

Personal, Social, and Environmental Factors Associated with the Behavior of Plastic Bag Use among Urban Residents: A Study with Socioecological Approach

Abstract

Background: Disposal and release of plastic bags in the environment can cause environmental, economic, and social problems. The aim of this study was to explore the determinants of the behavior of plastic bag use (BPBU) among residents using socioecological approach (SEA). **Methods:** In this cross-sectional study, multistage random sampling was employed to enroll 400 residents in Hadishahr County, North West of Iran. A valid and reliable instrument based on SEA variables was used. **Results:** Hierarchical multiple linear regressions were performed with SEA and BPBU as outcome variables. Predictors of outcome variables were classified into four different blocks. Demographic characteristics and SEA constructs explained 50% of the observed variance in BPBU. In the first block, age ($P = 0.03$) and purchase frequency ($P = 0.902$) were significant predictors of BPBU ($R^2 = 0.34$), and in the third block, access to alternatives in environment ($P = 0.01$) was significant predictor for BPBU ($R^2 = 0.49$). The majority of residents (47%) were taking home 6 to 10 plastic bags and more than 10 freezer bags after their shopping per week. **Conclusions:** Health-care providers may consider purchase frequency and SEA as a framework for developing educational, environmental, and social interventions aiming at reducing the consumption of plastic bags.

Keywords: Environmental factor, personal factor, plastic bag, social support

Introduction

Concerning the current status of massive solid waste produced by the world population, there should be new and efficient approaches to manage the wastes and provide a healthy environment to live not only for now but also for the next generations.^[1] Plastics and especially plastic bags are largely consumed which constitute more than 20% by volume of solid waste in municipal landfills.^[2] Disposal and release of plastic bags in the environment can cause environmental, economic, and social problems, including environmental esthetic pollution, blocking waterways, likelihood of floods, soil stiffness and decreased porosity,^[3] reduced seepage and poor ventilation in the soil, environmental pollution with long-term life over 500 years,^[4] entering into the domestic and wild animals' food chain,^[5] production of hazardous and toxic leachate,^[6] and increased greenhouse gas emissions.^[7,8] On the other hand, burning the plastics produce toxic gas called vinyl chloride.^[9] The widespread use of plastic bags is at

odds with the overall policy of sustainable development because the plastic bag has become a symbol of environmental crisis.^[10] Then, it is clear that the unified efforts are required to overcome the problem and protect environmental.^[5] Each year, about 500 billion plastic bags are utilized throughout the world,^[3] and 8 billion plastic bags are freely available to the people.^[11] According to previous researches, over 24 million plastic bags have been used monthly that half are ultimately disposed as waste.^[3] Every year, 302 tons plastic bags are consumed in Japan,^[12] and 6.7 billion plastic bags by 20 million Australians; this is as close as to one plastic bag per person per day. At least, every day 80 million plastic bags are finally abandoned as waste on beaches, streets, and parks.^[5]

The main reasons of widespread use of plastic bags are considered; cheap and easy to use, durability, lightweight, and robustness against corrosion, being waterproof, cost-effectiveness for the handling of food,^[8] mismanagement and/or

Fatemeh Bakhtari
Aghdam,
Ziba Delangiz
Alamdari,
Haidar Nadrian,
Mohammad Asghari
Jafarabadi¹,
Reza
Dehghanzadeh²

Department of Health Education and Promotion, Faculty of Health, Tabriz University of Medical Sciences, Tabriz, Iran, ¹Road Traffic Injury Research Center, Department of Statistics and Epidemiology, Faculty of Health, Tabriz University of Medical Sciences, Tabriz, Iran, ²Department of Environmental Health, Health and Environment Research Center, Faculty of Health, Tabriz University of Medical Sciences, Tabriz, Iran

Address for correspondence:
Dr. Reza Dehghanzadeh,
Department of Environmental Health, Health and Environment Research Center, Faculty of Health, Tabriz University of Medical Sciences, Tabriz, Iran.
E-mail: r_dehghanzadeh@yahoo.com

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perhaps due to the lack of knowledge about the undesirable environmental impacts of their use.^[4]

Several studies have suggested various methods to reduce the use of plastic bags, including facilitating access to reusable bags,^[5] encouraging the consumers to bring and use their own bags or other means of transport,^[13] training the stores for effectively exploiting bags, considering discount by stores for customers who bring their own bags,^[7] mandatory cost or tax for plastic bags,^[14] taxes on production levels, discounts on reuse of bags, informing and warning programs, establishing compulsory rules on production and use of plastic bags,^[10] higher tax on use of plastic bags,^[8] and implementation of educational campaigns.^[15]

However, far too little attention has been paid on the citizen's perception and attitude about the hazards of plastic, and use of alternatives for plastic bags. Despite the abundant production of plastic materials, there is no legal restriction or tax on plastic bags usage in Iran. These bags are available to the public freely by the stores. Therefore, the need for studies in this area seems to be absolutely necessary to carry out interventions for reducing the use of plastic bags. To assess the status of plastic bag use and the consumer behavior, we need to put them in the multi-level study.

One of the approaches that could have a multi-level impact on the health-related behaviors is a socioecological approach (SEA), which examines the health issues at different personal, social, organizational, and political levels.^[16,17] No study has been conducted so far that could examine the role of the mentioned levels on plastic bag consumption, thus, due to the high consume rate of plastic bags in Iran, and various personal, social, organizational, and political reasons, the present study was designed with a purpose to investigate the effective factors on behavior of plastic bag use (BPBU) using SEM.

Methods

Study area and sampling strategy

The present cross-sectional study was conducted on 400 residents in Hadishahr, a region in East Azerbaijan province, in the North West of Iran, from January 21, 2016, to March 15, 2016. The sample size was 400 according to Gupta *et al.*^[8] Sampling was carried out using the multistage random method. The city is composed of two separate community regions called Alamdar and Gargar (each with 4 zones), one zone from each region was considered randomly for the study. In the next stage, the residents were selected using systematic sampling. In this way, a list was prepared from the households of a selected population. After a random selection of the first household, the next households were chosen with the calculated interval of three. Totally, 400 samples were selected. The researchers were referred to the front doors of the houses

to collect data. Before providing the participants with the questionnaire, the purpose of the study was explained, and all those accepted the participation signed a consent form. Those who refused to participate were excluded from the study. The study protocol was approved by the Ethical Committee of Tabriz University of medical sciences (ethical code: Tbzmed.rec. 1394.878).

Data collection

According to SEM, the effective factors on BPBU were classified into three levels, including the personal, social, and environmental levels. In the personal level, the factors such as knowledge and attitude were investigated. The social factor included social support and the environmental factor included access to alternatives. To assess the variables, the questionnaire designed by the researcher was used. The content validity of the questionnaire was qualitatively assessed by ten experts in the field of health education and environmental health. Some alteration and modification were done afterward. The scores of content validity index (CVI) were computed on the basis of the simplicity, clarification, and relevancy of each item. A CVI score of higher than 0.75 was considered as reasonable. Content validity ratio (CVR) scores were calculated based on the necessity of each item. A CVR score of equal to/higher than 0.59 was envisaged a good content validity by the experts. The mean of CVI and CVR was 0.85 and 0.77, respectively, signifying a good content validity for the scale. To assess the reliability, a pilot study conducted on 30 residents and stores who did not include in the final sample. The Cronbach's α of the scales found in the study is presented in Table 1. Demographic data form the included participants' age, education, sex, family size, number of purchase, and job.

SEM questionnaire included personal, social, and environmental level and developed after a review on the previous researches. In the intrapersonal level, knowledge, attitude, and consumer behavior of residents were assessed using questions about the knowledge of the harmful effects of plastic bag use, including seven items so that the answers were as "Yes" and "NO." The attitude toward alternative use was measured with ten items that were answered with 3-point Likert scales. The consumer behavior was obtained with 11 items that were answered with 4-point Likert scales. In the social level, the self-administered questions of social support in the use of alternatives to plastic bags were asked and measured with three items and 4-point Likert scales. On the environmental level, the researcher-made questions were related to the accessible alternatives to plastic bags in the market using four items with "Yes" and "NO" answers, indicating whether there are accessible alternatives to plastic bags or not. For example, are there reusable alternatives (such as cloth bags, handbag, and other alternative means) in your neighborhood stores?). The consumption rate was determined as the following

questions: “How many plastic bags per week you enter into the home along with shopping?” and “How many small plastic bags (freezer) per week do you use?”

Statistical analysis

Data were presented using frequency, mean and standard deviation for both categorical and numeric variables. To assess the relationship between variables the Pearson correlation coefficient, independent *t*-test and ANOVA were utilized where appropriate. The mean range of each variable was selected 0–100. Hierarchical regression was used to determine the predictive value of intrapersonal and environmental factors for the BPBU in all analyses. *P* < 0.05 was considered as statistically significant. The statistical package for social sciences (SPSS) v. 18 for Windows (SPSS Inc., Chicago, IL) was used to analyze the data.

Results

In total, 400 residents participated in this study. The majority of the residents were female (*n* = 313, 78.3%). The demographic characteristics of the participants, as well as their associations with BPBU, are displayed in Table 2. The mean age of the participants was 37.90 (standard deviation = 10.96) and the majority was in the age range of 31–36 years. A significant difference was found in BPBU by age [Table 2]. Mean, standard deviation, number of items along with possible range, and Cronbach’s α in the study for all the variables are presented in Table 1. The Cronbach’s α for all the variables was 0.7 and more showing an acceptable to excellent internal consistency for the constructs. As it was shown in Table 1, the levels of knowledge and attitude among the participants were high, access to alternatives was moderate, but social support to use alternatives was very low, and the use of alternatives to the plastic bag was high. The majority of residents (47%) had entered the house 6–10 plastic bags per week along with shopping and more than 10 freezer bags per week. Based on the correlation test results, no significant correlation was found between knowledge and attitude with BPBU. However, a significant relationship was found between and social support with BPBU [Table 3]. According to SEA, personal, social, and environmental factors may influence on BPBU. Considering that there was one outcome variable BPBU in this study, a hierarchical multiple linear regression was performed in four blocks to assess the efficiency of SEA constructs over the influence of other parameters [Table 4]. Predictors of the outcome variable were classified into four different blocks according to their natures:

1. Demographic characteristics block: Age, gender, job, level of education, family size, and number of purchase per week
2. Intrapersonal block: Knowledge and attitude
3. Physical environment block: Access to alternative
4. Social support block.

In the first step (block 1), as shown in Table 4, demographic characteristics of the respondents explained 34% of the observed variance in the BPBU which was statistically significant. Age was the only significant predictor in this block. However, in the second block, intrapersonal factors including knowledge and attitude increased the observed variance in BPBU only by 4% ($R^2 = 0.38$) which was not statistically significant. In the third block, the predictive effects of accessible alternatives to plastic bags (physical environment factors) along with the

Table 1: Descriptive statistics for socioecological approach variables and behavior of plastic bag use

SEA levels	Mean	SD	Number of items	Possible range	Cronbach's α in the study
Personal level					
Knowledge	70.46	21.18	7	0-7	0.7
Attitude	60.24	17.32	10	10-30	0.7
Inter-personal level					
Access alternative	52.48	13.59	4	0-8	0.81
Social level					
Social support	19.59	23.24	3	0-9	0.78
Behavior					
Plastic bag use	37.75	11.18	11	0-36	0.71

SEA=Socioecological approach, SD=Standard deviation

Table 2: Demographic characteristics and their associations with behavior of plastic bag use among the participants

	BPBU			<i>P</i>
	<i>n</i> (%)	Mean	SD	
Age				
≤30	100 (26.2)	39.28	10.84	0.032
31-36	107 (28)	39.21	11.56	
37-44	87 (22.8)	35.23	11.02	
45+	87 (22.8)	36.76	10.88	
Total	381 (100)	37.76	11.18	
Education				
Diploma and lower	284 (71)	37.10	11.54	0.138
University education	116 (29)	39.29	10.09	
Gender				
Female	313 (78.3)	37.47	11.18	0.896
Male	87 (21.8)	37.71	11.17	

SD=Standard deviation, BPBU=Behavior of plastic bag use

Table 3: Bivariate correlations of socioecological approach variables and behavior of plastic bag use

SEA variables	PBU	
	<i>r</i>	<i>P</i>
Knowledge	0.042	0.406
Attitude	0.049	0.329
Access alternative	0.075	0.135
Social support	0.110	0.028

SEA=Socioecological approach, PBU=Plastic bag use

demographic and intrapersonal factors were studied on the BPBU. The variables in this block explained 49% of the observed variance in BPBU ($P < 0.01$). In the fourth block, the social support (as a social factor) was added to the predictive variables. In this block, the variables altogether explained 50% of the observed variance in BPBU ($P < 0.01$). Among all the factors, age, number of purchase per day, and access to the alternatives (as a physical environment factor) were the significant predictors of BPBU.

Discussion

This research was conducted aiming at examining the determinants of BPBU among residents using SEA in Hadishahr County, Iran. Having a good knowledge on BPBU and identifying their influential factors may be helpful in addressing those factors through educational interventions.

The results of the present study showed that the mean scores for intrapersonal level factor were high, but access alternative and social support were low.

The results showed that demographic variables in residents, especially the age and purchase frequency, could predict BPBU by 34%. In other words, at a later age and higher purchase frequency, the amount of plastic bag use was also increased. Training courses are required to be designed in separate age groups for interventions to reduce plastic bag use. In addition, purchase frequency is required to be less. Obviously, the number of plastic bags enters into home at any time shopping. Reduction in purchase frequency can lead to put many items in a plastic bag or its alternative. Among the residents, knowledge and attitudes predicted 4% of consumer behavior. Therefore, it should be noted that educational interventions emphasized only on knowledge and attitudes will have little impact on reducing the plastic bag use. At the same time, accessible alternatives to plastic bags might be able to predict the BPBU by 49% (11% increases). The results showed that social

support to use alternatives along with intrapersonal and environmental factors and taking into account all levels of ecological approach could predict consumer behavior as much as 50%. Therefore, it should be considered the access to alternatives and reduced purchase frequency in residents on reducing the plastic bag use. Based on the correlation test results in residents [Table 3], behavior had a significant correlation with access to alternatives and social support. It can be said that social and environmental factors, as well as intrapersonal factors, should certainly be considered to reduce the BPBU. In line with this study, other studies have shown that accessible alternatives to plastic bags can be effective on reducing the plastic bag use.^[8] The alternatives such as cloth bags can be put in the hands of residents at very low cost (about \$1);^[5] and even the money paid for them can be returned to the residents in exchange for returning them to the store.^[8] In some cases, the alternatives can lead to reuse of plastic bags (several times); again, 1% cash subsidy for the purchase value can be provided to consumers who use their own bags.

According to the present study, the access to alternatives along with social support and intrapersonal variables will have a better result. In line with present study, another study in Canada showed that encouraging consumers to bring plastic bags for reuse or other means of transporting goods (social support), facilitating customer access to alternatives, training the stores for effective use of bags and putting several items in a bag are effective methods on reducing the plastic bag use.^[8]

The present study did not examine the organizational and political factors of ecological approach because the laws related to contraindications or consumption taxes are inapplicable for the use of plastic bags in our country. While one of the important reasons and predictor of reduced consumption in other studies is necessity to consider tax laws^[15,18] and policy-making to contraindications.^[15]

Table 4: Hierarchical regression analysis to predict behavior of plastic bag use

Step/variable	B (Step 1)	SE	P	B (Step 2)	SE	P	B (Step 3)	SE	P	B (Step 4)	SE	P
Age	-0.35	0.19	0.03	-0.45	0.21	0.15	-0.49	0.19	0.05	-0.52	0.21	0.05
Gender	0.05	6.2	0.079	0.06	6.32	0.75	0.04	5.82	0.79	0.06	5.99	0.72
Job	0.07	3.9	0.75	0.08	4.01	0.69	0.18	3.74	0.40	0.18	3.78	0.40
Family size	-1.5	1.9	0.30	-0.17	1.94	0.26	-0.12	1.79	0.37	-0.13	1.83	0.35
Education	-0.02	1.7	0.90	-0.07	1.80	0.69	-0.08	1.66	0.62	-0.08	1.68	0.64
Number of purchase/week	-0.38	0.6	0.25	-0.44	0.69	0.18	-0.43	0.63	0.14	-0.42	0.64	0.01
Knowledge				-0.19	0.10	0.25	-0.21	0.09	0.17	-0.22	0.09	0.15
Attitude				0.22	0.13	0.24	0.22	0.12	0.21	0.23	0.12	0.19
Access to alternatives							0.35	0.35	0.01	0.35	0.14	0.01
Social support										0.08	0.07	0.56
R ²	0.34			0.38			0.49			0.50		
Cumulative R ²	0.34			0.72			1.1			1.59		
P	0.03			0.05			0.01			0.01		

SE=Standard error

In the current study, the majority of residents (92.7%) were using plastic bags for shopping, in line with studies conducted in the United Kingdom,^[2] Ethiopia,^[3] and India.^[6]

In the current study, only 5.8% of residents had used alternatives, in line with the study in India,^[19] whereas 47% of residents imported 6–10 plastics per week into the home through shopping, consistent with the results of studies in the United Kingdom.^[10]

Some of the reasons for high consumption of plastic bags in this study include frequent and unplanned shopping and lack of access to alternatives. Perhaps the knowledge, attitude, and social support can alter when there are changes in the physical environment and access to the many alternatives. A study in India showed that increased knowledge can be effective on reducing the plastic bag use, as well as posters and flyers can be used to bring a bag by consumers for carrying materials,^[8] also the use of popular alternative bags, motivating, promoting the use of reusable private bags by stores can have key roles in 50% reduction in plastic bag use in the long term.^[8]

The results showed that despite high knowledge of residents on the harmful effects of plastic bag use, the consumption rate remains high, which is consistent with a study in Ethiopia.^[4] This suggests that education alone is not sufficient for reducing the plastic bag use and there are needs to be changed in the environmental, social, and political levels.

Concerning the strengths of this study, it can be said that this study is the first one in the field of plastic bags usage in Iran and investigating the factors influencing consumption at different intrapersonal, social, and environmental levels. However, the paucity of studies in this area made less comparison in the discussion section.

Limitation

As data collection method in the present study was based on self-report by residents, recall bias is warranted. Another limitation may be a failure to evaluate the economic situation of the participants, which could have an impact on purchase frequency and thus on consumption rate.

Conclusions

It was concluded that SEA was a useful model in predicting cognitive determinants of BPBU. The consumption of plastic bags was high in Hadishahr County. Therefore, conducting intervention efforts aiming at SEA promotion and consequently, for reducing the plastic bag use among people is recommended. Health-care providers and community health nurses should pay much more attention toward plastic bag use among people and plan to design a specific program for this population applying promising health education theories like SEA. The intervention should be took place to reduce the usage rate simultaneously with increased knowledge, attitudes, social support to

reduce consumption and access to alternatives. However, it seems that in our country it is necessary to implement the consumption tax law along with changes above.

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Conflicts of interest

There are no conflicts of interest.

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