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Community's perception of utilization and disposal of plastic bags in Eastern Ethiopia

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ABSTRACT: Plastics, one of the most abundant materials in the world today, are one of the main sources of pollution. People's perception of using and disposing plastic bags is primordial as they tend to be a major part of household solid waste. This study aims to determine community's perception of usage and disposal of plastic bags in Eastern Ethiopia. A quantitative cross-sectional study has been conducted in Harar city of Eastern Ethiopia, using a multi-stage statistical sampling technique. The data concerning all variables have been collected via pretested questionnaire and observational checklist with a response rate of 91% which has then been into SPSS and analyzed by STATA 11.0. About 51% open dump their plastic bag wastes. It has been shown that the majority (88.7%) of the responders perceived plastic bags as having environmental impacts, with 82.8% feeling a growth in their plastic bags utilization and about 54% thinking that plastic bags should be banned. It has also been illustrated that perception of plastic bags' environmental impacts and the willingness to pay for solid waste collection service has an association with plastic bag utilization. This study has found that utilization and open dumping of plastic bags rests at a significantly higher level. Community's perceptions regarding environmental impacts of plastic bags have been at a higher level, which still requires consideration. A considerably high number of residents believe that utilization of plastic bag should be continued; therefore, a great emphasis should be given to bringing the desired attitudinal change.

Keywords: disposal, perception, plastic bags, utilization.

INTRODUCTION

Plastic bags have been introduced in 1970s. The word plastic, itself, is originated from the Greek term "plastikos", meaning able to be molded into different shapes (TARSC, 2010). It is an organic amorphous solid, favored for its cheap production, mechanical and thermal abilities, stability, and durability (Nugusu et al., 2013; TARSC, 2010).

Currently plastic material production enjoys a boom with common polyethylene products including jugs, bottles, buckets, plastic bags, etc. (Camann et al., 2011). It has been estimated that around 500 billion

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plastic bags are being used every year throughout the world, with its vast majority being discarded as wastes usually after the first use (Mangizvo, 2012; Moharam and Al. Maqtari, 2014; TARSC, 2010).

While the environmental costs of plastic bags are burdensome for communities and the planet, their cost for retailers is pretty low (Budhiarta et al., 2012; Tyagi et al., 2014). Unfortunately, such products are one of the main sources of pollution, as littering is still a problem. The combination of long lifetime and high levels of consumption can put landfill capacity UNDER pressure. The lightweight properties of the plastic bag allow it escape from rubbish bins and landfill and, if littered, move around the natural environment causing miscellaneous problems (Camann et al., 2011; Chitotombe, 2014b; Mangizvo, 2012; Moharam and Al. Maqtari, 2014; Mushonga et al., 2015; Okechukwu et al., 2012; Santos et al., 2005).

Plastic bags not only affect our local environment but also influence the world around us. It can also harm human health by creating conditions, favorable for causing diseases (Asgedom and Desta, 2012; Chengula et al., 2015; Mushonga et al., 2015). The widespread use of plastics demands properly ending the life management. Plastics make up more than 12% of the municipal solid waste. The perception of plastic recycling is not high, even if it is desirable, due to its avoiding the accumulation of plastics in landfills (Banga, 2011; Yintii et al., 2014).

The problems with plastic bags include littering, associated indiscriminate waste disposal, and consumer behavior; resource consumption issues; plastic degradability issues relating to littering and resource use; and social issues that involve community education and awareness, as well as consumer perceptions (Gyapomaa, 2013; Longe et al., 2009; Rajkumar, 2015). Dumping can be commonly observed near road side, open plots, river side, drains, and public places, even though it is prohibited under Ethiopian law.

Plastic or polythene bags, commonly known as festal in Amharic language, are in common use as shopping bags to package food and other items in Harar city as well as other parts of Ethiopia (Tyagi et al., 2014). The case with plastic bags is worsened in countries economically fallen behind, like Ethiopian (Legesse Adane and Muleta, 2011).

Hence, people's perception of plastic bag usage and disposal is primordial as it tends to be a major part in household solid waste management as it can have an impact on the reliability and success of integrated household solid waste management strategies.

Therefore, this study has attempted to analyze community's perceptions of the utilization and disposal methods of plastic bags with a view of safe and reliable long-term solution for different plastic waste residues, which provides important information for policy makers and planners in implementation of integrated solid waste management in Harar town and other cities of Ethiopia. In addition, it will also provide additional evidence for the scientific community. This study aims to determine community's perception of the usage and disposal of plastic bags in Eastern Ethiopia.

MATERIALS AND METHODS

Study setting

A quantitative cross-sectional study has been employed. The study has been conducted in a selected area of Eastern Ethiopia, namely Harar region from February 1 to April 15, 2015, its data being collected via a pretested questionnaire and observational checklist.

Participants

All household heads in Harar region of Eastern Ethiopia has been the statistical population of this study. Households, consisted of an individual, have been

included in the study while subjects, who were severely ill during the data collection phase, have been crossed out. In order to select the participants, the study has made use of a stepwise sampling technique, in which the homogeneity among the six urban districts (clusters) has been taken into consideration in order to select the available one via simple random sampling method (the lottery method). Then from the selected district, the studied households have been identified, this time by systematic random sampling technique.

Variables

- Community's perceptions of plastic bag utilization and plastic bag waste disposal methods
- Educational status, age, occupation and sex of household head
- Willingness to pay, fee for plastic bag disposal and cost of plastic bag.

Data sources/ measurement

Data, concerning all the variables, have been collected through pretested questionnaire and observational checklist by the trained Environmental Health Science professional data collector. The investigators were responsible for coordinating the assessment and identify sampled subjects, involved in the data collection, while the data collectors were responsible for collecting the necessary data via interview and observation, by means of their professional experience. The aim of the study was clarified to the subjects.

Bias

To minimize bias and ensure the quality data collectors were trained and a pretest was conducted in order to ensure the quality of the tools/ instruments. The investigators checked the collected data in order to maintain its accuracy, completeness, clarity, and consistency on a daily basis. Any error, related to clarity, ambiguity, incompleteness, or misunderstanding were solved on the following day, prior to data collection activities. To make the subjects respond freely and minimize the Hawthorne effect, the data collection process was conducted confidentially, its data kept as short as possible. The investigators coordinated and supervised overall data collection process.

Size of the study

Based on the assumption of homogeneity among urban districts (clusters) of Harar region, one district was selected via simple random sampling technique. The basis for selecting a specified number of clusters was the assumption that socio-demographic characteristics of the residents in the urban districts of Harar region are homogenous. Then the sample size was determined by means of single population proportion formula (i.e. by using critical value for normal distribution at 95% confidence level equal to 1.96; the proportion of targeted population equal to 0.5; and an absolute precision (margin of error 5%= 0.05). The final sample size turned out to be 384. Afterwards, a corrected factor was applied, since the total households in the district were below 10,000. Finally, after considering the non-response rate, the sample size declined to 332.

Quantitative variables

The collected data were coded and entered into a computer, using SPSS statistical packages. Afterwards 10% of the responses were randomly selected and checked for the consistency of data entry. Frequencies were then determined and printed to check outliers and clean the data, which were cleaned accordingly, then to be exported to STATA v. 11 for further analysis.

Statistical methods

The frequency distribution of dependent and independent variables were computed with Bivariate Analysis, used in order to calculate the crude Odds Ratio (OR) and a 95% Confidence Interval (CI). By means of logistic regression, the association between the outcome and selected covariates was identified. For all statistical

significance tests, the cut of value set was $P<0.05$ as this is considered statistically reliable for the analyses in this study.

Ethical considerations

Ethical approval and clearance was obtained from the Haramaya University, College of Health and Medical Science, IHRERC (Institutional Health Research Ethics Review Committee) Departmental delegated committee. Official communications were made with the concerned institutions in addition to personal communications by the investigators. To collect data, the participants were clarified concerning the purpose of the study, the importance of their participation, and true response. It was also explained that the study had no connection with respondents' private affairs. In addition, participant information sheet and informed consent form was prepared for each participant. Confidentiality of all data collected was kept. All sample populations were encouraged to participate in the study, while at the same time they were informed that they have the right not to do so.

RESULTS AND DISCUSSIONS

In sum, 302 respondents participated in this study, scoring a response rate of 91%, out of whom 56.6% were females and 40.4%, in the age range of 15 to 35 years. About 47.4% of respondents were at primary education level (Table 1).

About 40% of the residents mostly used plastic bottles among the plastic products (Fig. 1).

About 35.8% and 30.1% of residents believed that lack of alternatives and low cost caused them to prefer plastic bag, respectively (Fig. 2).

Table 1. Characteristics of residents of urban districts of Harar region, Eastern Ethiopia, 2015

Characteristics	Number (Un-Weighted)	% (Weighted)
Sex		
Male	131	43.4
Female	171	56.6
Age Group		
< 15	35	11.6
15 – 34	122	40.4
35 – 55	90	29.8
> 55	55	18.2
Level Of Education		
Illiterate	33	10.9
Primary Education	143	47.4
High School Education	93	30.8
Higher Education	33	10.9
Occupation		
Student	84	27.8
Government Employee	96	31.8
Private Business	117	38.7
Others	5	1.7

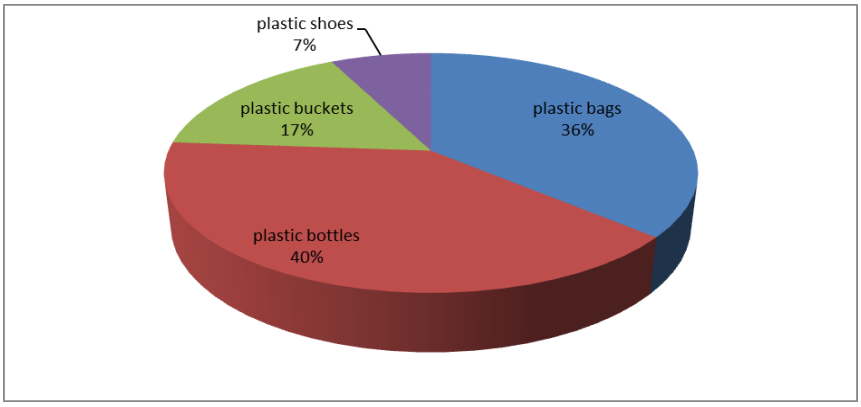

Fig. 1. Rate of used plastic products by type among urban residents of Harar region, Eastern Ethiopia, 2015

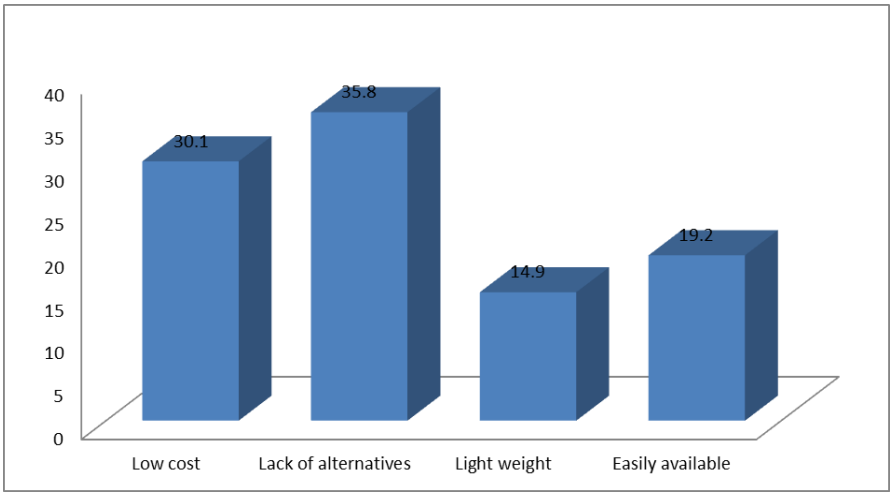

Fig. 2. Primary reason for perception of plastic bag preference among urban residents of Harar region, Eastern Ethiopia, 2015

This study revealed that among the plastic products, plastic bags utilization fell below the rate, provided by the other studies. The possible reason behind this difference could be scarcity of piped water supply in Harari region, forcing the community to consume more bottled water, hence greater use of plastic bottles. However, the utilization of plastic bags was still significantly at higher level, mainly influenced by its low cost and lack of alternative materials (Adane and Muleta, 2011; Asgedom and Desta, 2012; Camann et al., 2011).

About 51% of the residents mostly open dump their plastic bag wastes (Fig. 3). Regarding the disposal options of plastic bags, more than half of the residents responded that open dumping was their common practice to dispose plastic products, especially plastic bags, which is in accord with other reports, suggesting that (1) plastics cause the main problems and (2) that plastic is non-biodegradable. This confirms the fact that there were some residents in the study area, who had never heard about the impacts of plastic wastes. A study revealed that awareness and education are the most relevant and effective method or strategies to reduce plastic wastes. The reason could be the community's little focus on plastic bag wastes along with the limited law enforcement by the government on the entrance of non-recyclable plastic bags (Banga, 2011; Chitotombe, 2014b; Mangizvo, 2012; Okechukwu et al., 2012; Rajkumar, 2015; Tyagi et al., 2014).

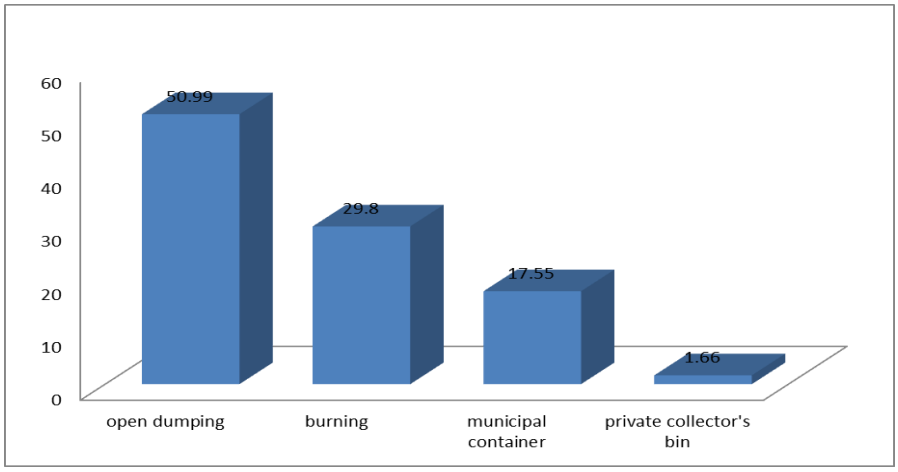

Fig. 3. Mostly used method of plastic bag waste disposal among urban residents of Harar region, Eastern Ethiopia, 2015

Majority (88.7%) of the residents responded that they perceived plastic bags have impacts on the environment. Among them, 63% responded that the primary information source for their current perception was through Television and/or Radio (Table 2). This study showed that majority of the respondents perceived the important roles of Television and Radio in dissemination of the information, concerning environmental impact of plastic bags, which is in line with other reports. These could indicate that media like Television and Radio is effective as they bring the desired awareness for the community, regarding the impacts of plastic bags (Banga, 2011).

Majority (82.8%) of the residents agreed that their use of plastic bags was increasing from time to time, while the rest (17.2%) said that it was other way round. This is in accord with other studies, indicating that the use of plastic bags is increasing at an alarming rate with its entire burden on our ecosystem (Adane and Muleta, 2011; Asgedom and Desta, 2012; Budhiarta et al., 2012; Moharam and Al. Maqtari, 2014; Santos et al., 2005). Among the perceived primary reasons for the increased utilization, 49.2% and 44.4% responded easy availability and low cost, respectively, whereas among the perceived primary reasons for decreased utilization, 53.9% responded increased awareness of the community (Table 3).

Among the residents, 54% said that utilization of plastic bags should be banned, while the rest (46%) believed that its utilization should continue. Among them 55.2% answered that it should be stopped by the community, itself, and again, 84.7% of them also stated that paper bags must be used as an alternative to plastic bags (Table 4).

Table 2. Primary information source for current perception about environmental impacts of plastic bags among urban residents of Harar region, Eastern Ethiopia, 2015

Information Source	Number (Un-Weighted)	% (Weighted)
Television and/or Radio	169	63.06
Town Municipality Promoters	43	16.04
Published Materials	26	9.70
Schools	28	10.45
Others	2	0.75
Total	268	100.00

Table 3. Perceived primary reasons for increasing and decreasing utilization of plastic bags among urban residents of Harar region, Eastern Ethiopia, 2015

Perceived Primary Reasons		Number (Un-Weighted)	% (Weighted)
For Increasing Utilization	Low cost	111	44.4
	Ease availability	123	49.2
	Low awareness	15	6
	Others	1	0.4
	Total	250	100
For Decreasing Utilization	Replaced with other material	10	19.2
	Increased price	8	15.4
	Increased awareness	28	53.9
	Others	6	11.5
	Total	52	100

Table 4. Perceived responsibility and alternatives in banning plastic bags utilization among urban residents of Harar region, Eastern Ethiopia, 2015

Banning Plastic Bags		Number (Un-Weighted)	% (Weighted)
Perceived Responsible Body	Community	90	55.2
	Government	72	44.2
	Others	1	0.6
	Total	163	100
Perceived Alternatives	Paper bags	138	84.7
	Fiber bags	12	7.3
	Cloth bags	13	8
	Total	163	100

Community's belief on stopping plastic bag utilization rested at a higher level, almost similar with other study findings. This is in line with the fact that utilization of plastics increased from time to time, perhaps indicating that the actions required to reduce plastic bag utilization was not up to the required level. Both in this and the other ones, the residents who found it more appropriate to discontinue plastic bag utilization thought that the community and government are responsible, which could suggest that community, by itself, is ready to take the responsibility and the government is expected to take quick action about the problem (Adane and Muleta, 2011; Camann et al., 2011; Chitotombe, 2014a).

About 60.6% of the residents responded that the provided solid waste disposal service was organized while the rest (39.4%) perceived it to be non-organized. Out of the respondents, belonging to the former category, 62.3% were satisfied with the service.

Concerning segregation of plastic bags, 65.2% of the residents were willing to separate onsite while the rest (34.8%) responded that they were not so.

Majority of the residents (89.4%) were willing to pay for solid waste management service, while only 10.6% responded that they were not, most of whom (97%) declaring that they were not encouraged to do so.

Multiple-variable logistic regression was used to identify the factors, contributing to the utilization of plastic bags. The coefficients were expressed as crude and adjusted odds ratio, relative to the reference category.

Government employee residents were 64% less likely to increase the use of plastic bags than students, which could be linked to

the fact that educated residents were more likely to be government employees, hence fewer users of plastic bags. This could indicate that students were more likely to contribute to the generation of plastic bag and that they have received less focus so far in this particular regard (Rajkumar, 2015; Santos et al., 2005).

Those residents who did not think plastics bags had environmental impacts were 2.65 times more likely to increase utilization of plastic bags than those who did, even if it lost its statistical significance after adjusted for other covariates. This further confirms the fact that the perception of plastic bags' environmental impacts could play a key role in reducing plastic bag utilization to the expected level (Banga, 2011; Rajkumar, 2015).

Those residents, who did not receive an organized solid waste collection, were 3.74 times more likely to increase plastic bag utilization than those who did. This could tell us that expanding the coverage of organized solid waste collection service in the town by itself will have a role in decreasing plastic bags utilization, as causing awareness, a component of this service, would bring the desired attitudinal change (Longe et al., 2009; Tyagi et al., 2014).

Residents, who were not willing to pay for solid waste collection, were 4.38 times more likely to increase plastic bag utilization than those who were willing to do so. In addition the study showed that those, unwilling to pay residents, majorly responded that they were not encouraged to do so. This could inform that those, unwilling to pay residents, were less concerned and informed about solid waste management problem, being more likely to contribute to the generation of plastic bag waste, as their utilization level was dramatically higher than the ones, willing to pay (Bharti et al., 2014; Ginindza et al., 2013; Longe et al., 2009; Table 5).

Table 5. Different factors' association with plastic bags utilization among urban residents of Harar region, Eastern Ethiopia, 2015

Variables		Odds Ratio (95%) CI	
		Crude	**Adjusted**
Occupation of Respondent	Student	1.00	1.00
	Government employee	0.39 (0.18, 0.86)	0.36 (0.16, 0.85)
	Private business	0.58 (0.29, 1.17)	0.56 (0.27, 1.16)
	Others	0.75 (0.08, 7.09)	1.24 (0.12, 13.31)
Perception that Plastics Bags have Environmental Impacts	Yes	1.00	1.00
	No	2.65 (1.20, 5.85)	1.57 (0.67, 3.72)
Received Organized Solid Waste Collection Service	Yes	1.00	1.00
	No	3.00 (1.62, 5.55)	3.74 (1.85, 7.57)
Willingness to Pay for Solid Waste Collection	Yes	1.00	1.00
	No	2.93 (1.31, 6.52)	4.38 (1.78, 10.76)

CONCLUSIONS

Utilization of plastic products is on the rise, with that of plastic bags being at a dramatically higher level. Lack of an alternative and its low cost has been thought as the major culprits for plastic bags preference, lifting the practice of plastic bag open to a largely higher level. Low cost and easy access are the major perceived factors for the increased plastic bag utilization. The current study has demonstrated that a significantly high number of residents thought that plastic bag utilization should be continued; to be a

governmental employee than a student was associated with decreased level of plastic bags utilization; and believing that plastics have environmental impacts, receiving organized solid waste collection service, and willingness to pay for solid waste collection service were all associated with increased use of plastic bags.

The responsible governmental body needs to mobilize the community (including school-based activities) in order to bring the desired attitude change on plastic bag utilization and disposal, produce and promote alternative reusable bags, increase the coverage of organized waste collection services, properly enforce the legislation for prohibiting non-recyclable plastic bags, and place street dust bins as required. Further studies also need to be done in the areas of recreating, producing, and promoting degradable plastic bags.

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