Original article

Received: Feb. 2, 2021;
Accepted: Aug. 8, 2021;
Published: Aug. 15, 2021

Assessment of Households' Practices towards Solid Waste Management

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Abstract

Solid waste is the organic and inorganic waste materials such as product packaging, furniture, clothing, bottles, kitchen refuse, paper, paint cans, batteries, etc. Management of solid waste; is the process of collection, treatment and recycling of solid waste in a sustainable manner to avoid the adverse effect on the environment. In Sudan waste management is poor and solid wastes are dumped along roadsides and into open areas, endangering health and attracting vermin. This descriptive cross-sectional community-based study with the aim to assess the practices of the households towards the management of house refuse was conducted in Al-Ozozab, Khartoum, 2019. Four hundred households were selected by multi stage sampling techniques from the community and data was collected by questionnaire and observation checklist. Most types (83.3%) of containers used for waste store were plastic bags. All (100%) of the respondents cover the waste container. Almost all the respondents wash their hands with water and soaps after cleaning. 50.7% of respondents hear about hazardous domestic waste from TV and (19.3%) from radio. More than half (53.3%) of the houses` level of cleanness was very good. Some factors are influncing solid waste practices such as solid waste practices improve significantly with the increase of the age of the households, with married women, with high level of education high monthly income. .It can be concluded that although, (97%) of the waste was transported with governmental body and disposed appropriately at communal sites, the rest of the households members throw waste in any available space including front of houses and in streets.

Keywords: Assessment, households, practices, management, solid waste

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Introduction

Solid waste is made up of organic and inorganic waste materials that comes about as a result of human and animal activities and is no longer needed which needs to be discarded due to its value loss to the user. It includes product packaging, grass clippings, furniture, clothing, bottles, kitchen refuse, paper, appliances, paint cans, batteries, etc. These wastes are produced in the society and generally do not carry any value to its first user, (Vickey, 2019). The term solid waste management is the process of collection, treatment and recycling of solid waste in a sustainable manner to avoid the adverse effect on the environment(Wilson, 2015). There are various sources of solid waste; they include household waste, industrial, commercial, construction and demolition, treatment plants and sites, agriculture and medical waste (Paes, 2019). The houses are one of the major sources, which discard domestic solid waste materials daily, these garbage and wastes are; food residues, glass, vegetables, fruits, wood, papers, minerals and plastic.

The first step of waste management is waste collection. House-to-house collection is very common in most developed nations but very low in developing nations due to several challenges including financial, population expansion and other economic difficulties(Bezama and Agamuthu, 2019). The second step is sorting these wastes; the following step is to transporting these materials to the final disposal sites to protect human health and environment.

Illegal waste dumping of solid waste raises many problems even in developed countries, transition economies, or developing countries, where rural areas are frequently exposed to environmental threats (Zeng, 2015). Residents in developing countries, especially the urban poor, are more severely impacted by unsustainably managed waste. In low-income countries, over 90% of waste is often disposed in unregulated dumps or openly burned. These practices create serious health and environmental consequences. Poorly managed waste serves as a breeding ground for disease vectors, contributes to global climate change through methane generation, and can even promote urban violence (The World Bank, 2019). Low and middle income countries face major challenges in ensuring universal access to waste collection services, eliminating uncontrolled disposal and burning and moving towards environmentally sound management for all waste, (UNEP, 2015). Globally, 39% percent of the world population does not use proper method for waste disposal. Some 1. 1 billion people still disposed waste in the open places. Improper waste disposal most widely practices in rural areas so that people face many health related problems, (Shahzadi, 2018). Communities in developing countries often turn to waste disposal methods that have proven to be destructive to human health and the environment, such as open dumping and burning because they feel they have no other options to manage their solid waste, (Al-Khatib, 2015).

For effective waste management, waste minimization, reuse, recycle and energy recovery are more sustainable than conventional landfill or dumpsite disposal technique. These actions not only help in protecting environment, but also help in employment generation and boosting up the economy, (Salman, 2019). Solid waste management techniques increase the rate of recycling waste and minimized waste disposal on land. Creative recycling is good for the environment, saves money, and can

form the basis of an enjoyable and engaging hobby, (Hofverberg and Maivorsdotter, 2018).

This study aims to assess the practices of the households towards the management of house refuse in Al-Ozozab, Khartoum, Sudan, 2019 and specifically to identify the practices concerning collection of house refuse, to determine the practices concerning transporting of house refuse and to explore the contributing factors of management of house refuse. The average weight of solid waste generated in Alkalakla Administrative Unit was 0.401 kg/ capita/day, and accordingly estimated annual amount of solid waste was (36241.6 ton), (Elzaki and Elhassan, 2018).

Households` knowledge, attitudes and practices about solid waste management

Kiran from Panchayath, Nitte University in his study about KAP of solid waste disposal of households in Kuttar&Manjanad found that the majority of participants had a positive attitude towards solid waste disposal and 98.3% felt that improper solid waste removal and disposal effects environment. Barloa conducted a study to establish the effect of knowledge, attitudes and practices on waste management among 2,528 Polytechnic university students. The findings indicate that 73.4% of the students` knowledge to be satisfactory, 71.4% had positive attitude towards strategic waste management issues. Study on attitude of household towards waste management in a rural area of Northern Kerala revealed that the participants responsible for the waste management in household were women. The majority (82%) had an educational qualification of high school and above. Most of them (82.5%) were housewives. Almost 70% had the belief that government is not doing anything to fix the garbage problem. About 97%, 88.6% and 92% were willing to do composting, segregation and recycling of waste respectively. Majority of the participants had above average attitude towards household waste management (Kaithery and Karunakaran, 2019).

Households` solid waste management practices

Kiran from Panchayath, Nitte University in his study about KAP found that household waste disposal practice was found to be unsatisfactory as 78 households disposed household`s wastes by just throwing away outside the house, (Kiran et al, 2015). Barloa from a Philippine State University in his study found that around 43.1% depicted satisfactory levels solid waste practices (Barloa, 2016). A study that conducted by Laurieri, regarding the practical management of home waste, showed that respondents differentially deliver their small bins outside their house during the week according to the pick-up planning scheduled by municipal authorities, with only a very few people delivering their bins only 3 days a week or less (9.6%) (Laurieri, 2020). McAllister stated that the municipalities' responsibility is to organize and manage the public sanitation system, including providing the infrastructure for the collection, transportation, treatment and disposal of wastes (McAllister, 2015). A study on assessment of household waste management and hygienic practice that conducted in Ethiopia discovered that (36%) of the households disposed solid wastes through municipality and 95.7% of households had temporary storage means for solid waste. This study revealed that household management of

waste in the community of Yirgalem town is poor in terms of their liquid waste management (Tekleyohannes, 2019). A study conducted in Shendi showed that 30% - 55% of the household produce about a kilogram a day per person, while 22% - 40% generate 5 or more kilograms daily. More than 50% of the household of different classes store their waste at home near the toilet, kitchen or other commodities in the house. Although most of the households were using suitable methods to store their solid waste (covered bins: 03%-09%; and closed plastic bags: 67%-74%), some household stored the waste at the collection point (03%-06%) or other improper methods (05% - 18%), (Omer and Eltigani, 2018). Lee stated that participants washed their hands more frequently "after cleaning" (79.5%) (Lee, 2015).

Responsibility of solid waste management among the households

A study conducted by Putnick and Bornstein showed that girls are more likely to be involved in excessive housework than boys (Putnick and Bornstein, 2016). A study that conducted in Ethiopia by Tekleyohannes, revealed that 94.3% the responsibility of waste management is left for women and girls (Tekleyohannes, 2019).

Factors influence solid waste management.

A study conducted in Sierra Leone, showed that the solid waste generation and composition in Freetown was significantly affected by average family size, employment and marital status, monthly income, and number of room(s) occupied by households. He highlighted the role of socioeconomic factors in affecting the generation and composition of household solid waste, (Sankoh, 2015). A study that conducted by King'oo, 2019 in Kenya found that Neighborhoods that are inhabited by affluent people may be more "cleaner" than those inhabited by low income groups due to the fact that those with higher monthly income are significantly more willing to contribute towards waste collection services than those with lower incomes, (King'oo, 2019).

Sources of solid waste management:

A study that conducted in Kenya found that (65.3%) of the respondents mainly acquired the information on solid waste management though television while those in rural Gachororo acquired through radio (71.3%), (King'oo, 2019).

Methods and Materials

Study design: Cross sectional descriptive community based study with the aim to assess the practices of the households towards the management of solid waste, Al-Ozozab, Khartoum, Sudan, 2019. The study was conducted in Al-Ozozab area, Al-Shajara Locality, Khartoum State. The targeted population is households. 400 of households were selected by the following formula: n = N/1+N (e^2) to participate in the study. The sample was distributed by using systematic random sampling techniques. The data was collected by using questionnaire targeting households that include demographic and KAP data about the solid waste management; interview targeting environmental health authorities and observation checklist to check the practice of the households towards the solid waste management.

The collected data was analyzed by using Statistical Packages for Social Sciences (SPSS) version 20.0 and $\chi 2$ test was used to show the association between socio-demographic factors and the practices of the households towards the solid waste management.

Results

Nearly half 49.3% of the of the respondents` age were less than 20 years, 48% were between 21 and 30 years old. The majority 98.5% of the respondents were married. 62% of the respondents were over secondary educated. Most of the respondents 71.8% were housewives. 53.5% of the respondents` monthly income >6000 SDGs, 21% between 4000 and 5000 SDGs, 16.3% between 3000- 4000 SDGs and only 1% has less than 3000 SDGs. More than half (50.7%) of the respondents` source of information about hazardous domestic waste was TV followed by Radio (19.3%) and person (15.1%) (Fig 1). Nearly half (48.9%) of the respondents have good knowledge concerning solid waste management. The majority (88.3%) of the respondents know the effect of domestic waste on the environment.

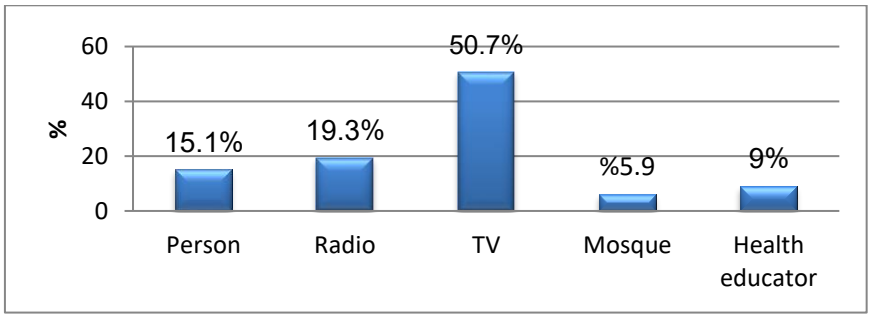

Fig.1 Source of information about hazardous domestic waste

The majority (86.0%) of the respondents have unfavorable attitudes towards hazard of domestic waste. The majority 96.3 has favorable attitude towards the correct method for waste disposal. All the respondents were cleaning their houses. 90.8% of the mothers were the first responsible of cleaning home followed by both mothers and fathers 9.3% (Table 1).

Table.1 Attitudes towards hazard of domestic waste and the correct method for waste disposal (n=400)

Response	No.	%
Hazard of domestic waste		
Favorable	56	14.0
Unfavorable	344	86.0
The correct method for waste disposal		
Favorable	385	96.3
Unfavorable	15	3.8

The majority 98.3% of respondents have role in home cleaning. The majority (83.3%) of the respondents use bags for storing waste. All respondents (100%) cover the waste containers. The vast majority (99.3%) of respondents are washing their hands with water and soaps after cleaning. 95.3% of the waste was transporting by governmental bodies (Table 2).

Table 2 The responsibility of transporting the waste

Response	No.	%
Governmental body	381	95.3
Private sector	7	1.8
Others	12	2.9
Total	388	100.0

Nearly half 48% of the respondents dispose the waste in the street. 32% dispose it in front of the house(Fig 2).

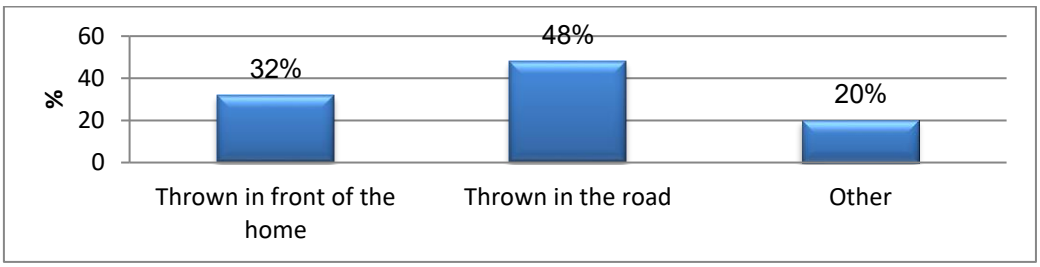

Fig.2 Distribution of the respondents according to the disposing of waste in case of the absent of the waste disposal vehicle

There is a significant association between respondents` age and improved solid waste management practice at ($p<0.05$). The solid waste management improve with the increased age (Table 3).

Table 3 Association between respondents' age and improved solid waste management practice

	Age			Total	P-value
Cleanliness status	< 20	21-30	> 30		
Clean	16 (100%)	185 (96.4%)	192 (100%)	393 (98.3%)	
Not clean	0 (0.0%)	7 (3.6%)	0 (0.0%)	7 (1.8%)	

There was a significant association between marital status and hand washing after cleaning at ($p<.05$) (Table 4).

Table 4 Association between marital status and practice of hand washing

Hand washing	Marital status		Total	P-value
	Married	Not married		
Washing hands with water and soaps	392 (99.5%)	5 (83.3%)	397 (99.3%)	
Washing hands with water only	2 (0.5%)	1 (16.7%)	3 (0.8%)	

There was a significant association between the respondents `occupation and frequent of cleaning the house at (p<.05) (Table 5).

Table 5 Association between the respondents` occupation and the frequent of cleaning the house

	Occupation			Total	P-value
	Housewife	Worker	Employee		
Twice daily	34 (11.8%)	24 (61.5%)	22 (29.7%)	80 (20%)	
Once a day	229 (79.8%)	15 (38.5%)	50 (67.6%)	294 (73.5%)	
Every two days	24 (8.4%)	0 (0.0%)	2 (2.7%)	26 (6.5%)	

Discussion

The study illustrated that the majority of the mothers (90.8%) were the first responsible of cleaning home followed by both mother and father. This was due to the gender role of the culture and social norms of the community. This finding agreed with the study that conducted in Ethiopia, which showed that 94.3% of the mothers and girls were the first responsible of cleaning home (Tekleyohannes, 2019). The study indicated that the majority (98.3%) of respondents mentioned that boys and girls have a role in home cleaning. This indicated participation of both genders in home cleaning. This disagreed with the study that conducted by Putnick and Bornstein, which showed that girls are more likely to be involved in excessive housework than boys, (Putnick and Bornstein, 2016). The current study showed that most types (83.3%) of containers used for storing waste were bags and these bags were covered. This because the plastic bags were available and less expensive compared with other types of waste containers. This finding agreed with a study that conducted in Shendi City, which found that most of the households were using plastic bags and 67%-74%, of the respondents covered the waste containers, (Omar and Eltigani, 2018).

The study indicated that the vast majority (99.3%) of respondents wash their hands with water and soaps after cleaning. This due to the convinced messages from T.V as indicated in the study that 50.7% of the respondents received their health messages from T.V. This finding agreed with Lee study, who stated that participants washed their hands more frequently "after cleaning" (79.5%), (Lee *et al*., 2015). Although, (86.0%) and (96.3%) of respondents have favorable attitudes regarding hazardous domestic waste and correct method for waste disposal, the majority (93%) place all the different types of waste in one container. This indicated that no segregation was done regarding solid waste at

household level. This agreed with the study that conducted in a rural area of Northern Kerala, which showed 93.8% of the study population had above average attitude and 6. 2% had below average attitude but disagreed with the same study that found about 97%, 88.6% and 92% were willing to do composting, segregation and recycling of waste respectively, (Kaithery and Karunakaran, 2019).[13] The majority (98.2%) of the respondents mentioned that the government transports the waste. This finding indicates that the responsibility of waste transport depends on government. This agreed with the study, which showed that the municipalities (government) have been in charge of providing solid waste management services in developing countries. However, the municipal responsibility is to organize and manage the public sanitation system, including providing the infrastructure for the collection, transportation, treatment and disposal of wastes (McAllister, 2015). 28.8% of the respondents reported that the frequent of transporting of the waste was once per week. This may return to the lack of vehicles or trucks that transport the waste in the study area. This finding agreed with the study that conducted by Laurieri, who found that the respondents differentially deliver their small bins outside their house during the week according to the pick-up planning scheduled by municipal authorities, with only a very few people delivering their bins only 3 days a week or less (9.6%), (Laurieri*et al.*, 2020).

In case the waste vehicle does not attend, half of the respondents (48%) throw their solid waste in the street, (32%) throw in front of the home. This may be due to poor practice concerning waste disposal. This agreed with the study that conducted by Kiran, who stated that household waste disposal practice was found to be unsatisfactory as (65%) households disposed of household wastes by just throw away outside the house (Kiran *et al.*, 2015). The current study showed significant association between respondents` age and cleaning solid waste. This implies that younger households were more likely to practice proper solid waste management compared to older ones. This agreed with study that conducted by Barloa, which shows that age and education levels were important contributing factors, (Barloa *et al.*, 2016). The study showed significant association between occupation and frequent of clean home. Housewives were significantly clean their home once a day, followed by employee, twice a day. This may be due to spare time of the housewives compared with the employees. The finding agreed with the study that conducted by Sanko, who found an association between employment status and waste management, (Sankoh*et al.*, 2015).

The study showed that those who have family income less than 3000 SDG were significantly often clean their kitchen twice (100%). The finding indicated that income was not a major contributing factor in influencing solid waste management. This disagreed with Kingoo`s statement that neighborhoods that are inhabited by affluent people may be more "cleaner" than those inhabited by low income groups due to the fact that those with higher monthly income are significantly more willing to contribute towards waste collection services than those with lower incomes, (Kingoo, 2015). In conclusions, the majority 77.6% of the solid wastes generated at home were papers and trees papers, 7.5% rubble, 3% glass or iron, and 11.9% were animal waste. 87.3% of the solid waste was stored covered in tided plastic bags containers and 48% of the

respondents dispose the waste in the street 32% dispose it in front of the house without sorting. (90.8%) of the mothers are responsible for household waste management. The TV represents (50. 7%) of the solid waste management source of information and radio represents (19. 3%). There is a significat association between increasing age, high level of education and high level of income on one side and improving solid waste practices among household on the other.

Recommendations:

The State Ministry of Health should involve community members in decision-making and make use of the local available mass media (radios, televisions, newspapers, posters, magazines) to promote the practice of the households regarding solid waste management beside providing more communal trash bins and the Ministry of Education should include the management of solid waste in the outclass activities.

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