Challenges Faced by the Residents in the Garbage Dumping area of Salem Corporation

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ABSTRACT

The uncontrolled and unscientific disposal of solid waste tends to affect the health conditions of the nearby residents. At this outset the paper attempted to analyze the health issues of households residing near the dumping yard at Chetticahvadi village, where the entire waste generated from Salem Corporation has been dumped. A sample of 300 households has been selected by using Chocran's formula. The factors determining the health problems of residents has identified by applying logit regression. The health of the residents living nearer to the garbage dumping yard was found more affected. The other major factors determining the health conditions of the residents is the longevity of their living in the village, where the dumping yard is situated. The major health ailments revealed by the households of Chettichavadi village were allergy, breathing problems, eye irritation and viral infections. The level of awareness of respondents has also been analyzed with the socio economic status of the respondents.

Introduction

Salem Corporation has been dumping the garbage in Chettichavadi village. The citizens residing in the nearby areas of the garbage dumping yard have been facing a lot of challenges due to pollution (Russell Kabir and Felicia Babs Shomoye, 2016 & Shaoli De, Biswajit Debnath, 2016). It affects the health conditions of the residents. The residents of Chettichavadi village complained that the smoke and odour emitted from the garbage yard caused them breathlessness. Since the maximum capacity of inert pits dug was reached and the practice of open dumping of garbage was followed in the dumping yard. It tends to cause more environmental problems as complained by the residents. Though the corporation officials reveal that there was no practice of putting fire on the garbage, it was complained by the residents that there was a practice of setting on fire frequently of solid waste in the dumping yard. The thick black smoke was found to be emitted from the garbage yard, pose severe environmental and health problems. The groundwater sources were also complained to be contaminated, since there is an infiltration of garbage leachate into groundwater. The villagers complained that 65 per-

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cent of groundwater in the village was contaminated, which affected the plants and trees in their surroundings (https://www.thehindu.com). An attempt was made in this paper to examine the challenges faced by the residents in the garbage dumping area.

Objective of the Study

1. To identify the challenges faced by the residents in the garbage dumping area.
2. To assess the level of awareness among the residents in the garbage dumping yard.

Hypotheses

1. The residents living in the nearby areas of the dumping yard are affected more by health issues rather than residents living in faraway places.
2. The awareness about the effects of garbage dumping depends upon the socio economic status of the residents.

Methodology

The sample size has been determined by applying Cochran equation.

The formula for Cochran's equation is

$$n_0 = \frac{z^2\, pq}{e^2}$$

where, e = margin error, p = proportion of the population, q = 1 – p, z value for given level of confidence.

Total number of households in Chettichavadi Village = 1350

Margin Error e = 95 percent, p = 0.5, q=0.5, z value = 1.96

$$n_0 = \frac{z^2\, pq}{e^2}$$

$$n_0 = \frac{(1.96)^2\,(0.5)\,(0.5)}{(0.05)^2}$$

n_0 = 385

Since the total number of households in Chettichavadi village is small, the following formula is applied.

$$n = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}}$$

$$n = \frac{385}{1 + \frac{385 - 1}{1350}}$$

n = 300

Thus the sample size for sanitary workers is 300. The sample has been identified by using simple random sampling.

Analysis and Discussion

Factors affecting the Health Conditions of Households

In order to determine the factors affecting health conditions of households' binary logit regression is used. Where the dependent variable is health conditions of households, which is binary in its nature (1=Affected 2=Not Affected). Independent variables are nature of house, ownership of house, distance between the house and the dumping yard and the longevity of living in the area.

The nature of house had an impact on the health of the household members (http://www.sciencedaily.com). Household members in the well constructed houses will have better protection from the pollution emitted from the garbage dumping areas. Thus the present study expected a positive sign to the impact of nature of house on the health of residents in the garbage dumping area. The other variable expected to have positive influence on the health of the residents in the garbage dumping area is the ownership of house. Members of the family living in their own houses may have more concern in protecting their environment and surroundings than members from rented houses. The floor of residence plays a significant role in determining the impact of pollution emitted from the garbage dumping area. The concentration of traffic related airborne pollutants emitted from vehicles involved in the disposal and dumping of wastes will be more in the ground floor. The distance between the house and dumping yard is also the significant factor in determining the health conditions of households (Shilpa *et al.*, 2018). The less the distance between the house and the dumping yard, more will be the health impact. Thus the present study has assigned negative sign for the relationship between the distance and the garbage dumping area. The longevity of living nearer the garbage dumping area and the health problems are positively related. The longer the liv-

Table 1. Description of Explanatory Categorical Variables

Variable	Type of Variable	Unit of Measurement	Expected Sign
Nature of House	Categorical	1 = Reinforced Concrete Construction 2 = Thatched 3 = Others	+
Ownership of House	Categorical	1 = Own House 2 = Rented House	+
Floor of Residence	Categorical	1 = Ground floor 2 = First floor 3 = Other floors	+
Distance between the	Continuous	1= Less than 1 km 2= 1 to 2 kms 3= 2 to 3 kms 4 = More than 3 kms	-
House and Dumping Area			
Longevity of living in the area	Continuous	1= Less than 1 year 2= 1 to 2 years 3= 2 to 3 years 4= More than 3 years	+

Table 2. Summary of Categorical Variables

Variable	Observation	Numbers	Percentage
Nature of House	RCC	138	46
	Thatched	159	53
	Others	3	1
	Total	300	100
Ownership of House	Own House	253	84
	Rented House	47	16
	Total	300	100
Floor of Residence	Ground floor	146	49
	First floor	129	43
	Other floors	25	8
	Total	300	100
Distance between the House and Dumping Area	1= Less than 1 km	3	1
	2= 1 to 2 kms	9	3
	3= 2 to 3 kms	48	16
	4= More than 3 kms	240	80
	Total	300	100
Longevity of living in the area	1= Less than 1 year	87	29
	2= 1 to 2 years	85	28
	3= 2 to 3 years	59	20
	4= More than 3 years	69	23
	Total	300	100

ing near the garbage dumping area more will be the chance to be affected by diseases.

The value of chi square and significance of the above model shows that the model has no explanatory power.

The -2 log likelihood statistics of the model is 81.542. Smaller the statistics of -2 log likelihood, bet-

Table 3. Omnibus Tests of Model Coefficients

		Chi-square	Df	Sig.
Step 1	Step	44.868	5	.000
	Block	44.868	5	.000
	Model	44.868	5	.000

Table 4. Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	81.542[a]	.294	.637

ter the significance of model. The Cox & Snell R Square statistics is similar to R^2 value in linear regression. The condition for the statistics is that it should not reach the maximum of 1. The Nagelkerke R^2 value can reach the maximum of 1. Based on the conditions, the model fits the data.

Table 5. Hosmer and Lemeshow Test

Step	Chi-square	Df	Sig.
1	4.846	8	.774

The insignificant p value suggests that the data fit the model well.

Of the five explanatory variables, two variables viz. longevity of living in the area and the distance between the garbage dumping yard and the houses were significant at one percent. The positive Beta value of longevity of living in the dumping area suggests that more the period of living in the garbage dumping area more will be the chance to be affected by health ailments. The negative Beta value of variable viz. distance between house premises and the garbage dumping area reveals that more the distance less will be the chance to get affected by health problems due to the pollution emitted from the garbage dumping yard.

Perception on Garbage Dumping

In order to fulfil the objectives of the study, the citizens residing in the garbage dumping area have been asked to state their level of agreement to the following statements regarding their perception on garbage dumping:

1. Garbage dumping has caused air pollution in our area.
2. Garbage dumping has caused water pollution in our area.
3. Environment is affected due to garbage dumping.
4. Bad smell disturbs the people.
5. When the solid waste is burnt smoke creates disturbances.
6. Children are unable to play on the roads.
7. Aged people are suffering from eye irritation.
8. Corporation vehicles carrying the solid waste create traffic issues.
9. Garbage is not properly dumped.
10. No proper method is followed for the solid waste management.

The level of agreement has been obtained from the respondents in a five-point scale and the scores have been assigned as to 5 for Strongly Agree; 4 for Agree; 3 for Neutral; 2 for Disagree; and 1 for Strongly Disagree.

The scores assigned to each of these ten statements have been summed up and the total scores have been taken for the analysis. The relationship between demographic variables and perception on garbage dumping has been analyzed in this study.

Age and Perception on Garbage Dumping

With a view to understand the relationship between the age of the respondents and their perception on garbage dumping, the following hypotheses have been framed and tested:

Null Hypothesis H_0: There is no significant relationship between the age of the respondents and their perception on garbage dumping.

Alternative Hypothesis H_1: There is a significant relationship between the age of the respondents and

Table 6. Variables in the Equation

Variables	B	S.E.	Wald	Df	Sig.	Exp (B)	95% C.I. for EXP(B) Lower	Upper
Distance between the House and Dumping Area	-2.698	.463	33.911	1	.000	.067	.027	.167
Nature of House	-.293	.595	.242	1	.623	.746	.233	2.394
Ownership of House	-1.372	1.005	1.863	1	.172	.254	.035	1.819
Floor of Residence	-.056	.360	.024	1	.877	.946	.467	1.917
Longevity of living in the area	1.719	.422	16.622	1	.000	5.578	2.441	12.746
Constant	3.886	2.474	2.466	1	.116	48.723		

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their perception on garbage dumping.

Table 7 reveals that the F value measuring the relationship between the age of the respondents and their perception on garbage dumping has been found to be 0.356 while the p value is 0.785. Since the p value is greater than 0.05, it falls in the acceptance region. Hence, the null hypothesis is accepted. The hypothesis that 'there is no significant relationship between the age of the respondents and their perception on garbage dumping' holds good. It is inferred that the perception of respondents on garbage dumping does not vary significantly in accordance with their age. The respondents from all age groups both younger and older were equally aware of the hazards of the dumping area. The respondents from younger and middle age group due their better level of education and exposure were aware of the environmental implications of dumping area situated in their village. Due to the better education and exposure, the younger and middle aged respondents understand the environmental implications of dumping area in their village. Similarly respondents of older age groups due to their better experience and longevity of living in the area were equally aware of the environmental impact of dumping of wastes in their village.

Gender and Perception on Garbage Dumping

With a view to understand the relationship between the gender of the respondents and their perception on garbage dumping the following hypotheses have been framed and tested:

Null Hypothesis H$_0$: There is no significant relationship between the gender of the respondents and their perception on garbage dumping.

Alternative Hypothesis H$_1$: There is a significant relationship between the gender of the respondents and their perception on garbage dumping.

According to the Table 8, the F value measuring the relationship between the gender of the respondents and their perception on garbage dumping has been found to be 1.275 while the p value is 0.26. Since the p value is greater than 0.05, it falls in the acceptance region. Hence, the null hypothesis is accepted. The hypothesis that 'there is no significant relationship between the gender of the respondents and their perception on garbage dumping' holds good. It is inferred that the perception of respondents on garbage dumping does not vary significantly in accordance with their gender. Both male and female gender were equally aware of the pollution caused by the dumping area.

Marital Status and Perception on Garbage Dumping

With a view to understand the relationship between the marital status of the respondents and their perception on garbage dumping the following hypotheses have been framed and tested:

Table 7. Age and Perception on Garbage Dumping - ANOVA

Source of variation	Sum of Squares	DF	Mean Square	F value	p value	Result
Between Groups	27.266	3	9.089	0.356	0.785	Accepted
Within Groups	7550.734	296	25.509			
Total	7578	299				

Table 8. Gender and Perception on Garbage Dumping – ANOVA

Total Score	Sum of Squares	DF	Mean Square	F	Significant
Between Groups	32.288	1	32.288	1.275	.260
Within Groups	7545.712	298	25.321		
Total	7578.000	299			

Table 9. Marital Status and Perception on Garbage Dumping - Anova

Total Score	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	293.654	1	293.654	4.611	.033
Within Groups	18977.292	298	63.682		
Total	19270.947	299			

Null Hypothesis H$_0$: There is no significant relationship between the marital status of the respondents and their perception on garbage dumping.

Alternative Hypothesis H$_1$: There is a significant relationship between the marital status of the respondents and their perception on garbage dumping.

Table 9 purports the F value measuring the relationship between the marital status of the respondents and their perception on garbage dumping has been found to be 4.611 while the p value is 0.033. Since the p value is less than 0.05, it falls in the rejection region. Hence, the null hypothesis is rejected. The hypothesis that 'there is a significant relationship between the marital status of the respondents and their perception on garbage dumping' holds good. It is inferred that the perception of respondents on the garbage dumping vary significantly in accordance with their marital status. It implies that the married respondents have better level awareness of the environmental implications of dumping of wastes in their area than the unmarried respondents.

Size of Family and Perception on Garbage Dumping

With a view to understand the relationship between the size of family of the respondents and their perception on garbage dumping the following hypotheses have been framed and tested:

Null Hypothesis H$_0$: There is no significant relationship between the size of family of the respondents and their perception on garbage dumping.

Alternative Hypothesis H$_1$: There is a significant relationship between the size of family of the respondents and their perception on garbage dumping.

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It is evidenced from the Table 10 that the F value measuring the relationship between the size of family of the respondents and their perception on garbage dumping has been found to be 4.64 while the p value is 0.003. Since the p value is less than 0.01, it falls in the rejection region. Hence, the null hypothesis is rejected and the alternative hypothesis is accepted. The hypothesis that 'there is a significant relationship between the size of family of the respondents and their perception on garbage dumping' holds good. It is inferred that the perception of respondents on the garbage dumping vary significantly in accordance with the size of the family. The household having more number of members is able to obtain the experience and awareness about the environmental conditions of their surroundings from their elder and younger members than small sized households.

Educational Level and Perception on Garbage Dumping

With a view to understand the relationship between educational level of the respondents and their perception on garbage dumping the following hypotheses have been framed and tested:

Null Hypothesis H$_0$: There is no significant relationship between the educational level of the respondents and their perception on garbage dumping.

Alternative Hypothesis H$_1$: There is a significant relationship between the educational level of the respondents and their perception on garbage dumping.

According to the Table 11, the F value measuring the relationship between the educational level of the respondents and their perception on garbage dump-

Table 10. Size of Family and Perception on Garbage Dumping – ANOVA

Source of Variation	Sum of Squares	DF	Mean Square	F value	p value	Result
Between Groups	340.387	3	113.462	4.64	0.003	Rejected **
Within Groups	7237.613	296	24.451			
Total	**7578**	**299**				

Table 11. Educational Level and Perception on Garbage Dumping - ANOVA

Source of Variation	Sum of Squares	DF	Mean Square	F value	p value	Result
Between Groups	992.839	3	330.946	5.382	0.001	Accepted
Within Groups	18200.948	296	61.490			
Total	19193.787	299				

ing has been found to be while the p value is 0.001. Since the p value is less than 0.05, it falls in the acceptance region. Hence, the null hypothesis is rejected. The hypothesis that 'there is a significant relationship between the educational level of the respondents and their perception on garbage dumping' holds good. It is inferred that the perception of respondents on garbage dumping vary significantly in accordance with their educational level. The sample respondents with the higher educational qualification were more aware of the ill effects of the garbage dumping yard than the uneducated respondents.

Occupational Status and Perception on Garbage Dumping

With a view to understand the relationship between the occupational status of the respondents and their perception on garbage dumping the following hypotheses have been framed and tested:

Null Hypothesis H_0: There is no significant relationship between the occupational status of the respondents and their perception on garbage dumping.

Alternative Hypothesis H_1: There is a significant relationship between the occupational status of the respondents and their perception on garbage dumping.

Table 12 envisages that the F value measuring the relationship between the occupational status of the respondents and their perception on garbage dumping has been found to be 1.842 while the p value is 0.121. Since the p value is greater than 0.05, it falls in the acceptance region. Hence, the null hypothesis is accepted. The hypothesis that 'there is no significant relationship between the occupational status of

the respondents and their perception on garbage dumping' holds good. It is inferred that the perception of respondents on garbage dumping does not vary significantly in accordance with their occupational status.

Monthly Income and Perception on Garbage Dumping

With a view to understand the relationship between the monthly income of the respondents and their perception on garbage dumping the following hypotheses have been framed and tested:

Null Hypothesis H_0: There is no significant relationship between the monthly income of the respondents and their perception on garbage dumping.

Alternative Hypothesis H_1: There is a significant relationship between the monthly income of the respondents and their perception on garbage dumping.

According to the Table 13, the F value measuring the relationship between the monthly income of the respondents and their perception on garbage dumping has been found to be 7.282 while the p value is 0.000. Since the p value is less than 0.01, it falls in the rejection region. Hence, the null hypothesis is rejected and the alternative hypothesis is accepted. The hypothesis that 'there is a significant relationship between the monthly income of the respondents and their perception on garbage dumping' holds good. It is inferred that the perception of respondents on garbage dumping varies significantly in accordance with their monthly income. It can be interpreted that the category of higher income group has more awareness due to their better level of education about the environmental problems of dumping area in their village.

Table 12. Occupational Status and Perception on Garbage Dumping – ANOVA

Source of Variation	Sum of Squares	DF	Mean Square	F value	p value	Result
Between Groups	184.644	4	46.161	1.842	0.121	Accepted
Within Groups	7393.356	295	25.062			
Total	7578	299				

Table 13. Monthly Income and Perception on Garbage Dumping - ANOVA

Source of variation	Sum of Squares	DF	Mean Square	F value	p value	Result
Between Groups	520.834	3	173.611	7.282	0.000	Rejected **
Within Groups	7057.166	296	23.842			
Total	7578	299				

Conclusion

From the forgoing analysis on the impact of the garbage dumping yard, on the residents in Chettichavadi village, where the dumping yard is located, it is inferred that the health of the residents living nearer to the garbage dumping yard were more affected. The other major factors determining the health conditions of the residents is the longevity of their living in the village, where the dumping yard is situated. The major health ailments revealed by the households of Chettichavadi village were allergy, breathing problems, eye irritation and viral infections. The flies, odour and smoke from the garbage dumping yard were found to cause health ailments to the households. Daily 350 to 400 tonnes of waste from Salem Corporation were dumped at the village. The practice of dumping of waste is done in the village for several years. The Lorries and tractors transporting the waste to the dumping yard are also huge in number in the village. Regarding the level of perception and awareness about the dumping of waste in their village, the residents were more aware of the hazards of the garbage dumping yard. Thus it is the role of the Corporation to adopt scientific methods of disposal and management of waste to avoid mere dumping of waste in Chettichavadi village.

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