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Household recycling knowledge, attitudes and practices towards solid waste management

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ABSTRACT

A questionnaire survey consisting of 2400 householders was performed on Abadan residents to evaluate their knowledge, attitudes, and practices (KAP) towards solid waste (SW) reduction, source separation and recycling, collection and willingness to pay (WTP) for SW services. The study has also covered the relationship between demographic variables and KAP towards SW management. The data analyzed suggests that the studied community had a very positive attitude to take part in SW source separation and recycling plans. However, the respondents not only showed low intimate knowledge of different steps of SW management, but were also weak to take practices about these steps. The KAP of SW source separation and recycling was influenced by demographic factors of age, education level, gender and occupation. It was further found that education level and occupation were two significant factors affecting residents' WTP ($\chi^2 = 24.083$, p-value <0.0001). In conclusion our study found that providing public with MSW infrastructures and improving citizens' awareness about SW source separation and recycling to promote SW recycling programs hold great promise for developing effective public campaigns and behavior-changing interventions. This has important implications in that the usual KAP of public proved inadequate in the case of SW source separation and recycling. The implementation of needs-based training programmes considering females as one of the main audience groups and determination of municipality needs are thereby highly advocated.

1. Introduction

Household waste retains an absolute majority of municipal solid waste (MSW) sources to which most costs of municipal waste management are allocated (Karak et al., 2011). MSW constitutes approximately 10 percent of the waste produced, generating approximately 50 million kilograms of MSW in Iran annually (Jamshidi et al., 2011; Nasrabadi et al., 2008). Solid waste management (SWM), therefore, assumes a prominent role in municipal services (Ahmed and Ali, 2004). Keeping the view of serious health problems associated with population growth, rapid development and urbanization, providing a suitable waste management is perceived a challenging task in many communities. Developing countries suffer greatly from these problems, where garbage collection operations do not occur at all or not enough (Ahmed and Ali, 2006; Sharholy et al., 2007). The best and most economical method for dealing with these setbacks is to minimize the generation of waste (Farrelly and Tucker, 2014; Koolivand et al., 2014). Recycling of previously used materials has also been found to alleviate deleterious impacts of increasing amount of waste (Ehrampoush and Baghiani Moghadam, 2005). Although, it has been reported that more than half of all solid waste is recyclable, it is interesting to note that a substantial amount of recyclable waste is dumped into the garbage (Donnini Mancini et al., 2007). Hence, people play a prominent part in SWM elements such as waste generation, source separation, storage, collection, recycling and disposal. However, owing to a lack of public participation in recycling programs and

Abbreviations: KAP, knowledge, attitude and practice; SW, solid waste; SWM, solid waste management; MSWM, municipal solid waste management; SD, standard deviation; WTP, willed to pay; PAYT, pay as you throw.

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also an apparent lack of funding for waste transfer, the waste management sector in the developing country of Iran is faced with a growing concern of household waste disposal (Nasrabadi et al., 2008). Despite the fact that about 60–80% of municipal solid waste is recycled and turns back to the consumption cycle in European countries and the United States, reports in contrary to the most developed countries demonstrating only 8% of household waste recycling in Iran; however, exist. The remaining MSW is buried using unhygienic methods (Jamshidi et al., 2011).

It is worth-noting therefore that, besides providing the MSW infrastructures (by local government), achievement of integrated municipal solid waste management starts with understanding public concerns, preferences, knowledge and behaviour (Chung and Lo, 2004). The most cost-effective way of reducing household waste include public education and citizen encouragement to share in the design of household recycling processes (De Feo and De Gisi, 2010). Moreover, citizens' participation in the source separation process strongly affects the success of household recycling programs (Keramitsoglou and Tsagarakis, 2013; Krook et al., 2007). Thus, there is a crucial need to test and carry out theory-based detailed surveys to fathom the mechanisms responsible for citizen participation in the waste management programs. Assessment of factors influencing these behaviours including knowledge, attitudes, and practices (KAP) has been conducted extensively across literature (Barr, 2007; Byrne and O'Regan, 2014; Ehrampoush and Baghiani Moghadam, 2005; Nasrabadi et al., 2008; Pakpour et al., 2014; Pearson et al., 2012; Rahardyan et al., 2004). Knowledge is a familiarity, awareness or understanding of a community, such as facts, information, descriptions, or skills towards the topic of interest, which is acquired through experience or education by perceiving, discovering, or learning. Attitude is a settled way of thinking or feeling about something and refers to the community thoughts which may have tended to it. Practice, on the other hand, is an action based on the community knowledge and attitudes. Knowledge and attitude are two factors determining behaviour of society and the people in it.

Research studies in this field have usually focused on attitude, action and behaviour toward different aspects of SWM (Al-Sari et al., 2012; Barr et al., 2005; Jabbari et al., 2012; Purcell and Magette, 2010). Nevertheless, in order to achieve the goal of better and more effective recycling programs in the community, and also to assist in informing governmental strategies for waste management and solving household waste problems, it is important to know the behavioural and psychological factors influencing household recycling activities (Kofoworola, 2007; Rahardyan et al., 2004). Various studies have been conducted in this sector on elucidating the relationship between demographic variables and recycling involvement (Pakpour et al., 2014). Complicated SWM programs, which may be misunderstood by some residents, can affect SWM participation rate in a negative way (Purcell and Magette, 2010). In this sense, gender, age, education and the individual's income level are being most commonly employed variables (Pakpour et al., 2014; Saphores et al., 2006).

Attempts to improve SWM in developing countries have mainly focused on cost-effective waste management practices together with source reduction, separation and recycling (De Feo and De Gisi, 2010; Krook et al., 2007). Despite advantages of recycling programs in these countries, their implementations have encountered social oppositions including lack of public awareness and participation in recycling activities (Jamshidi et al., 2011; Nasrabadi et al., 2008). However, only a handful of studies have specifically been published showing the whole integrated treatment of public interest including knowledge, attitudes, and practices. In this field, the overall goal of the present study was to investigate and comprehend which factors prevent and/or facilitate residents participation in wastes source separation and recycling programs. Furthermore, the sense

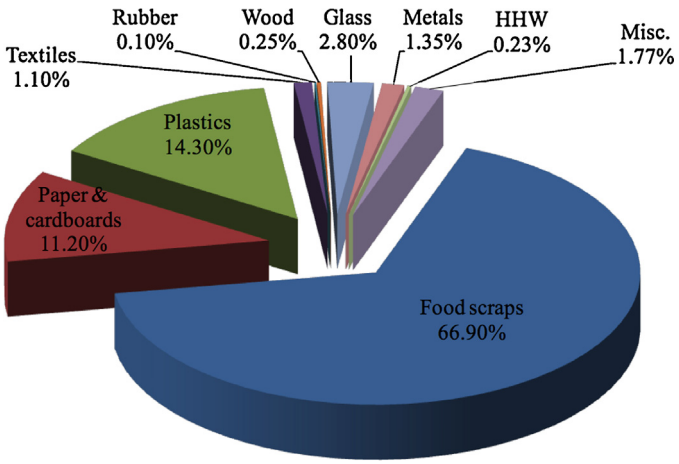

Fig. 1. MSW composition of Abadan city.

of citizens satisfaction towards SW collection system and their willingness to pay for SWM services were also noted. To achieve this goal, Abadan – a city in and the capital of Abadan County, Khuzestan Province in the Mediterranean region was selected as a model community in our study.

2. Area description and waste management in the city of Abadan

Abadan is located in the central west of Iran near the Iraqi-Iran border, with an approximate area of 2100 ha and estimated population of 228,409 in 2011. Abadan consists of 49,981 closely connected households (SCI, 2011). This city is an important industrial center in the southwest of Iran. The waste generation rate in this city, based on the data collected by local authorities, is estimated to be 0.70 (±0.10) kg per capita per day. In other words, about 290 kg of solid waste is generated annually by each citizen in Abadan city; which is comparable to other areas in Iran (Alavi Moghadam et al., 2009; Nasrabadi et al., 2008). Total amount of municipal solid waste is currently about 160 (±20) tons/d with a seasonal variation during the year.

The average loose or bulk density of the MSW is relatively high (250 kg/m^3) primarily due to the high content of food scraps (67.0 wt%) and the high average moisture content (74.5% (w/w)), as well. The physical composition of the MSW in the Abadan city is given in Fig. 1. It is clear that food scraps make up the highest proportion at 67.0 wt%, followed by plastics and paper. As shown, the percentage of food scraps in the MSW of Abadan city is fairly high, which is mostly due to use of unprocessed foods in daily people diets. Potentially recyclable materials such as paper, plastics, glass, metals and textiles all together account for 31 wt% of the MSW (Babaei and Alavi, 2010). Excluding industrial and special wastes, Abadan municipality is responsible for waste collection, transportation and disposal in accordance with waste management law in Iran (Islamic Parliament, 2004).

Solid waste is stored in no uniform waste storage bins at the source of generation in different areas of this city. Generally, household waste is stored mainly in plastic bins together with plastic bags. These bags are thrown away near houses or in medium-sized stationary containers, which are recently located in main and submain streets in commercial locations and in densely populated areas by Abadan municipality. Collection schedule and frequency were set differently from one place to another. Overall, a daily collection service has been provided in Abadan, with while the market areas were provided with collections twice a day. Currently, neither systematic source separation nor waste recycling programs