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SOLID WASTE SEGREGATION BEHAVIOR AMONG URBAN WOMEN

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Abstract:- This study examined the solid waste segregation behavior of the women of Chennai city of Tamil Nadu state. Using a structured, self-developed interview schedule, 120 women were selected randomly for the survey with equal representation from the three regions of Chennai city. Findings revealed that most of the waste that is being generated in the households of the selected samples was organic, recyclable and reusable. The sample women are not highly knowledgeable about the solid waste segregation techniques, its importance and impact on the environment. Only one - third of them sorted their recyclable and reusable waste prior disposal and majority of them discarded their household waste without segregating it. It was also observed that education, income and level of knowledge towards solid waste segregation have an impact on the waste segregation behavior of the selected sample. The study indicates that proper training, awareness and intervention program which could bring about behavior changes among women to enhance their awareness and participation in the waste minimization practices through waste segregation at the source itself.

Keywords: solid waste, waste minimization, waste segregation, recycle, reuse, women.

INTRODUCTION

Waste is an inexorable by-product of human activities. Economic development, urbanization and improving living standards in cities have lead to increase in the quantity and complexity of generated waste (Gustavson, 2008). Solid waste can be defined as any substance or object in solid form which the holder discards or intends to discard. The dynamic nature of solid waste, environmental regulations and public attitudes has made the development of solid waste management strategies an increasingly complex task (Williams, 2005). The most paramount issue in the developing nations is its environmentally unfriendly disposal of solid waste (Ehrampoush and Baughiani, 2005).Without an effective and efficient solid waste management program, the waste generated from various human activities, both industrial and domestic, can result in health hazards and have a negative impact on the environment (APO, 2007).

The solid waste generated in Indian cities has increased from 6 million tons in 1947 to 48 million tons in 1997 and is expected to increase to 300 million tons per annum by 2047 (Sujatha and Janarthanan, 2012). Chennai, the fifth largest city (in terms of area) in India, generates the largest per capita amount of waste (0.7 kg/person /day) in the country (TOI, 2014). As per the data compiled by the Waste-to-Energy Research and Technology Council (WTERT), in Chennai, which generates 6,404 tons of waste daily, the garbage generated by an average household includes 25 per cent recyclable waste, 60 per cent organic waste and 10 per cent hazardous waste. If the amount of waste in Chennai city is allowed to grow in the trend projected from the current amount of waste generated, it is expected that the two dumping grounds - Kodungaiyur (200 Acres) and Perungudi (200 Acres) will be full by 2015 (Chennai corporation). There is a need for a new landfill site/dumping ground in Chennai. This is expensive and unsustainable and a more permanent and sustainable waste management system is needed. The city is therefore looking for options to reduce the waste flow to landfill sites. The problem of solid waste in Chennai city is due to the disposal of all types of waste together. The solution for this could be applying the waste minimization technique. One of the solid waste minimization techniques focuses on waste segregation at the household level itself (Nicolas,

2003). Waste segregation is a process of separating or sorting the waste into 'reduce', 'reuse' and 'recycle' materials. If the waste is segregated at the source, it is easy to dispose waste and it saves time, energy and money. Realizing the importance of waste segregation, the study was carried out with the following objectives:

1. To find out the socio-economic profile of the selected women.
2. To study the level of knowledge regarding solid waste segregation among the selected women.
3. To identify the household waste segregation behavior of the selected women
4. To study the determinants of the household waste segregation behavior of the selected women

METHODOLOGY

The study was conducted in Chennai. It is the capital of the state of Tamil Nadu. The total area of the expanded Chennai city is 425 sq. km. with a current population of 4,792,949. Chennai is classified into 3 regions – North Chennai, Central Chennai and South Chennai. It is further divided into 15 zones consisting of 200 wards. Stratified random sampling technique was used for the purpose of the study. A total of 120 home makers were selected randomly, 40 each from the 3 regions of the Chennai city. They were surveyed using structured interview schedule. The questionnaire consisted of 4 parts relating to socio-economic profile, knowledge information on solid waste segregation, information regarding the waste segregation behavior and reason for not practicing segregation at household level. A pilot study was conducted with 30 samples to test the efficiency and validity of the interview schedule. The sample women were contacted personally one at a time, at their convenience. The required information was then collected following the interview schedule and recorded side by side.

RESULTS AND DISCUSSION

The statistical technique that was used in the analysis of data includes percentage, mean, standard deviation and Analysis of Variance. The findings of the study on "Solid waste segregation behavior among urban women" are furnished below.

SOCIO-ECONOMIC PROFILE

Table 1 show the socio-economic profile of the selected women of Chennai city which helps to understand the age, education, employment status and income groups of the sample. Out of 120 samples, majority (38 per cent) of the selected women belonged to the age group of 31-40 years and about 35 per cent of them had their higher level of education up to high school. It was found that majority (67 per cent) of the samples were home makers. Based on MPCE (Monthly Per Capita Expenditure) classes from NSS Socio-economic survey 60th round, division of households were classified and calculated and the results showed that one third of them (40 per cent) belonged to middle income group.

Table 1
Socio-economic profile of the home makers

Sl. No.	Socio-economic profile		Number N=120	Percentage
1.	Age	18-30 Yrs	28	23%
		31-40 Yrs	45	38%
		41-50 Yrs	41	34%
		Above 50 yrs	6	5%
2.	Education	Up to high school	42	35%
		Higher Secondary	29	24%
		Graduate	31	26%
		Post graduate	18	15%
3.	Employment Status	House wife	80	67%
		Full time employed	33	27%
		Part time employed	7	6%
4.	Income groups	EWS	19	16%
		LIG	42	35%
		MIG	48	40%
		HIG	11	9%

EWS= Economically Weaker Section; LIG= Low Income Group; MIG= Middle Income Group; HIG= High Income Group

TYPE OF WASTE COLLECTED IN THE HOUSEHOLDS OF THE SELECTED WOMEN

Figure 1 pictures the type of waste collected in the households of the selected women. The study shows that all their households generates kitchen waste (100 per cent) daily, followed by polythene bags (93 per cent), milk cover (80 per cent), papers (45 per cent) and the least generated waste was leather/rubbers with 3 per cent generation daily. It is observed from the results that most of the waste that is being generated in the households of the selected samples was organic, recyclable and reusable.

Figure 1
Type of waste collected in the households of the selected women
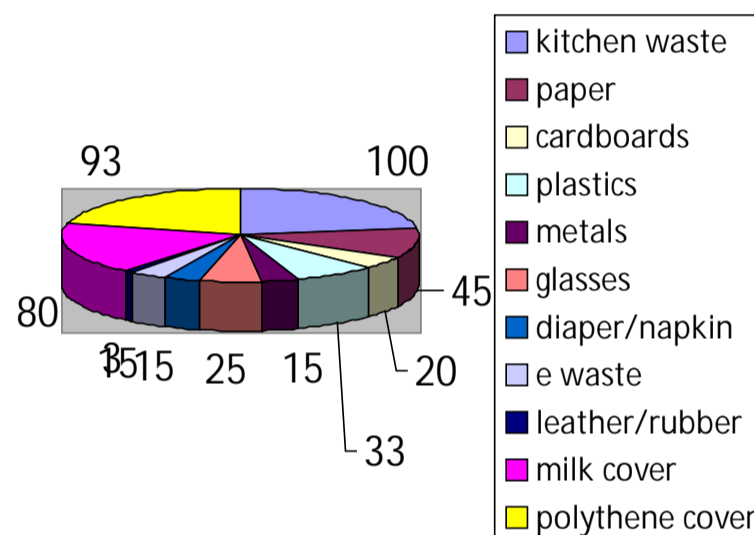
KNOWLEDGE OF WOMEN REGARDING SOLID WASTE SEGREGATION

Figure 1 shows the level of knowledge of the selected women regarding solid waste segregation. 12 multiple choice questions were asked to assess the level of knowledge of the samples about solid waste segregation. Each right answer was awarded with one mark. The respondents who scored between '0 – 4' were rated as having low level of knowledge, '5 – 8' as medium level of knowledge and score between '9 -12' as possessing high level of knowledge. The results revealed that, about half (52 per cent) of the selected samples were having medium level of knowledge regarding solid waste segregation, followed by 38 per cent with low level of knowledge and only 10 per cent of them had high level of knowledge. The results of the study clearly show that the sample women are not highly knowledgeable about the solid waste segregation techniques, its importance and impact on the environment.

Figure 1
Level of knowledge of the selected women regarding solid waste segregation
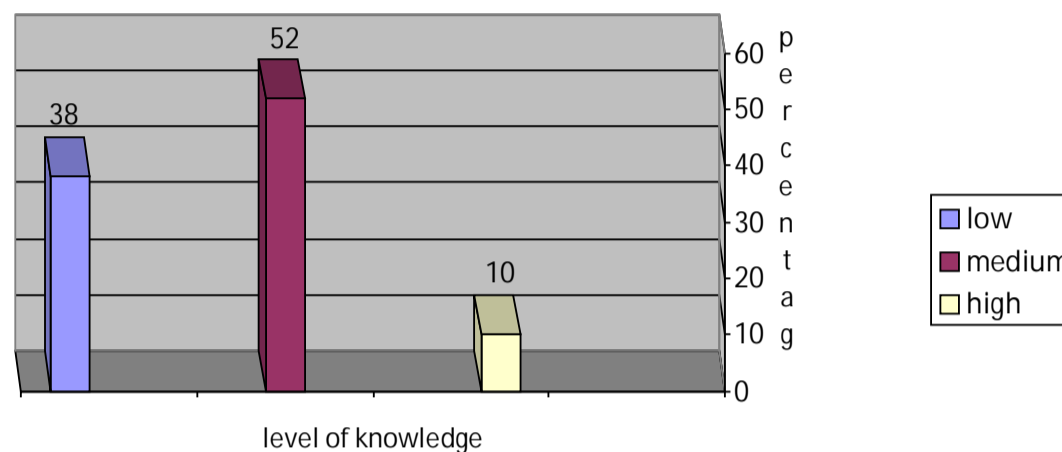
SOLID WASTE SEGREGATION BEHAVIOR

Solid waste segregation behavior of the selected samples is shown in figure 2. It is understood from the results of the study that majority (57 per cent) of the sample women discarded their household waste without segregating it and only 43 per cent of them sorted their recyclable and reusable waste prior disposal.

Figure 2
Solid waste segregation behavior of the selected samples

Solid waste processing techniques adopted by the selected women

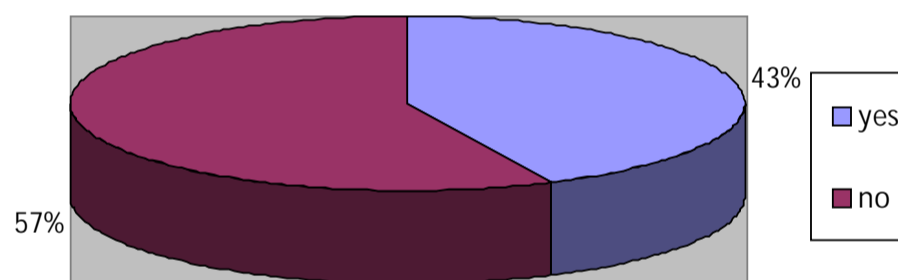Waste recycling and reusing is a worthwhile activity. Recycling is a process of separating various useful materials from waste stream and processing it suitable for reuse or manufacturing of products which may or may not be similar to the original product whereas reusing means using of waste materials more than once (Sasikumar and Krishna, 2009). Components such as paper, cardboards, plastics and metals could be separated out for recycle or reuse. Significant amount of money can be earned through selling out of these recovered materials (Khan & Ahsan, 2003). When the solid waste processing techniques adopted by the sample women were analyzed, out of 52 samples who segregated their household waste, majority (54 per cent) of the sample sold their recyclable waste to scrap collectors, followed by 31 per cent of them sold it to recyclable dealers/agencies and about 15 per cent of the samples also gave it to recyclable dealers/agencies free of cost.   The findings also revealed that 40 per cent of the sample sold the reusable waste to scrap collectors, followed by 33 per cent gave it to others who will use again and about 27 per cent of the sample who segregated their waste kept their reusable waste for own use. Table 3 shows the solid waste processing techniques adopted by the women who practiced segregation of waste at their households.

Table 3
Solid waste processing techniques adopted by the selected women

Sl. No.	Solid waste processing techniques	Number N=52	Percentage
Recyclable waste			
1.	Selling to recyclable dealers/agencies	16	31%
2.	Giving free of cost to recyclable dealers/agencies	8	15%
3.	Selling to scrap collectors	28	54%
Reusable waste			
1.	Own use	14	27%
2.	Giving free of cost to others who will use again	17	33%
3.	Selling to scrap collectors	21	40%

Reason for not segregating waste

Reason for not segregating waste was sought from the selected women and the results are given in the table 4. The main reasons cited by the respondents for not segregating waste are "not having enough space in their house to segregate the waste" (41%), followed by "no time to segregate waste" (38%) and about 17 per cent of them felt "dirty to handle waste". It is surprising to note that about 4 per cent of them pointed out that "sorting of waste does not benefit them". This clearly shows that the sample women are not aware of the economic benefit arise out of recycling and reusing the waste.

Table 4
Reason given by the selected sample for not segregating waste

Sl. No.	Reason for not segregating waste	Number N=68	Percentage
1.	No time	26	38%
2.	Not enough space in house	28	41%
3.	Sorting of waste does not benefit	3	4%
4.	Too dirty to handle	11	17%
5.	Do not know how to compost, recycle or reuse	9	13%
6.	Not bothered	8	12%

Determinants of household waste segregation behavior

One Way Analysis of Variance (F test) was carried among the selected women, where the determinants of waste segregation behavior in different socio economic set up were analysed, between groups and within groups. Table 5 present the mean and standard deviation scores of age, education, employment, income and level of knowledge regarding solid waste segregation behavior of the selected women. Table 6 gives the results of one way Analysis of Variance (F test). From the foregoing results, it was concluded that age and employment status does not impact any difference in the waste segregation behavior of the sample women. As to the difference of the means, ANOVA showed that there were significant mean difference in solid waste segregation behavior and educational levels of the respondents at the 0.05 level. It was also observed that income and level of knowledge towards segregation practice have a significant impact on the waste segregation behavior of the selected sample at the 0.01 level. The findings of the above results are substantiated by a study by Chandra (1999), who explored the influence of education, income, age and gender on public awareness and practice toward environmental quality issues and reported that environmental concerns and waste disposal practices among the residents of Gaborone vary according to education and income levels, while age and gender do not seem to have any significant influence on variation of concern and waste disposal practice.

Table 5
Means and standard deviations scores of age, education, employment, income and level of knowledge of the selected women

Sl. No.	Variables		Mean	Standard deviation
1.	Age	18-30 Yrs	0.35	0.487
		31-40 Yrs	0.46	0.505
		41-50 Yrs	0.41	0.498
		Above 50 yrs	0.66	0.516
2.	Education	Up to high school	0.285	0.448
		Higher Secondary	0.551	0.506
		Graduate	0.516	0.508
		Post graduate	0.444	0.511
3.	Employment Status	House wife	0.437	0.499
		Full time employed	0.454	0.505
		Part time employed	0.285	0.487
4.	Income groups	EWS	0.052	0.229
		LIG	0.5	0.506
		MIG	0.5	0.505
		HIG	0.54	0.052
5.	Level of knowledge	Low	0.2	0.422
		Medium	0.25	0.436
		High	0.86	0.363

EWS= Economically Weaker Section; LIG= Low Income Group; MIG= Middle Income Group; HIG= High Income Group

Table 6
Analysis of Variance data on household solid waste segregation behavior of selected women with regard to age, education, employment, income and level of knowledge

Variable	Source	DF	Sum of Squares	Mean Squares	F- Value	Level of Significance
Age	Between groups	3	0.553	0.184	0.740	NS
	Within groups	116	28.876	0.249		
Education	Between groups	3	1538	0.513	2.157	0.05
	Within groups	116	27.579	0.238		
Employment status	Between groups	2	0.169	0.085	0.338	NS
	Within groups	117	29.255	0.250		
Income	Between groups	3	3288	1.096	5.421	0.01
	Within groups	116	23455	0.202		
Level of knowledge	Between groups	2	11.129	5.565	33.378	0.01
	Within groups	117	19.505	0.167		

CONCLUSION

The problems of waste disposal threaten to become a serious environmental consideration in Chennai. One of the strategies to tackle this problem of environmental threat is to reduce the impact of urban based production,

consumption and generation of waste on natural resource. Effective waste minimization can be achieved through segregation of waste at the source itself and carrying out reuse strategy through donation of reusable to charity or using by themselves and diverting recyclable materials to recycling centers through scrap dealers or rag pickers.

Findings of this study showed that waste segregation has already gained acceptance among a greater majority of the respondents. However, this requires individuals to develop those attitudes which will encourage them towards a sustainable waste management behavior. Therefore there is an urgent need to educate the public about waste reduction; waste segregation; waste reuse and waste recycle as a viable means of solid waste management.

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