital in taking the first steps towards promoting resource management among cultural groups to prevent conflicts and to resolve environmental issues (26). The implementation of educational and informative programs based on the cultural foundations of various communities in different regions of Iran may be effective in improving awareness in citizens regarding environmental pollution control institutions and their cooperation with these institutions for efficient management of environmental pollution control. Considering people's reception of health plans such as those to eradicate viral contagious diseases, providing education for citizens to improve their awareness of environmental pollution and resulting diseases may entail increased cooperation in this field. Besides, producing participatory and encouraging programs for families and citizens may be useful and worthwhile. Inter-organizational cooperation within entities active in the field of environmental pollution control and allocation of sufficient financial resources in this regard may aid in further advancing of the objectives of these organizations.

Among the respondents, 61.4% of the cases reported CNG as a less polluting factor. Based on a study conducted in Denmark, automobile fumes and wood scraps had been also mentioned as the most prominent sources of airborne particles whilst the main reason of human exposure to these particles in open environments was their high density especially in urban areas that were also more densely populated (20, 27).

Considering the importance of the environment and its vital role in sustainable development, in this study were investigated the level of environmental literacy (i.e. awareness (namely, knowledge), attitudes, and practices) among citizens residing in the city of Yazd, Iran. one of the limitations of this study was the collection of the required data through a questionnaire, assuming that the respondents' answers were honest and accurate, but some respondents may not be so. Information was also collected using a

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self-report, so some items may not have been answered accurately by the participants.

Conclusion

Although awareness among Yazd citizens on some environmental issues was at low levels, in general, their awareness specifically regarding health issues stemming from air pollution was proper. In view of the importance of environmental factors, it is necessary to conduct various research studies to identify and control these factors and to carry out further intervention studies to find right and proper solutions before their implementation.

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Conflict of Interest

The authors declared no competing interests.

Author contribution

H.M. Writing and Formal Analysis, A.A. E Investigation and Supervision, M.Kh, Z.Sh, M.Gh Writing and Methodology, H.R Formal Analysis, J.V. Present Idea, H.M, M.Gh and A.A. E Review and Editing, R.M, A.A and F.P. Data collection.

All authors read and approved the final manuscript and are responsible about and question related to article.

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