Awareness and attitudes of people perception towards to household solid waste disposal: Kumbakonam Town, Tamilnadu, India

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ABSTRACT

Introduction: This study mainly focuses the people attitude and awareness about the solid waste disposal. The questionnaire survey method and possibly covering the socio-economic, demographic and environmental variables that are largely determined the behavioral pattern of household solid waste management. Objectives: a) to simplify the socio-economic and demographic characteristics of respondent's participation in solid waste disposal, b) to explain the public awareness towards to household waste disposal, c) to analyze the attitude of people regarding household solid waste disposal and d) to identify the statistical association and significance between the selected variables. Sample: 183 males and 117 females (300) respondents were observed for the present study and their age was between 18 and 60 years. Methodology: The SPSS software is used derive Karl Pearson Correlation analysis is used for easy interpretation and interrelationship between variables. Conclusion: More than half of them are using small dustbin to put household wastes. One forth, half, and one fourth of them are disposing waste daily once, twice and thrice respectively. They are disposing three and six kilograms of bio-degradable and non-degradable waste/week. Three fourth of the respondents are opinioned that they are satisfied with the works of municipality sweepers.

Key words: Karl Pearson, SPSS, Degradable
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INTRODUCTION

Increasing population, urbanization, industrialization and changing consumption patterns are resulting in the generation of increasing amounts of solid waste and diversification of the type of the solid waste generated [1]. Solid waste is the most visible environmental problem among many in urban areas [2]. Increased solid waste generation creates more environmental problems [3], as many cities are not able to manage it due to institutional, regulatory, financial, technical, and public participation shortcomings [4]. There is a need to practice integrated solid waste management approach such as: Incorporation of more environmental and economic friendly concepts of source separation; recovery of waste; legitimization of the informal systems; partial privatization and public participation [5, 6]. Although some governments have formulated policies for environmental protection, they were only implemented in the national capital cities [7]. In many urban areas, open dumping is still considered the most popular method of solid waste disposal [8]. Adverse environmental impacts from improper solid waste management are rooted in inadequate collection, recovery of recyclable and disposal of wastes [9]. These impacts are also due to inappropriate location, design, operation, or maintenance of dumps and landfills[10].

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STUDY AREA
Kumbakonam Town is located on the banks of river Cauvery, one of the vital hindu religious town in India and second biggest town in Thanjavur District well known for its mahamaham festival. Kumbakonam town lies between from $10^{o}51'$ North to $11^{o}4'$ North latitude and from $79^{o}17'$ East to $79^{o}31'$ East longitudinally. It is a alluvial plain with smooth rolling surface towards to Nagapattinam coast. Kumbakonam city is surrounded by two rivers, namely Cauvery on the North and the Arasalar in the south. It has been divided into 45 electoral wards with a population of 1, 67,098 according to census data 2011.

THE PRESENT STUDY AND SIGNIFICANCE
The present study is attempted to analyze the household solid waste disposal in Kumbakonam town with a view 1) To simplify the socio-economic and demographic characteristics of respondent's participation in solid waste disposal. 2) To explain the public awareness towards to household waste disposal. 3) To analyze the attitude of people regarding household solid waste disposal. 4) To identify the statistical association and significance between the selected variables.

ANALYSIS PLAN
The data collected from the questionnaire survey were coded and with the help of these coding sheets the data were transformed into SPSS .v.16. As much as 66 Variables were drawn from the data structure possibly covering the socio-economic, demographic and environmental variables that are largely determined the behavioral pattern of household solid waste management. These variables are assumed to be the vital factors in determining the waste disposal. Karl Pearson Correlation analysis was employed for the present data structure and accordingly a correlation matrix of 300 x 66 to facilitate easy interpretation of interrelationship between variables. In addition to the above Chi-Square techniques were used to explain the strength of relationship between the variables.

ANALYSIS
Socio-Economic and Living Conditions
183 males and 117 females (300) respondents were observed for the present study and their age was between 18 and 60 years. They are living as single (25.3 %) and married (73.7 %). Their family size were small (66 %) to medium (34 %) and they are living in joint family (46.7 %) and nuclear family (53.3 %). 84 per cent of them are Hindus and the remaining are Christians and Muslims. The respondent's communities are Forward Caste are 3.0 per cent, Backward Class are 37.7 per cent, Most Backward Class 25.7 per cent, Scheduled Caste 24.7 per cent and Scheduled Tripe 9.0 per cent. The respondent's educational statuses are illiterate (1.3 %), primary level (7.7 %), middle school level (9.3 %), tenth standard level (18.0 %), higher secondary (25.0 %) and graduate level (38.7 %). They are engaging in agricultural activities (1.7 %), daily wage laborer (17.7 %), employee in private concern (42.0 %), business (16.7 %) and government service (22.0 %). 15.7 per cent of the respondents are earning less than five thousand rupees, 51.7 per cent of them are receiving five thousand to ten thousand rupees and the remaining are getting more than ten thousand rupees per month.

The respondents are living in own (49.3 %) and rental house (50.7 %). 18.0 per cent of them are living in flats, 37.3 per cent are concrete house, 36.3 per cent are tiled house and 8.3 per cent are huts. Few of the respondents are living in single house or without room facilities (9.7 %); most of them are having two rooms (62.0 %), some of them are having three rooms (25.7 %) and very few of them are having more than four rooms (2.7 %). The majority of them are having bath room and toilet (91.7 %) facilities and the remaining respondents are not having such facilities. Almost 93 per cent of the houses are electrified, having television, radio, iron box, gas cylinder, fan and having drainage facilities. 70.7 per cent of them are having moped and motorcycle, 26.3 per cent are having bicycle and only 3.0 per cent are having car. A very few of them are having micro oven and air condition facilities. Half of the respondents are having municipal water pipe connection and the remaining half of them are taking water from the public tape for drinking purposes and some of them are fetch water from the hand pumps. Three fourth of the respondents are having life insurance.

Household Waste
The respondents (62 %) are using small dust bins at their home and the remaining (38 %) are not using like that. The disposal of household waste per day is once (37 %), twice (45.3 %) and thrice (17.7 %). The respondents are disposing vegetable waste per week is three and six kilograms (42.3 %) and more than six kilograms (57.7 %). Plastic waste disposal per week is three and six kilograms (71.0 %) and more than six kilograms (19.0 %). Almost 93.3 per cent of the respondents are revealed that their having municipal dust bins in their street and the remaining

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6.7 per cent are not having such facilities. The respondent are also informed that the distance between their home and municipal dust bin location is less than hundred meters (29.0 %), two hundred meters (33.3 %) and more than three hundred meters (37.7 %). Half of the respondent's houses are located thousand meters away from the waste dumping place. They also expressed that their streets dustbins are cleared or transported daily (69.3 %), once in two days (20.0 %) and once in three days (10.7 %).

The types of household solid waste disposal items are food items, vegetables, plastics, garden wastes, batteries, electronic goods, cloths and glasses. Sixty percent of the respondents are informed that they are disposing household solid waste is two kilograms per day and the remaining are disposing more than two kilograms. About fifty per cent of the respondents are identifying wastes and only few 11.7 per cent of them are having separate waste bins for degradable and non-degradable and they are segregating wastes. Three fourth of the respondents are opinioned that they are satisfied with the works of municipality sweepers. Only electronic goods are reused by 32 per cent of the respondents. Ninety six per cent of the respondents are not doing composting but the remaining four percent are allowing for composting. Most of respondents are not aware of solid waste disposal and management of solid waste. So the respondents are willing to participate awareness program because three fourth of them are informed that they are facing solid waste problem in their localities especially paper and plastics are spreading over the surface, roads and everywhere. Most of the respondents are expressed that the incineration of solid waste is common along the road side and the smoke is giving invisibility to the vehicle drivers and publics. The respondents are suggesting that the municipality must clean the town and collecting dustbins daily two times (12.0 %), they must increase the number of dustbin in every street (5.0 %), they must keep improved (covered/lid) dustbin system (4.0 %), keeping city cleanness is more vital (79.0 %).

DISCUSSION

The following table 1 shows that the variable age is positively correlated with variables marital status, size of family, monthly income, bathroom facilities, clearance of dustbins, disposal food waste and plastics. These are indicating that the variable age increases the above said variables are also increasing. The variable age is negatively correlated with segregation and educational status. This is clearly indicating that the respondent's age increases with the segregation of waste (degradable and non-degradable) and their educational status are decreasing. The table 2 explaining that the variable size of family is having strong positive correlation with the variables of number of rooms, disposal of wastes, vegetable waste, distance from dustbin and weight of wastes. This is indicating that the variable size of family is increasing the above said variables also increasing significantly. If the sizes of family members are increasing the respondents are disposing more wastes. This variable is having strong negative correlation with dust bin in the street and **s**egregation of waste, showing that the increase in size of family with decreasing dustbins in their streets and their not segregating household waste before disposal.

Table 1 Age

Variables	Person correlation	Sig.2 (Tailed)	Chi Square
Age of the Respondent			
Marital status	*0.437** *	*.000*	*.000*
Size of family	*0.334** *	*.000*	*.000*
Monthly income	*0.178** *	*.002*	*.002*
Both room facilities	*0.152** *	*.008*	*.008*
Toilet facilities	*0.144* *	*.012*	*.012*
Clearance of dustbins	*0.150** *	*.009*	*.009*
Disposal of food waste	*0.184** *	*.001*	*.001*
Disposal of plastics	*0.118* *	*.041*	*.041*
Segregation of waste	*-0.171** *	*.003*	*.003*
Educational status	*-0.210** *	*.000*	*.000*

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Table 2 Size of Family

Variables	Person correlation	Sig.2 (Tailed)	Chi Square
Size of Family			
Number of rooms	*0.185***	*.001*	*.001*
Disposal of wastes	*0.227***	*.000*	*.000*
Vegetable waste	*0.262***	*.000*	*.000*
Distance from dustbins	*0.127**	*.028*	*.028*
Weight of wastes	*0.200***	*.000*	*.000*
Dust bin in the street	*-0.145**	*.012*	*.012*
Segregation of waste	*-0.127**	*.027*	*.027*

Table 3 Educational Status

Variables	Person correlation	Sig.2 (Tailed)	Chi Square
Educational Status			
Occupation	*0.368***	*.000*	*.000*
Monthly income	*0.373***	*.000*	*.000*
Disposal of plastics	*0.119**	*.039*	*.039*
Distance between dumping yard and house	*0.117**	*.043*	*.043*

An increasing trend in the educational status of respondents is noticed from the respondent's survey. Which is positively affects the occupations and monthly income of them. Apart from that they are using and disposing of plastics are more among the educated people and they are living far away from the solid waste dumping yard or place. These are clearly shown by the correlation table 3, an increase in the educational status with increase in their monthly income, disposal of plastics and the distance between housing location and the dumping yard.

The variable monthly income (Table 4) is having strong positive relation with the variables number of rooms, vehicles and disposal of vegetable waste. These are indicating that the respondent's monthly income increases and their living in good house with many rooms, two wheelers and disposing of solid wastes increasing. However this variable is strong negative relationship with dust bin at home and reusing items. This is explaining that the respondent's monthly income increasing and using of dustbins at home is decreasing and their not reusing any items and things again.

Table 4 Monthly Income

Variables	Person correlation	Sig.2 (Tailed)	Chi Square
Monthly Income			
Number of rooms	*0.370***	*.000*	*.000*
Vehicles	*0.383***	*.000*	*.000*
Disposal of vegetable waste	*0.174***	*.033*	*.033*
Dust bin at home	*-0.320***	*.000*	*.000*
Reusing items	*-0.160***	*.005*	*.005*

Table 5 Type of Family

Variables	Person correlation	Sig.2 (Tailed)	Chi Square
Type of Family			
Type of house	*0.266***	*.000*	*000*
Dustbin at home	*0.140**	*.015*	*.015*
Garden waste	*0.211***	*.000*	*.000*
Cloths	*-0.133***	*.022*	*.022*
Weight of waste disposal	*-0.148***	*.010*	*.010*

The respondents are revealed that they are living in nuclear family and joint family, so, this variable (Table 5) is strong positive relationships with type of house, dustbin at home and garden waste. This is indicating that those who living in own house they are disposing garden wastes and those who living in nuclear family and in flats they are having dust bin at their home. This variable (Type of family) is also negative relationship with disposing waste

cloths and weight of household waste disposal. Housing status is a vital variable, which is having more strong positive effect on various variables (Table 6). These are bathroom, toilet, drainage, electric power and other basic amenities are increasing more with respondent's housing status (huts, tiled, flat and concrete). Apart from that the disposal of household solid waste are also depends upon the housing status. This is justified by the variables like dustbin at home and street, disposal of waste, distance from dustbin, identification and segregation of waste, reuse and composting are strong positive relationship with housing status. This is indicating that the increasing of housing status with increasing the awareness to keeping their surroundings very clean.

The respondent's are also revealed that those who living in huts and tiled houses their surrounding areas are untidy environment. The variable dustbin (Table 7) at home is having strong positive link with variables like disposal of household waste, distance from municipal dustbin, food items, cloths, identification of waste and compost facility. This is clearly showing that the increase and using of dustbin at home is an increase of household waste disposal, more distance from dumping yard and municipal dustbin.

Table 6 Housing Status

Variables	Person correlation	Sig.2 (Tailed)	Chi Square
Housing status			
Bathroom	*0.517***	*.000*	*.000*
Toilet facilities	*0.504***	*.000*	*.000*
Drainage facilities	*0.476***	*.000*	*.000*
Electric power	*0.312***	*.000*	*.000*
Telephone	*0.187***	*.001*	*.001*
Washing machine	*0.479***	*.000*	*.000*
Micro oven	*0.182***	*.002*	*.002*
Air condition	*0.188***	*.001*	*.001*
Source of drinking water	*0.343***	*.000*	*.000*
Life insurance	*0.321**	*.000*	*.000*
Dustbin at home	*0.420***	*.000*	*.000*
Disposal of waste	*0.136**	*.018*	*.018*
Dustbin in the street	*0.154***	*.008*	*.008*
Distance from dustbin	*0.278***	*.000*	*.000*
Identification of waste	*0.340***	*.000*	*.000*
Segregation of waste	*0.144***	*.012*	*.012*
Reuse of waste	*0.154***	*.008*	*.008*
Composting	*0.201***	*.000*	*.000*

Table 7 Dustbin at Home

Variables	Person correlation	Sig.2 (Tailed)	Chi Square
Dustbin at Home			
Disposal of household waste	*0.212***	*.000*	*.000*
Distance from municipal dustbin	*0.263***	*.000*	*.000*
Distance from dumping yard	*0.115**	*.047*	*.047*
Food items	*0.135***	*.019*	*.019*
Cloths	*0.170***	*.003*	*.003*
Identification of waste	*0.246***	*.000*	*.000*
Compost facility	*0.153***	*.008*	*.008*

Table 8 Vegetable Waste/ week

Variables	Person correlation	Sig.2 (Tailed)	Chi Square
Vegetable Waste/week			
Plastic waste/week	*0.331***	*.000*	*.000*
Weight of waste/week	*0.217***	*.000*	*.000*
Identification of waste	*0.140**	*.015*	*.015*

The table 8 shows that there is a strong positive relationship between vegetable waste/week and with plastic waste/week, weight of waste/week and identification of waste. This indicates that the increases of vegetable waste/week and increase of plastic waste/week, weight of waste/week and identification waste.

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Table 9 Distance from Dustbin

Variables	Person correlation	Sig.2 (Tailed)	Chi Square
Distance from Dustbin			
Food items	*0.120**	*.038*	*.038*
Weight of waste disposal	*0.190**	*.001*	*.001*
Identification of waste	*0.176***	*.002*	*.002*
Keeping separate waste	*0.167***	*.004*	*.004*
Reuse	*-0.123**	*.033*	*.033*

The above table 9 explaining that the variable distance from dustbin is having strong to medium relationship with the variables food items, weight of waste disposal, identification of waste and keeping separate waste. This is expressing that the increase of distance between the house and the municipal dustbin and the increases of food waste items, weight of waste, identification and segregation of waste. The variable reuse of items is decrease with the variable distance from dustbin because it is having negative relationship with that variable.

Table 10 Clearance of Dustbin

Variables	Person correlation	Sig.2 (Tailed)	Chi Square
Clearance of Dustbin			
Food items	*0.227***	*.000*	*.000*
Plastics	*0.225***	*.000*	*.000*
Opinion	*0.158***	*.006*	*.006*
Identification of waste	*-0.280***	*.000*	*.000*
Reuse	*-0.167***	*.004*	*.004*
Solid waste problem	*-0.186***	*.001*	*.001*

Table 11 Awareness Program

Variables	Person correlation	Sig.2 (Tailed)	Chi Square
Awareness Program			
Organization	*0.869***	*.000*	*.000*
Problem in solid waste	*- 0.170***	*.003*	*.003*

This table 11 is explaining that the increase of awareness among the respondents with increases of management of solid waste disposal by the municipal organization. At the same time the decreases of awareness among the respondents with the increase of problems of solid waste in the respondent's locality. This is clearly justified by the above correlation table by its positive and negative correlations respectively.

CONCLUSION

More than half of them are using small dustbin to put household wastes. One forth, half, and one forth of them are disposing waste daily once, twice and thrice respectively. They are disposing three and six kilograms of bio-degradable and non-degradable waste/week. The types of household solid waste disposal items are food items, vegetables, dry leaves, plastics, garden wastes, batteries, electronic goods, cloths rubbers and glasses. The locations of municipal dustbins are accessible to ninety per cent of the people but the dustbins are not cleared and transformed properly by the municipality. Some of them are putting their waste along the roadside, street corners, vacant places, in front of unused houses. These places are got fire sometimes and it leads to invisibility to vehicle drivers, eye irritation for publics and there is a chance of getting fire at large level. These wastes are also spreads on road and the surroundings are looking very awkwardly. Three fourth of the respondents are opinioned that they are satisfied with the works of municipality sweepers. Most of respondents are not aware of solid waste disposal and management of solid waste.

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