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Assessing the knowledge, attitude and practice of the kermanshahi women towards reducing, recycling and reusing of municipal solid waste

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ABSTRACT

The present study was conducted with the aim of surveying the knowledge, attitude and practice (KAP) of 1750 females from Kermanshah city in Iran on separation and reduction in source, recycling, harmful effects of solid waste mismanagement on the environment and human health. Also, the relationship between the demographic characteristics of individuals (age, occupation, education, family size, and marital status) and solid waste management was evaluated. The results indicated that Kermanshahi women had satisfactory levels for knowledge (79%) and attitude (86%) on solid waste management. However, 77% of the people showed a poor performance. The present study revealed that females with academic education and public employment as well as young females had a greater KAP, while they had less satisfaction with the waste collection systems. The women's practice showed that 48.33% had received waste management training on TV, 24% as face-to-face, 32.21% by brochures, 2.66% through newspapers, and 1.99 via radio. Also, 83% of females emphasized the role of internet in raising their knowledge and attitude. According to this study, increasing the participation, education, raising the knowledge of individuals, providing appropriate facilities and equipment and implementing coordinated coherent programs of recycling by the governmental and private sectors played a very important role in solid waste management. With more emphasis on educational aspects, especially through municipalities and by creating participatory and encouraging programs among the families and the municipality, it is possible to improve the practice of citizens by improving their knowledge, while taking effective steps for promoting this environmental activity.

1. Introduction

Rapid population growth and urbanization, continuous economic development, industrialization, and an increase in the welfare of people's lives have led to increased production of municipal solid waste (MSW) (Mousavi et al., 2015). Increasing waste production and its disposal into the environment without recycling is considered as a threat to the environment and human health (Drost, 2011). Hence, solid waste management (SWM) is of great importance which should take care of health, economic, and environmental issues and be coordinated with other general conditions of the society. Waste reduction; recycling and reuse are among the most important functions of MSW (Almasi et al., 2017).

More than 48,000 tons/day of MSW is produced in Iran, where 70–80% is organic materials which can be recycled, but only 8% is recycled (Ghanbari et al., 2016). Therefore, considering the methods of waste production reduction, it is a warning that has attracted a great deal of attention in recent years. Indeed, recycling is a system aiming at optimizing the use of different resources for the purpose of achieving more general profit and less waste production (Dahlin et al., 2017).

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Urban waste separation at source is one of the main parameters affecting recycling. Segregation in the source, through recycling a significant part of the waste and returning it to the production cycle, reduces the cost of collection and disposal of waste. It is also economically profitable, reduces the land required for burial; produces higher quality compost fertilizers, etc (Ayodele et al., 2018; Pirsaheb et al., 2016).

One of the most important factors in the MSW is the public participation. Public participation is necessary for success of any health program, without which health will not have an enforceable guarantee (Bertram et al., 2002). The main way to exploring public interest and participation in the abovementioned issues is to study the knowledge, attitude and general opinions toward solid waste management and recycling (Ghanbari et al., 2016). In most developed and successful countries, such as Germany, the recycling program has started by educating and engaging people in the field of waste separation from origin; as 90% of the German population is active in the waste separation plan (Schwarz-Herion et al., 2008).

The results of the research in Abadan indicated that their knowledge and attitudes towards reduction, separation at source, and recycling are good depending on age, gender, and occupation, but their performance is poor. Therefore, implementation of home waste management training programs as a necessity can play an important role in enhancing the practice of individuals (Babaei et al., 2015).

One of the most important health and environmental aspects is the production of different types of waste materials which is of special importance due to its high volume as well as cultural, social, and economic issues and at present, due to excessive population increase, shortage of waste landfilling facilities, and the reflection of pollutions and diseases transmitted by municipal solid waste, leading people and authorities to pay more attention to this problem and properly plan its management (Inglezakis and Moustakas, 2015).

We are specifically describing management in Iran as an example of developing countries. Management steps of municipal solid waste are largely different in average- to high-income (industrialized) countries. The efficiency of this plan must focus on attention to health, economy and environmental engineering and must be coordinated with other general conditions of waste at the origin, where recycling and reuse are among the most important actions of waste management. The demographic factors influencing this issue have been assessed in many studies (Oke, 2015).

Considering the numerous advantages of recycling (reducing the amount of waste produced, landfilling cost, storage of energy and natural resources), knowledge, attitude, and desirable practice of women given their active role as the house manager is crucial (Moh, 2017). The first step in implementing the plans of waste material recycling is to implement it accurately, where this knowledge, attitude and desired practice will raise their level of cooperation later.

Therefore, considering the environmental, economic, and social effects of recycling, a recycling program is necessary. Before doing so, this issue should be investigated in order to identify the level of public participation and level of knowledge, attitude, and practice of people.

The aim of this study was to determine the level of knowledge, attitude, and practice of women in Kermanshah as house directors about municipal waste management (MWM) and the effect of demographic variables on MWM. The reasons for people's dissatisfaction with waste collection systems and their lack of willingness to recycle waste were questioned. Further, the type and amount of MSW composition were also studied. In this study, Kermanshah city, the capital of Kermanshah province, was chosen as a model of a developing society in the west of Iran.

2. Region characteristic and SWM in Kermanshah

Kermanshah is a metropolis and the capital city of Kermanshah Province with a population of 1,093,833 in 2016 and an area of 93,389,956 m^2 located in area region with a moderate mountainous climate (Alaee et al., 2010) (Fig. 1). Kermanshah is the most important city in the central region of western Iran which is considered the agricultural center of Iran, with more than 256 industrial units being active in this city. The amount of daily per capita waste production has been estimated as 0.8 ± 0.1 kg; considering the population of Kermanshah city, the total waste produced amounts to 757.6 tons/day. Also, each person produces almost 290 kg of solid waste per year. These wastes are accumulated in the southern part of Kermanshah city, about 15 km away from it, on the northern slopes of the White Mountain. As a result, there is not enough soil to cover the waste and there is no suitable space for hygienic landfill of the waste. Meanwhile, with every incidence of raining, a large amount of waste liquids flows toward the hillside by surface currents.

Fig. 1. The location of Kermanshah city (Study area) in Iran.

The accumulation place of wastes is located near and upstream of Sarab Ghanbar spring which supplies a part of Kermanshah water. The penetration of the waste liquids in the upstream and their wash by rain water will contaminate the water of this spring. On the other hand, household wastes are stored in plastic bags and then they are thrown in the municipal solid waste collection tanks in alleys or are collected by sanitary (municipal solid waste) trucks.

The waste collection is performed by placing containers in alleys which it is the most common method of waste collection throughout the city. Municipal solid waste collection program in each district of the city is different from that of others. In some districts, the program of recycling resources is practiced at a very limited level, but in most households, the waste materials are collected together without any separation.

3. Literature review

Considering the great benefits of recycling through reducing the amount of landfilled solid waste, reducing the cost of waste disposal and saving energy and natural resources, the public's knowledge and attitude about the recycling of solid waste is the first step in the proper utilization of resources, leading to people cooperation and development of recycling programs. Therefore, the public knowledge and attitude can be better understood in order to train them and improve the recovery plan of solid wastes.

Many studies have been conducted on the knowledge, attitude, and practice of people on recycling in different countries. Bortoleto et al. (2012) believed that the knowledge of individuals is recognized as an important and influential factor in practices and, to a large extent, facilitates the implementation of recycling programs and ensures their success. This concept is at the heart of policy making, with proper knowledge of concrete affecting the behavior. However, Amouei et al. (2016), showed that most people, while having good knowledge of waste recycling, did not practice properly.

Yukalang et al. (2018) indicated that with the provision of continuous and planned training through educational methods as well as the existence of waste separation organizations, a significant contribution can be made to the solid waste recycling.

Shorofi and Arbon (2017) along with Mangiri et al. (2017) suggested that demographic factors such as age, marital status, education, and occupation have a significant effect on KAP.

According to Bom et al. (2017) on the recycling of solid waste in the city of Laramie, 80% of people expressed their main motivation for recycling as environmental protection, suggesting the importance of recycling and satisfaction of individuals.

The level of knowledge and participation of individuals in the separation, storage, collection, and disposal of domestic waste in India was investigated by Bhawal Mukherji et al. (2016). The results showed that only 2% of the individuals separated the waste from the source. However, most of the segregated waste was mixed up by garbage collectors. In general, women were more aware of waste management than men.

The study by Barloa et al. (2016) on the knowledge, attitude, and practice toward waste management in the Philippines showed that 73.4% of the people had appropriate knowledge and 71% had a favorable attitude. The family size, the social status of individuals, and academic education influenced the management of household waste.

Laor et al. (2018) revealed the local government should prioritize women in order to promote knowledge and attitude on effective MSW management. In addition, the source of waste management information is important for its provision, and appropriate media should be selected for the target group.

However, in west of Iran, especially Kermanshah, there has been no widely published research that has described knowledge, attitudes and behaviors toward solid waste management and training methods on SW recycling, quantity and quality of SW, the satisfaction of citizens with collection of SW, etc. Taken together, all of these are critical in understanding how to resolve issues surrounding solid waste management and recycling.

4. Materials and methods

4.1. Sample selection

This cross-sectional descriptive study was conducted from April to September 2016. A total of 1750 women from Kermanshah city were included. Given that the gender ratio of men and women in Kermanshah is approximately equal, according to the census in 2017, so the population of women in this study was estimated to be 541,917. The sample size was determined according to the following equation.

$$n = \frac{N.\ Z^2_{1-\alpha/2}.\ \sigma^2}{(N-1)e^2 + Z^2_{1-\alpha/2}.\ \sigma^2} \quad (1)$$

Where,

n = The volume of sample

N = The population size

Z^2 = Desired confidence level (95%)

σ^2 = The variance of an attribute in the population (1.06)

e = The desired level of precision (0.05)

Data collection was conducted through face-to-face interview at the door of the houses. According to previous studies, face-to-face interview is of higher efficiency compared to other methods such as electronic email, telephone, etc. In the study by Babaei et al. (2015), the efficiency of response was 98% and in the study by Zhuang et al. (2008) it was 95%. Studies have reported low participation in surveys through email. The subjects were justified in terms of the methodology, confidentiality of information, and the goals of the study, and all of them were willing to participate in the investigation. Considering the size of the community in question to be sampled to represent the community, the samples were selected using simple random cluster method from five districts of the city: north, south, east, west and center.

4.2. Data collection

The data were collected using researcher-made questionnaire. The structure and semi-structure questionnaire consisted of two types of open and closed questions for studying the level of knowledge, attitude, and practice of women toward the waste management. Individuals under the age of 15 were excluded from the study. The validity and reliability of the questionnaire was confirmed by distributing the primary questionnaires among 25% of the eligible individuals based on Cronbach's alpha (85%). During the introductory study, the content validity method was used as the data collection tool, where the items of the questionnaire were compiled in line with the goals of the investigation. Then, the content of the questionnaire was studied and evaluated by five faculty members of Kermanshah University of Medical Sciences, after which a well comprehensible questionnaire was developed for the target community. The coefficients achieved for each item varied between at least 0.8 and 1.

Initially, demographic information including 5 questions about age, family size, educational level, occupation, and marital status was asked from participants in the study. This information was studied to determine its effect on knowledge, attitude, and practice toward municipal solid wastes management. Then, closed questions were presented in three areas of knowledge (9 questions), attitude (9 questions), and practice (7 questions) which were divided in four sections of 1) solid waste management (SWM) (3 questions), 2) reduction in origin, separation and recycling (15 questions), 3) waste collection (4 questions); and 4) training (3 questions) (Tables 1 and 2). The questionnaires were distributed among interviewers in a written form. They explained the questions face to face and filled the answer in the questionnaire.

The questions of the knowledge section consisted of: 1) Types of solid waste (SW) categories, 2 The relationship between non-sanitary landfill as well as the outbreak of diseases and 3) The relationship between non-sanitary landfill as well as environmental pollution, 4) The best way to saving waste at home, 5) Solid waste reduction methods at home 6) The benefits of household waste separation, 7) The knowledge of the existence of official recycling organizations in Kermanshah, 8) The best location for waste separation, and 9) The benefits of recycling.

Attitude questions included: 1) Motivations for reduction, separation and recycling, 2) Personal responsibility for reduction and source separation, 3) The transfer of SWM to the private sector, 4) Task of separation of SW, 5) Satisfaction with the waste collection service, 6) The best time for disposing SW, 7) The best method of waste collection, 8) The most appropriate method of training and 9) The most appropriate telecast.

The practice question included: 1) Participation in source separation plan, 2) render of segregated waste, 3) Source separation of hazardous household waste, 4) Receiving goods or money for SW segregation, 5) Use of disposable tableware, 6) SW collection by Urban Recycling Organization and 7) Training.

Two questions were answered in the descriptive form including the reasons for 1) not recycling SW and 2) dissatisfaction with the waste collection service.

With placing a same value for each of the questions, point 1 was assigned to a correct answer while zero was designated to incorrect answer. The knowledge, attitude, and practice of people were classified according to their scores in three levels of poor (less than 50% of the total score), medium (50–75% of the total score), and good (more than 75% of total score).

4.3. Statistical analysis

Descriptive and analytical statistics of the data collected were studied by SPSS software (version 20, SPSS Inc., Chicago, IL). Parameters

Table 1
Structure of questions.

Component		Question no.	Items
	Knowledge	Q1	Best solid waste category
Mismanagement of solid waste (SW)	Knowledge	Q2	Unsanitary landfill and prevalence of diseases
	Knowledge	Q3	Unsanitary landfill and environment health
SW reduction, source separation and recycling	Knowledge	Q4	Best method of waste storage at home
	Knowledge	Q5	Waste reduction methods at home
	Knowledge	Q6	Benefits of separating solid waste at home
	Knowledge	Q7	Aware of the official organization of urban recycling in Kermanshah
	Knowledge	Q8	The most appropriate separation location
	Knowledge	Q9	Benefits of recycling
	Attitude	Q10	motivations for reduction, separation and recycling
	Attitude	Q11	Person's responsibility for reduction and source separation
	Attitude	Q12	The transfer of solid waste management to the private sector
	Attitude	Q13	Task of separation of solid waste
	Practice	Q14	The participating in source separation plan
	Practice	Q15	Render of segregated waste
	Practice	Q16	Types of materials Separated
	Practice	Q17	Get the goods or money for segregated waste
	Practice	Q18	Use of throwaway dishware
	Practice	Q19	Get the goods or money for segregated waste
SW collection	Attitude	Q20	Waste collection service satisfaction
	Attitude	Q21	The best time for setting out SW
	Attitude	Q22	The best method of waste collection
	Practice	Q23	Solid waste collection by Urban Recycling Organization
Training	Attitude	Q24	The most appropriate method of learning
	Attitude	Q25	The most appropriate telecast
	Practice	Q26	receiving information

Choice of questions:
Q1: wet and dry, corruptible and non - corruptible, recycled and non-recycled materials.
Q2: typhoid, cholera, tuberculosis, plague, anthrax and diarrhea.
Q3: Water, soil, air pollution and aesthetic aspects.
Q4: Bucket with cap, Garbage bag, bucket equipped with garbage bag.
Q5: Reuse of goods, Increased durability of goods, separation and recycling.
Q6: Allocating less urban land for waste disposal and reducing economic costs, less energy consumption, Reducing water, soil and air pollution, all items.
Q7, Q11, Q12, Q14, Q17, Q19, Q20, Q23: Yes/ No.
Q8: House, collection service, landfilling site.
Q9: Aesthetic, economic, environmental, energy aspects, etc.
Q10: Training, Encouragement and financial punishment, rule and law.
Q13: Mutual cooperation with the municipality, municipality, no idea.
Q15: dealer, Urban Recycling Organization.
Q16: battery, electronic waste, glass, Paper and cardboard, lamp, insecticide, Car spoil, bread, metals.
Q18: Always, sometimes, rarely.
Q21: Morning, evening and night.
Q22: house to the house in specified time, reservoir at alley, have no idea.
Q24, Q26: Television, radio, internet, newspaper, face to face, brochure, etc.
Q25: TV series (animation and actual), short commercial messages, etc.

Table 2
Characteristics of the studied residents.

Independed group		Respondent's number and percentage	Total
Age (year)	Mean ± SD	30.51 ± 6.7	100% (1750)
Size of family	< 4	70% (1225)	100% (1750)
	> 4	30% (525)	
Occupation	Governmental	19.08% (334)	100% (1750)
	Self-employed	36.23% (634)	
	Unemployed	44.68% (782)	
Level of education	Diploma holder	41. 2% (721)	100% (1750)
	Higher educated	59.82% (1047)	
Marital condition	Single	42% (735)	100% (1750)
	Married	58% (1015)	

including mean, standard deviation, and frequency of data were calculated. Then, the data normality was calculated using the Kolmogorov-Smirnov test. When the results were normally distributed, variables were reported in the form of mean ± standard deviation. However, in the absence of normality, the data range was used. The relationship between demographic characteristics and knowledge, attitude and practice was assessed by Chi-square and Pearson test at a significance level of less than 0.05. Tables, bar graphs, pie charts, and histogram graphs were also applied to visualize the data.

5. Results and discussion

5.1. Sample distribution

According to different studies, demographic characteristics of individuals consisting of age, family size, education level, material status, and occupation are very important in the knowledge, attitude and practice (KAP) (Castagna et al., 2013; Chu et al., 2016). The demographic characteristics of the interviewees are presented in Table 2. In this study, 1750 women with the mean age of 31.51 ± 6.7 participated, 59.82% of whom had college education. The majority of the individuals (44.64%) were unemployed. Most women had a family of less than 4 members (70%), and were unemployed (44.68%) and married (58%).

In the study of Bhawal Mukherji et al. (2016) in India, which was conducted on the knowledge and attitude of the residents of Delhi, the

variables of age and occupation were identified as influential in the knowledge and attitude of the studied people. Most people had 21–40 years of age, and they had a family with 5–8 members. In a similar study conducted by Barloa et al. (2016) in the Philippines, the majority of women (51.2%) had a mean age of 21.2 ± 2.2, family size of 1–4 (57.5%), and education level as university students. Differences in the demographic characteristics of individuals can be due to cultural, social, economic, and political conditions among others.

5.2. Non-sanitary disposal of solid waste; health and environment

Studies suggest that one of the most cost-effective ways to preventing environmental degradation is public awareness and community participation.

The results indicated that people's knowledge about the diseases transmitted by unsafe landfilling and its effects on the environment was moderate (53.78%). Further, 65% of interviewees believed that unhealthy landfilling of MSW leads to contamination of surface and ground waters, soil, and air pollution as well as death of aquatics. This result was consistent with that of Song et al. (2012) in China along with Nixon et al. (2009) in the US.

In the current study, women with academic education and governmental jobs had better knowledge and attitude in this regard ($p < 0.05$). No significant difference was observed across marital status, family size, and age with their knowledge and attitude regarding complications caused by mismanagement of SW on human health and environment ($p > 0.05$). Knowledge of the respondents suggested that people in Kermanshah are to some extent aware of the consequences of SWM, which is in agreement with the results of Yoada et al. (2014) study in Accra city. To enhance the public knowledge, it is better to train them and improve the waste recycling plan by governmental and private sectors. Possibly, the mismatch between practice and knowledge is due to lack of awareness of social obligations regarding health, knowledge, tradition, and economic situation in the society. Definitely, the role of municipalities in this regard is also important.

5.3. Components of SW

Identification of the constituents of SW will determine the direction of SWM development programs and plans.

In this study, physical combinations of SW were surveyed. Food waste is an important part of the waste produced in Kermanshah due to the consumption of unprocessed food in people's daily diet. It is followed by plastic in terms of volume. Organic wastes with their economic value, nutrients and energy could be used for animal feed, soil enhancer, and fuel. Recyclable materials such as paper and cardboard, plastics, metals, and glass, in general, account for 27.7% of MSW (Fig. 2).

In a study conducted on the quality and quantity of wastes in developing countries, the highest amount of recyclable materials belonged to biological wastes (40–85%), followed by paper and cardboard (3–10%) and glass (1–10%). The minimum amount of MSW was related to hazardous wastes (0.5–1%), metals, leather, and wood, confirming the present study findings. According to the World Bank reports, organic waste in the US, Germany, and Switzerland is 25%, 14%, and 29% respectively, while are less than the volumes in the current study (Bank, 2012). Typically, this difference arises from the population density, standards, lifestyle, consumption, and business activities. In addition, weather conditions, seasonal changes, and changes in behavioral patterns of individuals, especially at particular times of the year, affect these changes.

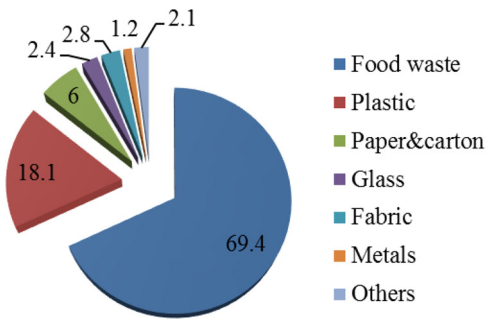

Fig. 2. Component of MSW in Kermanshah in 2017.

5.4. Household hazardous waste (HHW)

Hazardous waste (HW) has the characteristics of flammability, corrosivity, reactivity, and toxicity. Non-systematic management of HHW can create a potential hazard for individuals and the environment.

With regards to the separation of HHW, an alarming report was presented. Unfortunately, 96.97% of the citizens did not separate household batteries, while electronic waste was always separated by 21.37% of citizens and 20% in most cases. The greatest extent of separation (71.84%) was from automobile waste (antifreeze, engine oil, worn-out spare parts), while the other materials were considered to be very low (Fig. 3).

Failure to participate in the separation of hazardous waste can be largely attributed to the lack of effective facilities and training. In order to attract people's participation in the separation of HHW, they should be trained about identification and appropriate methods of HHW storage and a separate service to collect hazardous waste residues.

According to this study, there are no strong laws and no motive for separation of HHW. The results of the study indicated that due to the lack of suitable methods for separation, storage, collection, treatment, and disposal of HHW in Kermanshah, the production of these materials should be decreased by providing a suitable management plan in an attempt to the enhance public participation and to create a proper waste management system in this city.

According to studies in Canada, 58% and 42% of fluorescent lamps and household batteries were disposed of along with municipal solid waste, which is less compared to the current study. In another study by Gray et al in (2005) America, the results were almost congruent, where 88% of people threw HHW a way alongside urban waste. The two countries were examples of developed countries, in which the separation of hazardous waste has still an executive problem. However, the problem is far more serious in developing countries.

5.5. Composting

Regarding the high volume of organic matter in the present study, the composting was considered as one of the most useful and

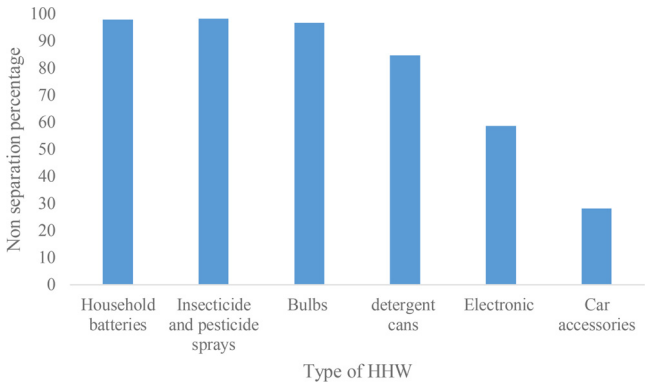

Fig. 3. The percentage of people who have never attempted to separate hazardous waste.

economical methods for the recycling of organic household materials. Also, the level of knowledge and practice of individuals in this regard was investigated. Given the high volume of organic solid waste in developing countries, composting option is one of the suitable methods of waste recycling. Gajalakshmi and Abbasi (2008) suggested that composting considerably reduces the volume and weight of the SW and results in prolonged life of burial mounds, soil fertility, and income generation.

In this study, the awareness of people was asked about waste reduction methods. The awareness of people about home composting was low (16.91%). The practice of women also showed that only 1% women did this, which was in line with the Song et al.'s (2011) study. Song indicated that 31.6% of individuals under study sold recyclable waste to dealers nearby and none of them composted them.

In this section, there was no significant relationship between knowledge as well as practice of women and demographic characteristics ($P < 0.05$). The most important cause of non-composting by women in this study was the lack of green space at home and the age of the apartment, lack of proper equipment for composting, not providing the necessary training by the private and governmental sectors, depriving the women of the opportunity for composting.

5.6. Reducing, separation and recycling

No study has yet been performed on the knowledge, attitude, and practice of Kermanshah people as the most important city in the central region of western Iran with regard to the SWM including reduction and separation at the source and recycling. Among the studies conducted in the United States of America, the Emirates, Turkey, Taiwan, Hong-Kong, South Korea, Iran, Malaysia, and New Zealand, Iran is one of the countries which has remained most understudied.

The knowledge of people in Kermanshah was medium considering reducing and recycling of paper and cardboard, plastic, metals, glass, bottle, and its profits. The relationship between the demographic variables and SWM in Kermanshah is shown in Table 3.

The results suggest a weak relationship between family size as well as marital status and practice, which was generally in agreement with the study conducted by Banga (2011). In their study, the individuals had a mean age of 36.7 years, out of whom 6.9% were illiterate and 30.5% had primary school education. Despite their knowledge, the individuals did not have appropriate practice with regard to recycling. During the study, it was revealed observed individuals younger than 40 years old possessed more knowledge and attitude, though this relationship was not significant ($p > 0.05$). These results are consistent with present study findings.

In general, a significant relationship was found between KAP and age, education, as well as occupation ($p < 0.05$). The younger individuals who had received academic education and had governmental jobs enjoyed a better KAP, suggesting the government's attention to the environment and educating its own employees. Other studies conducted in this regard confirm the results of our study (Martin et al., 2006; Sidique et al., 2010). In the study by Andersson et al. (2012), where the mean age of individuals was 45.6 ± 12.2 and the size of family was estimated to be 2.7, it was found that the Swedish people had a higher attitude toward recycling in contrast to the present study, while individuals in the recent study had a lower practice level.

Further, the relationship between demographic characteristics and separation in the source was significant ($p < 0.05$). The interviewees believed that homes were the most suitable place for separation (%54.66), followed by MSW trucks (%29.99) and landfills (%12.66), respectively.

According to the results, 10.13% of individuals were not familiar with the term 'recycling'. Different studies suggest that motivating people and marketing for recycled products are effective in increasing the rate of public participation (Ragazzi et al., 2014; Chu et al., 2016). In England, around 64% of people considered protecting the environment as their main motivation for recycling (Martin et al., 2006).

Given the tendency toward waste separation (56.65%) as a social

Table 3
Respondents answering based on their age, educational level, occupation, marital status and size of family.

Question			Yes	No	Chi-square	p-value
Q9 (Source separation and recycling of MSW)	Education	Diploma holder	34.2%	65%	19.124	0.001
		Higher educated	78%	21.9%		
	Occupation	Governmental	62.3%	37.6%	11.234	0.012
		Self-employed	57.1%	42.8%		
		Unemployed	34.6%	65.3%		
Q11 (Person's responsibility against reduction and separation)	Education	Diploma holder	26.7%	73.2%	21.211	0.0001
		Higher educated	68.1%	31.8%		
	Occupation	Governmental	67.3%	32.8%	16.781	0.041
		Self-employed	46.2%	53.6%		
		Unemployed	31.9%	68%		
	Age	< 40	69.8%	30.1%	20.124	0.001
		> 40	37.7%	62.2%		
Q14 (The participating in source separation plan)	Age	> 40	32.4%	67.5%	18.746	0.005
		< 40	61.2%	38.7%		
	Occupation	Governmental	56.4%	43.5%	11.231	0.034
		Self-employed	51.3%	48.3%		
		Unemployed	69.7%	40%		
Q19 (Get the goods or money for segregated waste)	Occupation	Governmental	34.2%	65.2%	13.421	0.001
		Self-employed	51.7%	48.2%		
		Unemployed	72.3%	27.5%		
	Education	Diploma holder	64.9%	35%	14.415	0.025
		Higher educated	41.1%	58.3%		
	Age	> 40	71.2%	28.6%	9.871	0.025
		< 40	46.8%	53.1%		
	Size of family	< 4	38.7%	61%	15.612	0.001
		> 4	61%	38.6%		
Q18 (Use of throwaway dishware)	Occupation	Governmental	43.1%	56.9%	10.876	0.002
		Self-employed	36.9%	63%		
		Unemployed	23.2%	76.7%		
	Marital status	Married	41.1%	58.7%	14.371	0.003
		Single	63.3%	36.6%		

duty (32%), providing more training in this field seems to be very necessary. While 56.65% were willing to participate in the recycling plan, only 11.33% of the individuals always and 27.99% occasionally separated the MSW.

Martin et al. (2006) found that 55% of people occasionally and less than one third of individuals always recycled the solid waste which is higher than those in Kermanshah, while 17.5% never recycled their waste. In Kermanshah, 10% of people never separated the MSW. In the study by Yoada et al. in Accra, 82.7% of people did not separate the SW prior to landfilling, which is almost the same as the finding of the present study. Suttibak and Nitivattananon (2008) reported that the separation in the source was satisfactory despite the low knowledge of people about the problems and barriers of separation in the source. It is completely consistent with the results of the present study.

Studies by Song et al. (2012) in China and Saritha et al. (2015) revealed that people feel less responsibility toward recycling waste and considered the government to be the major responsible for this matter. In the study by Saritha et al. (2015), 48.8% of people ranged between 26–35 years of age and 67.2% were married. In 88.4% of cases, the number of family members was more than 6 people, with 26% having governmental jobs.

The highest rate of separation in the source belonged to dried bread (75%) and metals (58.65%). Glass and paper were never segregated in 62.28% and 94.68% of cases, respectively. Martin et al. (2006) showed that the tendency toward recycling especially paper recycling is high in England. While 80% of the people considered local recycling services unreliable, they recycled waste paper and only 3% of the people had negative attitudes toward recycling. Lack of participation is attributed to lack of facilities and effective training on the abovementioned issues. Unfortunately, 47.25% of the respondents were not aware of the official recycling organization in Kermanshah (Fig. 4).

The most important reasons for lack of women's participation in the separation and recycling plan is attributed to lack of an organized and cooperative plan on the part of municipalities, unsuitable scheduling of the plan, very little financial gain, the government not paying attention to recycling and educating citizens, lack of easy access to municipal solid waste trucks of the recycling organization, etc. Specifically, 53.99% of the women delivered the separated waste to itinerants and 39.03% delivered it to municipality recycling organization. Also, 37.31% of the citizens reported that the recycling organization is optimally collecting their separate waste. They also believed that selling recycled materials to the round merchants or vendors can jeopardize the general health of the society, and pose occupational risks for the vendors.

5.7. Correlation between knowledge, attitude and practice

Since the success of waste recycling programs depends on the suitability of the bedding and this will be appropriate to raise the level of women's knowledge and attitude, so increasing awareness, attitude, and practice in this regard is of particular importance.

The results of the present study indicated that 34%, 45%, and 21% of individuals enjoyed good, medium, and week knowledge. In regard to attitude items, 14% of individuals enjoyed weak attitude, 52% were medium and 34% were good in this area. However, considering practice, 77% of individuals had weak practice, 15% were medium and 8% were good in their practice. There was a significant correlation between the knowledge and attitude, but the practice was too poor ($p < 0.05$). The results of this study were inconsistent with those of Andersson et al. (2012) as well as Domina and Koch (2002), while it was in agreement with the study of Zhang and Wen (2014) in China. Zhu et al. (2007) and O'Connell (2011) found that only positive attitude and knowledge do not lead to the development of correct practice. The reason for differences in studies results may be the difference in the planning of municipalities and the allocation of funds to SWM across different parts of the world.

The reasons for the lack of coordination between knowledge as well as attitude and the practice in this study can be weaknesses in system management, lack of awareness of people about social obligations regarding health, limited financial resources, inappropriate management of urban managers, lack of public participation, lack of infrastructure and equipment required for recycling, and lack of sustained recycling by the municipality (Al-Khatib et al., 2009).

In some cases, women are also involved in the separation and recycling. However, once collected by the responsible people, they are mixed again, which leads to a reduction in the motivation of individuals in the separation program and failure of the integrated solid waste management program.

Study of demographic characteristics revealed that there was a significant relationship between the occupation and knowledge ($p < 0.05$), where the employees and unemployed individuals had the highest and lowest knowledge respectively, which is in agreement with the results of study by Banga (2011). In general, people with a good level of knowledge and attitude did not show a satisfactory practice, which may be due to employees' business and little opportunity to pay attention to recycling, as well as the lack of a comprehensive and appropriate recycling plan by the municipality.

Also, a significant relationship was observed between marital status and the knowledge, where single women acquired the highest score ($p < 0.05$). This can be due to the less responsibility of single girls in the family than mothers and having more opportunities to study and change their behavior.

The results suggested that the degree of knowledge and attitude regarding waste management was higher at younger ages, which can be attributed to the fact that recycling industry is new in the county. Further, acquiring knowledge and attitude through educational

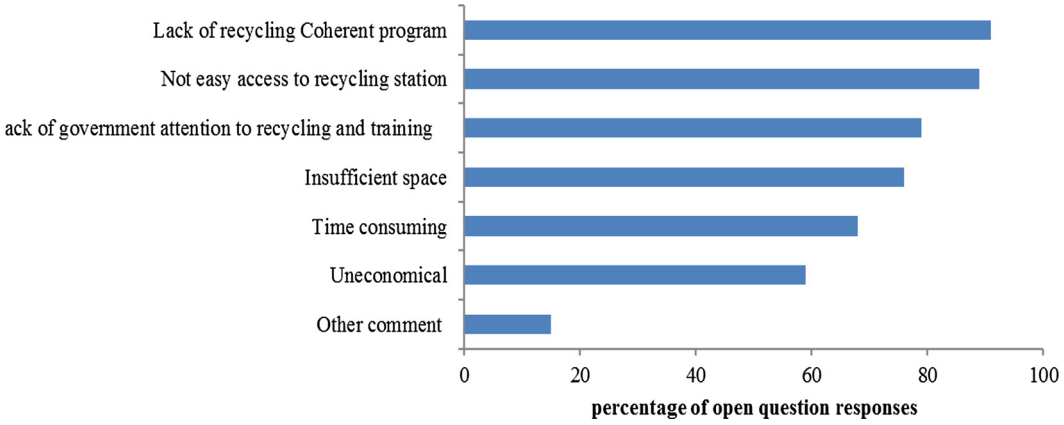

Fig. 4. Categorized responses (N = 1750) to the open question "the reasons for not recycling of solid waste?".

programs by different media which have been more influential at younger ages can be another reason.

In addition, the level of knowledge and attitude had a direct relationship with education, where academics enjoyed the highest magnitude of knowledge and attitude, which is in agreement with the study by Mrayyan and Hamdi (2006) in Al-Khatib et al. (2015) in Palestine, while being in contrast with the investigation by Ekere et al. (2009).

Note that training and promoting knowledge, attitude and practice of students will lead to enhanced level of knowledge, attitude and practice of the family and eventually society. Hence, families with educated children had greater knowledge and attitude, though this difference was not significant ($p > 0.05$).

Generally, knowledge and practice of women in Kermanshah regarding the SWM was not evaluated positively, which seems to be far from the desired point. Having pure knowledge does not mean awareness of the harmful economic, social, environmental, and other consequences of waste production in society. Therefore, it is necessary to develop and implement effective and relevant programs by organizations that are responsible for developing culture among, informing, and training citizens. In this way, officials and policy makers can focus on raising their awareness of SWM.

5.8. Satisfaction with MSW collection service

Since the determination of people's satisfaction with MSW collection service is one of the most important works in the field of SWM, this study aimed to investigate the views of citizens and their satisfaction with the implementation of waste collection system. During this study, it was found that 913 of the women (52.17%) were satisfied with the practice of the municipality for collecting the waste throughout the city.

Comparison between the results of present study and Martin et al.'s (2006) study revealed that 70% of English people were satisfied with the waste collection system, which is higher compared to women in Kermanshah. In the study by Akaateba and Yakubu (2013a,b) in Ghana, where the majority of individuals were within the age range of 31–50 years old, 65.1% were married and 54.4% had academic education. In that context, people were reported to be relatively satisfied with the waste collection facilities.

It seems that non-sanitary waste collection tanks, dumping building debris in the city, shortage of waste collection tanks, searching for recyclable materials, developing contamination around the tanks by waste collectors, and lack of consistency regarding times of collection have a great role in dissatisfaction (Fig. 5). Chi-square test revealed a significant relationship between the satisfaction with the waste collection system and the job as well as the level of education. In this regard, people with governmental jobs and university-level education reported less satisfaction than others ($p < 0.05$). However, no significant relationship was observed between the family size and the level of satisfaction ($p > 0.05$).

Further, 47.33% of women considered waste collection at home doors at certain times the best method for waste collection, while 35.33% considered fixed stations at major centers and near the houses as the best method for waste collection. It seems that not meeting the needs of people according to their desires is another reason for their dissatisfaction. These findings are consistent with the findings of Longe et al. (2009) and Ezebilo and Animasaun (2011) reporting that the majority of respondents were dissatisfied with the management of waste collection services.

Regrettably, the placement and installation of tanks is performed without scientific principles and careful study, which can cause problems for citizens. The distribution and placement of reservoirs have an important role to play in increasing the impact and approaching the goals. Easy access to reservoirs promotes their proper usage and the placement of MSW inside the tanks, and eventually, prevention from dispersion of SW.

5.9. Training on separation, reduction in source and recycling

Most people (89.31%) in the study believed that the impact of television on educating citizens about SWM is high. Video training family programs and TV series (67.33%), animation programs (38.13%), as well as teasers and TV short messages (37.11%), were recognized as the most suitable methods, respectively. Considering practice, the percentage of people who received the necessary training on SWM from different information sources is revealed in Fig. 6.

The general status of training in SWM indicates that newspapers and radio have not been sufficiently prepared and do not present continuous educational content. Similarly, educational technologies and media have not been used to educate people in this field. Further, television and face-to-face education should also be used in the field of SWM in public education programs with appropriate methods of teaching technology. An agreement was observed between the attitude and practice of women.

Different studies have been performed on the desirable effects of television on education in society. A study by Mosler et al. (2008) in Cuba showed that media have a very effective role in raising the knowledge and participation of people in the recycling. The role of television as a widespread medium and available in the developing countries was evaluated as very important.

Banga's study (2011) revealed that 39% of the individuals got familiar with recycling through friends, 30% through the Internet, and 27% through newspapers and magazines. However, the share of the newspaper in Iran was far lower compared to Banga's study. In the study by Omran et al. (2009) in Malaysia, 46.82% of the individuals declared newspaper as their source of information. The share of other information sources was as follows: television (65.3%), radio (43.2%), magazines (41.4%), and billboards (29.6%), which were in contrast with the recent study findings.

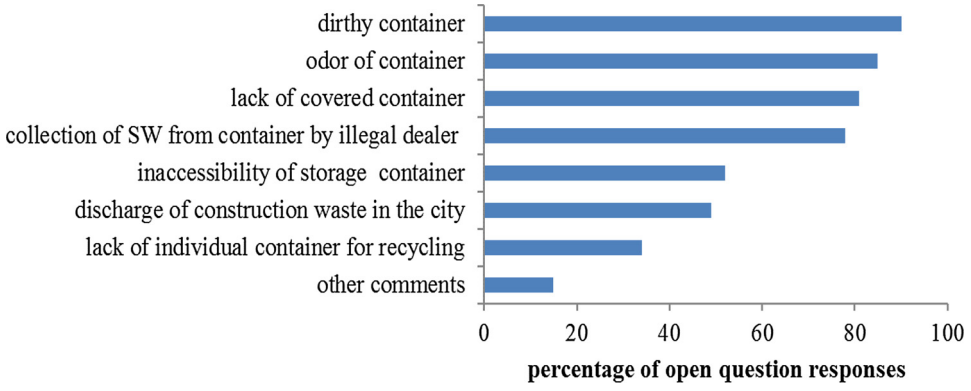

Fig. 5. Categorized responses (N = 1750) to the open question "the reasons for not satisfaction of waste collection service?".

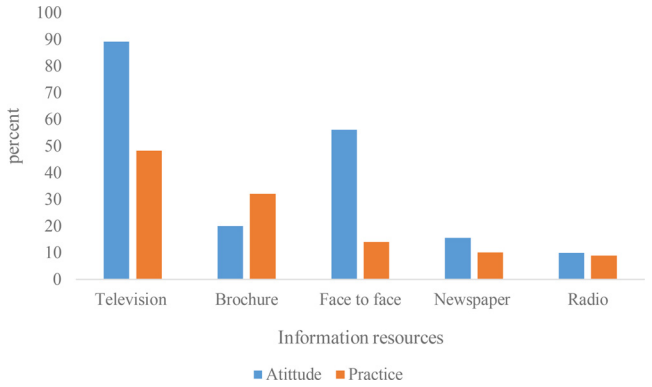

Fig. 6. Atittude and practice level of samples related to best type of training.

Lack of efficient training programs in the field of SWM is a relatively common problem and has been reported in some studies worldwide (Guerrero et al., 2013). Guerrero et al. studied 23 developing countries in terms of SWM and found that higher levels training on recycling and reduction leads to their greater tendency toward recycling.

The differences in how information about SWM in various studies can be derived arise from differences in policy organs as well as local, health, social, and economic policies of communities. In Iran, the Environmental Protection Agency is responsible for the policy of environmental education. Although the Environmental Protection Agency has so far done some efforts to provide educational materials related to SWM, the existing educational materials are not sufficient and do not meet all the needs, and further action needs to be taken in this regard.

6. Conclusion

The results suggested that the proper practice level of respondents (23%) was lower than their knowledge (79%) and attitude (86%) in relation to reduction in the source, separation, and recycling, where the majority of the people (56.65%) had a tendency toward recycling at home.

Due to lack of sufficient knowledge in this field and planning and constant support by different districts of the municipality, segregation is not done correctly. Also, the extent of recycling was a function of the level of education, occupation, and age. HHW separation and production of household compost were not performed due to the lack of facilities and required training by the governmental and private sectors. Also, 47.5% of the respondents were not satisfied with the waste collection services.

This study showed that although the municipality had plans for training people in the field of SWM, these plans did not have sufficient quality and quantity to be promoted. Also, the municipality must expand the facilities for public participation. Other organizations especially Environmental Protection Agency, ministry of education and the media should also promote their activities in the field of SWM.

The current status of municipal waste recycling has shown that no coherent and organized plan has been made to recycle and process MSW in Iran. Scattered movements in the field of compost production from MSW have been carried out in some cities in recent years, which have also the support of the government. The separation of recyclable materials from MSW is unofficially abused by thieves across all cities of Iran.

In order to raise the level of women's awareness, attitude and practice in the field of waste recycling from the source, the statement of the benefits resulting from the plan and the economic and social consequences of failure to implement the plan directly addressing people needs to be put into this context (Fig. 7).

Conflict of interests

The authors declare that they have no competing interests.

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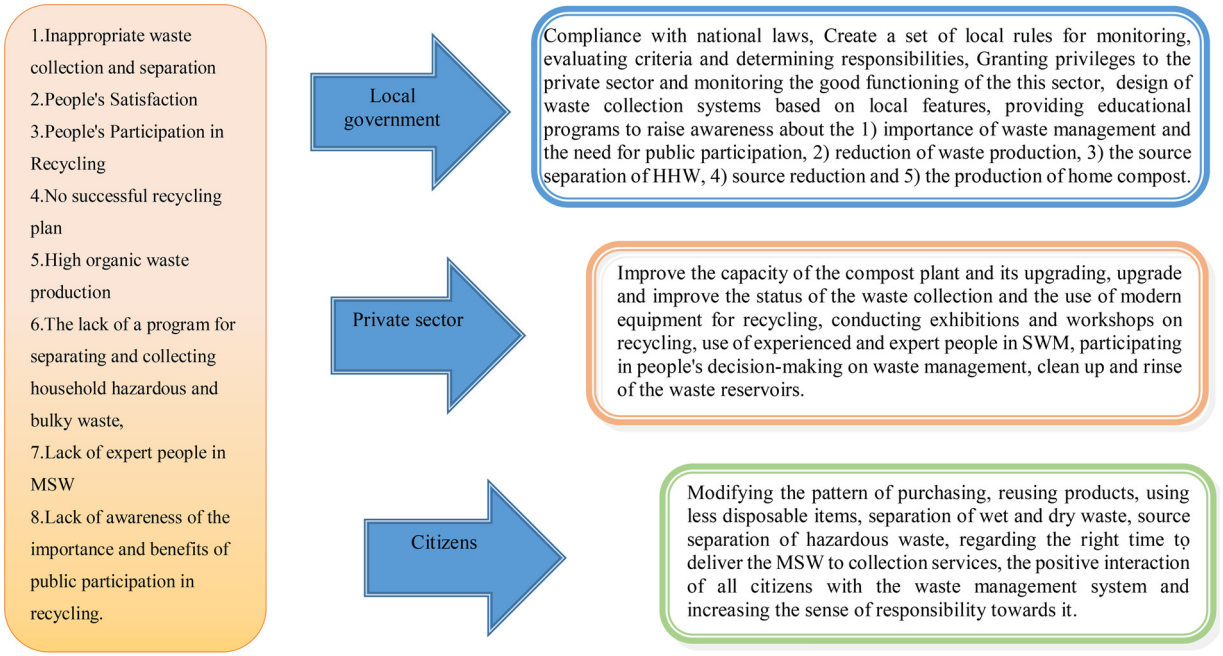

Fig. 7. Theoretical flowchart for SWM in Kermansha.

Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.resconrec.2018.10.017.

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