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Predicting environmental behavior by relying on water consumption behavior based on environmental awareness, attitude and concern

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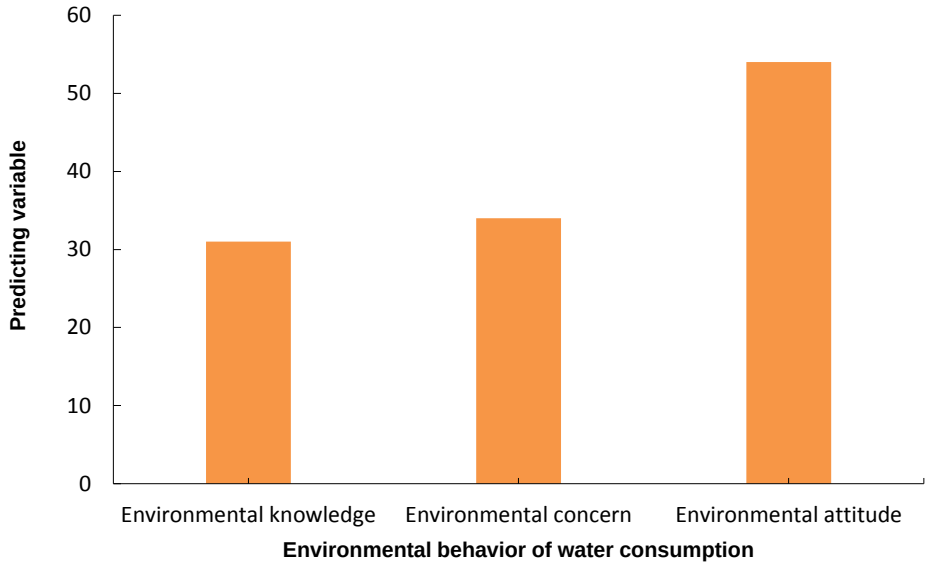
GRAPHICAL ABSTRACT



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ABSTRACT

Water is one of the most important resources on earth. However, due to the drought crisis in Iran and the need to save water and study the determinants, this study was conducted to predict environmental behavior by relying on water consumption behavior based on environmental awareness, attitude, and concern. The research is a survey in which 865 citizens of Kermanshah City answered the research questionnaires by cluster sampling. The data was analyzed by statistical methods using SPSS software. The results showed that the variables of environmental knowledge (31 %), environmental concern (34 %), and environmental attitude (54 %) have the ability to predict the environmental behavior of water consumption. Therefore, people with higher knowledge, concerns and environmental attitudes are more diligent in saving water. According to the results of this study, explaining environmental behavior using three variables of environmental knowledge, environmental attitude, and environmental concern can be suggested to implementers and policymakers for use in developing interventions and educational campaigns and raising people's environmental awareness and knowledge. Also, these results can increase the paying attention to their environmental attitudes toward water consumption, can demonstrate that water conservation is realistic and practicable for people, and can convince them that they can engage in conservation-related behaviors. These results have the potential to raise people's awareness of their environmental attitudes about water consumption, illustrate that water conservation is feasible and achievable for them, and persuade them that they can engage in conservation-related actions.

1. Introduction

Water is one of the most valuable environmental factors that plays an important role in human life and health (Tavakoli. 2012). Today, water scarcity and pollution are seriously endangering the lives of millions of people on earth, especially in poor countries. Statistically, 80 % of the world's population has access to only 20% of safe water supply. Diseases caused by polluted water are also the cause of many

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deaths in the poor countries of the world. Therefore, with over-harvesting and pollution of water resources, the water crisis will intensify day by day and political and social tensions in the global arena will increase, especially in arid and semi-arid countries (Akbari et al. 2020). Increasing demand for water has put pressure on water supply systems, and this has created environmental problems such as overuse of water resources and upsetting the balance of the ecosystem (Maleki et al. 2014).

One of the main areas of water consumption is domestic water consumption. About forty years ago, the United Nations defined the concept of water consumption pattern as the right of people to meet their basic water needs as "All people, at any stage of development and in any social and economic conditions, have the right to access drinking water, both quantitatively and qualitatively, to meet basic needs," (Jalil Khani. 2009). This concept was endorsed in 1992 at the Rio Land Conference and in 1997 at the UN General Assembly on the Development and Use of Water Resources, stating that priority should be given to meeting basic needs and preserving ecosystems (Esmaili. 2007). In addition, it was stated that water planning is essential to meet basic human needs and to develop water strategies in order to preserve the ecosystem (Nazarzadeh et al. 2003). Water comes from the natural sources. Thus, its use must be carefully regulated to ensure that there is enough to meet present demands without causing environmental degradation. Due to the fact that a significant amount of water consumption is spent on household consumption, increasing demand for water has put pressure on water supply systems, and this has led to environmental problems such as overuse of water resources and upsetting the balance of the ecosystem. The increasing demand for water also creates water waste.

On the other side, many nations are currently experiencing water shortages, and it is expected that many more countries will be experiencing water shortages by 2025 unless aggregate demand is reduced (Asadollah Zadeh Mousavi. 2011). Iran is no exception, and with consecutive droughts, limited water resources, and an expanding population on one side, and inefficient water usage on the other, it requires scientific and practical planning to boost water productivity (De Vaus. 2004).

Although the pattern of water consumption varies according to climatic conditions, lifestyle, culture, technology, and the economy, unfortunately, there is no data needed to estimate the actual amount of water needed to provide the minimum pattern for life (Flick. 2008). Improving household water consumption behavior can reduce the pressure on water supply, but this requires understanding water consumption behavior and the factors affecting it. Understanding the factors affecting the behavior of home water consumption is very important for proper management of water consumption and storage. In fact, in the light of scientific knowledge, water consumption demand can be managed by reducing consumption, consumption efficiency is improved and resources are prevented from being contaminated or destroyed (Babbie. 2007).

Treatment of natural resources, including water, depends on various individual, social, and economic factors. One of the most important individual factors is attitude. Attitude refers to how a person's motivational, emotional, perceptual, and cognitive processes are organized throughout time in response to certain features of their environment. For this reason, attitude reflects the way one thinks, feels and reacts to the environment (Hawkins et al. 2012). An attitude can also be a combination of beliefs and emotions that prepare a person in advance to look at others, objects, and groups in a positive or negative way. For this reason, attitudes guide human actions or behaviors by summarizing evaluation of phenomena. Some believe that the type of attitude towards the environment is rooted in the value system of individuals (Schultz. 2000), and if the attitude of individuals changes, their behavior will also change. The second view holds that behavior change will also change attitudes in individuals (Khaksar Moghaddam et al. 2016). In general, a person's attitude towards a subject can affect his behavior towards the subject (Khodabakhshi et al. 2011).

It is important to examine the attitude of the environment because it can be used to answer the question of the extent to which environmental beliefs cause appropriate behaviors (Abedi Sarvestani. 2010). At the same time, it should be noted that attitudes are not the only factors that constitute human behavior towards the natural environment. For example, studies have indicated that many people consider themselves pro-environmental, but do not act on their positive attitudes in order to protect the environment (Ferdowsi et al. 2007; Abedi Sarvestani 2011). One reason is that other situational variables (such as mental norms, personality, level of control over behavior, and cost) can affect a person's behavior (Abedi Sarvestani. 2011). At the same time, the study of environmental attitudes has been examined in various studies, so that some studies have introduced environmental attitudes as a strong predictor of environmental behaviors (Kaiser et al. 1999).

In a study conducted by Nazarzadeh et al. (2003), people were not concerned about water shortages, but they were dissatisfied with water quality, and the majority of their attitudes were positive toward water conservation. And Shahroudi et al. (2007) concluded that education, irrigated area, annual income, extension calls, social capital components, irrigation status from the perspective of rain water and the status of farmers' participation in the field of irrigation network management, have a positive and significant relationship with farmers' attitudes towards participation in rain water cooperatives.

Furthermore, some researchers have stated that environmental concerns affect positive norms and increased control of the situation; thus, people who are concerned about the environment influence the behavior of others through the pressures of family and friends (Saut and Saing (2021), Zhang et al. (2019), Bhutto et al.

The researchers concluded in their studies that a set of variables are always involved in shaping environmental behaviors and the role of a factor in environmental behaviors is not tangible (Akbari et al. 2020) . Accordingly, among the various factors affecting the formation of water consumption behavior, the role of environmental attitudes is prominent, and therefore, in the present study, its role in shaping environmental behavior (with emphasis on domestic water consumption) was investigated. In addition, in this research the relationship between these variables and the environmental behavior variable (based on household water consumption behavior) was investigated. Finally, the role of these variables in predicting the variable of household water consumption was determined.

2. Materials and methods

In terms of gathering data, the method utilized in this study is implemented in terms of purpose and field. It was carried out using descriptive research and survey approaches. All people aged 20 to 65 residing in urban and rural areas of Kermanshah city in 2018 and 2019 in the west of Iran were included in the statistical population of this study. Sampling was performed in two stages as follows: First, to evaluate the validity and reliability of the questionnaires, a multi-stage cluster sampling method was used. The sample size of 880 people was determined and selected by multi-stage cluster sampling from multiple urban and rural areas of Kermanshah City, for 176 items used in the present study. Two neighborhoods from each district and 15 households from each neighborhood were selected by simple random sampling. According to the 2016 census, 10 villages were chosen from 86 villages in Kermanshah, and 10 households from each village were picked using a multi-stage cluster selection approach. It should be noted that 6 questionnaires were incompletely filled out and 7 questionnaires were discarded due to incomplete data. Finally, 867 questionnaires were analyzed in the hypothesis testing stage. Sample size determination formula in structural equation modeling methodology: $Q < n < 15Q5$.

Research tools

The Environmental Attitudes Scale: Ten questions designed by Dunlop et al (2002) are used to measure environmental attitudes. Respondents were asked to express their views and beliefs about ten items in order to measure this variable. The categories "I strongly agree," "I agree," "I have no opinion," "I disagree," and "I strongly disagree" are ordered in order of priority on the assessment spectrum. This questionnaire has been validated by Emamgholi (2011). The Pro-Environmental Behavior Scale: Readiness and tendency to take practical action to improve environmental issues (Ajzan. 1995) refers to biological performance. The Environmental Behavior Questionnaire is adapted from the Kaiser et al. (1999) questionnaire. The questionnaire includes questions about how people perform behaviors such as recycling, energy saving, and information about how people engage in environmental activities, and is ranked with priority given to categories that are very low, low, medium, high, and very high, respectively. Participants are asked to answer questions according to their performance. The validity of the questions was confirmed through formal validity, so that the research questions were provided to a number of environmental experts, based on which the questionnaire questions were finalized. The reliability of the questions was assessed using Cronbach's alpha coefficient, which was calculated for the environmental attitude variable (0.85) and for the environmental behavior variable (0.78) and confirms the reliability or reliability of the assessment tool (Shobiri. 2016).

Environmental Concern Questionnaire: This questionnaire has 9 questions and its purpose is to assess the level of environmental concern of individuals. The questionnaire is scored as a 4-point Likert spectrum (I am not worried at all = 1, I am a little worried = 2, I am very worried = 3, and I am very worried = 4). To get the total score, the total score for each question is calculated. This score will range from 9 to 36. Achieving a high score on this scale means a higher environmental concern for the respondent. In Salehi et al. (2012) research, the face validity of this scale has been confirmed by the relevant professors. Also, the reliability of this questionnaire was evaluated using Cronbach's alpha, which was 0.89.

Environmental Awareness Questionnaire: According to Arcry et al. (1990), environmental knowledge is the practical information that individuals have about the environment, the earth's ecological problems, and the impact of human actions on the environment. To implement it, the standard 6-item environmental knowledge questionnaire by Daniar et al. (1987) is used. Cronbach's alpha had a reliability of 0.82 in the research done by Haghighatian (2014). Descriptive statistics (i.e. calculation of mean, standard deviation, and Pearson's zero-order correlations) were used to analyze the data with SPSS-23 software.

3. Results and discussion

According to the descriptive results of demographic variables, out of 867 respondents, 557 (64.2 %) were female and 310 (35.8 %) were male, most of whom were in the age range of 25-35 years old. 35.5 % of them had a university degree, 456 (53.6 %) were single and 369 (425.6) were married. Of these, only 59 (6.8 %) were members of environmental protection associations. But based on the descriptive results of research structures, the average environmental knowledge was 3.38 ±1.61, environmental concern was 24.28 ±6.64, environmental attitude was 21.76 ± 4.66 and environmental behavior of water consumption was 18.56 ±7.5 (Table 1).

Environmental knowledge predicted 46 % of the variance for environmental behavior of water consumption, environmental concern predicted 58 % of the variance for environmental behavior of water consumption, and environmental attitude predicted 83% of the variance for environmental behavior of water consumption. Also, environmental knowledge, environmental concern, and environmental attitude have 31 %, 34 % and 54 % ability to predict the environmental behavior of water consumption, respectively (Table 2).

Table 1. Correlation matrix of research variables with environmental behavior of water consumption.

Variable	Environmental knowledge	Environmental concerns	Environmental attitude	Environmental behavior of water consumption
Environmental knowledge	1	-	-	-
Environmental concerns	0.25**	1	-	-
Environmental attitude	0.50**	0.60**	1	
Environmental behavior of water consumption	0.27**	0.36**	0.57**	1

**P<0/01

Table 2. Predicting the environmental behavior of water consumption based on study variables.

Model	Non-standard coefficients		Standard coefficients	t	Significance level	The coefficient of determination	F	Significance level
	B	Error standard deviation	Beta					
Constant value	5.69	1.18		4.79	0.001			
Environmental knowledge	0.57	0.11	0.46	4.94	0.001	0.31	158.6	0.001
Environmental concern	0.24	0.04	0.58	6.98	0.001	0.34	105.7	0.001
Environmental attitude	0.10	0.05	0.83	2.11	0.035	0.54	198.8	0.001

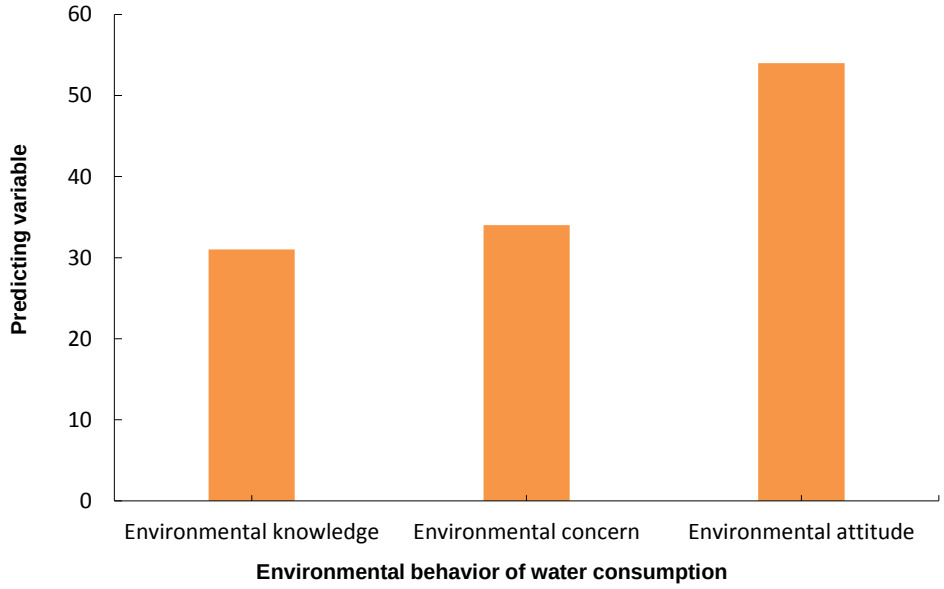

Fig. 1. Predicting the environmental behavior of water consumption based on study variables.

The aim of this study was to investigate the prediction of environmental behavior of water consumption based on environmental knowledge, attitude and concern. The descriptive results of the study indicate that the average environmental behavior of water consumption was 18.56, which is lower than the actual average. In study of Maleki et al. (2014) the average behavior of water consumption was 36.25 (of 45), In addition, the results show that environmental knowledge, environmental concern and environmental attitude can predict and explain the environmental behavior in water consumption. These results are consistent with the results of research conducted by Powell et al. (2021), Zhang et al. (2019), Bhutto et al. (2019), Modi and Patel (2016), Albireck et al. (2012), Song and Bakht (2015) Khaksar

Moghadam et al. (2016), Maleki et al. (2014), Talebi Soomehsarai (2013), Aghaei Abyaneh (2013), Kalantari et al. (2016) and Biranvand et al. (2019). Attitudes are important because they can affect people's behavior. In the last years, various studies have been conducted on the relationship between attitudes and environmental behavior that most of them have concluded that understanding people's attitudes is important to examine their behavior with the environment and its resources. Another result of this study was the relationship between environmental knowledge and environmental behavior based on water consumption behavior and the ability to predict water consumption behavior based on environmental knowledge. One of the reasons for extravagance or non-observance of optimal consumption patterns could be the lack of knowledge about these patterns. Many undesirable behaviors are due to not knowing the outcome of the desired behavior and how to achieve it. Environmental concern refers to the level of awareness and effort of individuals in the field of environmental problems and shows the behavior of the individual to protect the environment. Also, the results of this study are consistent with the study of Nawah et al. (2012) that stated there is a positive and significant relationship between behavioral beliefs and environmental behaviors, between normative beliefs and environmental behavior, between environmental attitudes and environmental behavior, and between individual norms and environmental behavior, and between the intention to perform behavior and environmental behavior. The human attitude to the environment and its importance in predicting environmental behaviors has long been considered by researchers. In recent models for measuring attitudes, it is assumed that knowledge of specific realities affects attitudes toward them. For example, Ajzan (1989) states that if people are not convinced that certain factors play a role in the destruction of the environment, they will not have a negative attitude towards it and human knowledge of the environment will affect the way they view the environment. The type of attitude towards the environment can include the unrepeatable teachings of environmental resources, or it can be assumed that environmental resources are recreated and replaced after each use and even destruction. These can be attitudes with specific or generalist preferences. According to the results of this study, several suggestions can be made for implementers and policymakers as well as researchers interested in the culture of water consumption behavior. According to the present study's results, explaining environmental behavior by relying on water consumption with three variables of environmental knowledge, environmental attitude, and environmental concern can be suggested to implementers and policymakers for awareness in designing interventions and educational campaigns and raising people's environmental awareness and knowledge. Environmental behavior also considers their environmental attitude toward water consumption, which demonstrates that water conservation is doable and practicable for individuals, which also encourages them to engage in conservation-related behaviors. Creating a culture through the media and launching media campaigns can raise public knowledge of measures to conserve water and, as a result, improve environmental outcomes.

4. Conclusions

In this study, showed that environmental knowledge, environmental concern and environmental attitude can predict and explain the environmental behavior in water consumption. So citizens with more environmental understanding have better water consumption habits.Also, lack of awareness and the correct way of a subject can be one of the main reasons for making a mistake in this field. The higher the environmental awareness and knowledge of people, the more environmental concerns they have, which in turn increases the optimal water consumption behavior. One of the basic assumptions in environmental studies is that many environmental problems can be solved by increasing public awareness about the environment. In other words, environmental awareness is believed to be the key for solving many environmental problems.

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