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A Study On Issues And Challenges In Segregation And Disposal Of Household Solid Waste

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Abstract

Countries across the globe have acknowledged that solid waste management is vital to the survival of mankind. This problem needs to be dealt with sincerity and commitment. It is a necessity so that both environmental health and human health are effectively protected. Heaps of solid waste resulting from persuasive marketing techniques and consumerist societies pose serious threats to waste segregation and its disposal. In developing countries, there are still practices of dumping waste in unapproved areas, putting people at risk for serious health issues and environmental contamination. The objective of the research study was to examine household solid waste management in the existing scenario and evaluate how demographic, socio-cultural, and institutional forces are reflected in their efficacy in South Delhi and Gurugram. Structured questionnaires were used to collect data from 200 households in both cities. Descriptive and inferential statistics and correlation analysis were used to test relationships between variables. The research established major determinants of the effectiveness of household solid waste management in the selected municipalities.

Key words: Household Solid Waste, Segregation, Disposal, Hazards, Challenges.

Introduction

Our earth today is burdened with solid waste. The mountains of solid waste are like time bombs ready to explode, resulting in health hazards and putting the whole of humanity in peril. Though the problem is worldwide, it is the third-world countries that daily find it challenging to deal with segregation and disposal of household solid waste due to a lack of resources and know-how. Solid waste is defined as material that no longer has any value to its original owner and which is discarded (Rouse, 2008). Organic trash—which includes garden and kitchen scraps—as well as paper, glass, metals, and plastics—as well as dust, ash, and street sweepings—are the primary components of solid waste in metropolitan areas. Human activity is inherently tied to production and consumption, and in the process of utility maximization, it inevitably generates externalities and waste. The wastes could be both solid and liquid types, and the way they are going to be handled, stored, and disposed of can expose the environment and public health to risks (Zhu, 2008).

The solid waste management system was not a major global concern many years ago. Earlier studies on the solid waste management professed that, initially, humans just left their trash where it landed and didn't give any thought to waste management. This indicates the world's rapidly growing population and evolving urbanisation are making solid waste management a major challenge. Also, our early inhabitants used all-natural and biodegradable materials for their existence and livelihood. As is expressed by Smith (2003), "as far as humans have been living in settled communities, solid waste has become an issue, and modern people generate by far more waste than early humans ever did".

The rate at which solid waste is generated is directly correlated with the urbanisation and population growth rate of a given city or country. According to UNESCO (2009), the population growth and the rate of urbanisation are alarmingly increasing throughout the African and Asian continents. Moreover, the know-how of the management of solid waste is not available, be it technical, managing the finances or even the basic understanding of the community or culture of that place. Related to this, Ali (2001) noted that an increase in population, solid waste management would be the main challenge for the responsible bodies in the coming times.

Globally, municipal solid waste management (MSWM) has been a substantial environmental issue, specifically in underdeveloped nations, and in Indian cities too. In India, rapid industrialisation and population explosion have resulted in the relocation of villagers to cities, which produces thousands of tons of MSW daily. The MSWM, especially in metropolitan cities, is undergoing a critical phase, due to the unavailability of suitable facilities for the management of MSW generated daily in abundance (Gupta & Arora, 2016). In Indian megacities, MSWM encompasses the issues associated with solid waste generation, its storage and collection, shifting and transporting, processing and disposal of solid waste. Household solid wastes are not properly managed at source by the generators. Furthermore, inappropriate management of municipal solid waste (MSW) leads the way in causing a menace to inhabitants. In this backdrop, an attempt is made to provide a comprehensive review through the study of characteristics, generation, collection and transportation, disposal and treatment of MSW disposal practices adopted in the area under study.

Solid waste management is important for making the environment sound and safe for human health. On the other hand, a properly managed solid waste system may generate a multi-billion-dollar business. The opportunities in the whole process are yet to be explored, especially in third-world countries.

Objectives of the Study

The study broadly evaluates the issues & challenges involved in the segregation of solid waste and disposal at source, i.e. at the household level. The following are the specific objectives of the research study:

- To examine the household solid waste management practices adopted by households.
- To analyse the demographic, socio-cultural and institutional factors influencing the effectiveness of SWM practice at the household level.
- To investigate the challenges & issues faced by solid waste collectors.
- To identify practical and sustainable alternatives to enhance household SWM practices.

Theoretical Base

The premise of waste management theory is that waste management should keep trash from endangering the environment and public health. Though a radically new and dynamic approach, based on an object-oriented need to define the key concepts of waste management, the theory of reasoned action (TRA) and the theory of planned behaviour (TPB) were applied in the research study as a framework in understanding, explaining and predicting the behaviour. The basis for the theory of planned behaviour is the hypothesis that individuals' attitudes and behavioural intentions are closely linked. And according to the theory of reasoned action, a person's intention to act or not act immediately determines their action. There are two factors that determine this behavioural intention of an individual: 1) the subjective norms, and 2) the attitude towards the behaviour (Ajzen & Fishbein, 1980). Normative beliefs pertain to subjective norms, whereas behavioural beliefs are associated with attitudes towards behaviour. However, it is preferable to study human behaviour when choices about involvement are voluntary

and within the control of the individual. In this instance, the goal is to forecast the audience's intention to engage in a particular activity related to solid waste segregation and disposal.

Drawing on the theoretical insight, the research questions were framed:

- Are people aware of the types of solid waste that exist?
- Are they aware that solid wastes need to be segregated?
- Are people aware of the hazards involved in inappropriate solid waste disposal?
- The current household solid waste management practices adopted by the households of the area?
- What is the influence of demographic, socio-cultural and institutional factors on the solid waste disposal practices?
- Are the private solid waste collectors performing the assigned duties?

Methodology

The present research was an exploratory study. It discussed an association between the different factors and efficient solid waste management at the household level. The survey method was used for the study. To achieve the objectives of the research, both primary and secondary data were used. For the collection of primary data, a questionnaire as a tool was applied. The universe of the study involved the households from South Delhi and Gurugram to have a diverse perspective from the national capital and a millennial city. The sample size consisted of 200 households, of which 100 were from Sarvodya Enclave in South Delhi (Group A) and 100 were from Block C, Mayfield Gardens in Gurugram (Group B). 20 garbage collectors, both municipal and private, were also interviewed to understand the challenges faced by them in collecting and managing household waste. The area was chosen as on the convenience of the researchers. The questionnaires were filled out by an adult member of each household.

Data Analysis

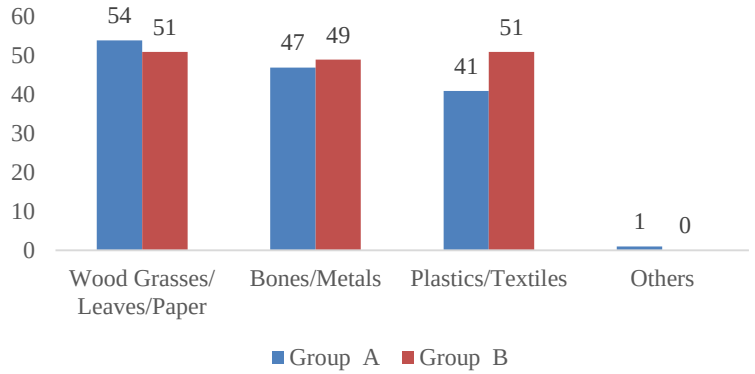
Based on the collected data, the issues & challenges involved in the segregation of the household solid waste were analysed:

Demographic Profile of the Respondents

Demographics	**No. of Respondents**		**Percentage**
Gender	**Group A**	**Group B**	
Male	33	43	38
Female	67	57	62
Total	**100**	**100**	**100**
Educational Qualification			
12th Grade	9	12	10
Graduate	43	59	52
Post Graduate	31	14	22
Any other	17	15	16
Total	**100**	**100**	**100**
Annual Income (Rs.)			
Below 1 lakh	2	2	2
1-5 lakh	8	6	7
5-10 lakh	48	48	48
10 lakh & above	42	44	43
Total	**100**	**100**	**100**
Household Size			
1-2	1	3	2

3-4	90	74	82
5-6	2	16	9
7-8	5	3	4
9 & more	2	4	3
Total	**100**	**100**	**100**

The data represents the demographic profile of the residents of South Delhi and Gurugram surveyed for the research study. The data shows that women outnumbered men in the case of participation in the survey, as expected by the researchers. Of the 200 respondents, more than 60% were women. Out of 76 male respondents, 43 were from Group B, while 33 males were from Group A. On the other hand, more females participated from Group A and 57 from Group B out of 124 women respondents. Being capital region and from Millennium City, all the respondents were literate and educated above the 12th Grade. More than half of the respondents, i.e. 52%, had a Graduation Degree; of these, 59 graduates were from Group B, while 43 were from Group A. 45 respondents were Post Graduates, while 32 had Professional degrees, viz. MBBS, Law, Engineering. While only 21 were just 12th pass.

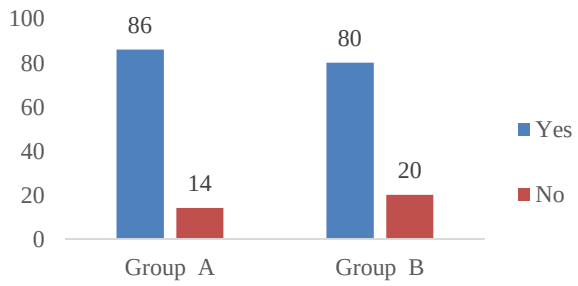


The economic standards of most of the families were of the upper-middle class. 43% of the respondents belonged to affluent families with their annual income above Rs. 10 lac per annum, of these 44 residing in Gurugram and 42 in South Delhi. On the other side, 48% of the respondents belonged to the upper middle & middle class, and 2% with income below 1 lac per annum. The data indicates that most of the respondents belonged to the middle class or affluent classes in terms of income from both areas under study. 82% of the respondents were living in a nuclear setup up having 3-4 members in their family. Of these 104 families, 90 were from Group A and 74 from Group B, followed by 5-6 family members in 9% of the respondents. Only 2% of the respondents were either living single or with two members in the family.

Solid Waste Generated by Households

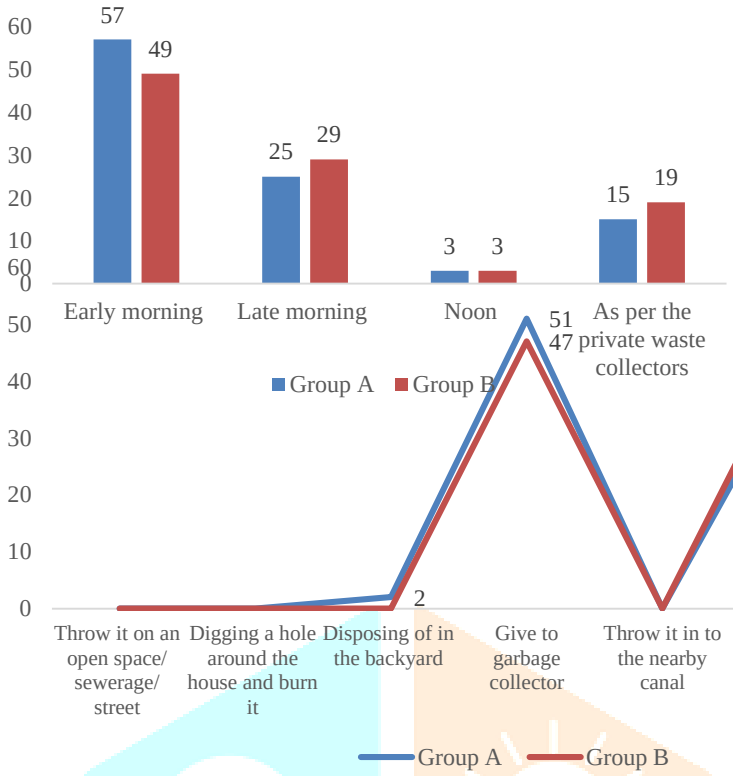
The graph depicts the types of solid waste generated by households. ***Wood Grasses, Leaves, Paper Waste & Food*** as the solid household waste which was generated by 53% of the households, of these 54 from group A and 51 from group B; while according to 48% of the respondents ***Bones & Metals*** was the second largest solid waste generated by the residents with 47 households from group A and 49 from group B households; which was closely followed by ***Plastics and Textiles*** that ***was*** agreed by 46% of the respondents with 51 from group B and 41 from group A.

Storage of Solid Waste Generated by Households



The graph shows the temporary solid waste storage done by the respondents and the means of storage available to respondents at their homes. To understand if the residents have temporary solid waste storage arrangements at their places, the respondents were asked the same and 166 (83%) respondents agreed that they had solid waste storage at their home with 86 from group A and 80 from group B while 34 (17%) respondents disagreed to the same. Of these 34, 20 belonged to group B, whereas 14 from group A.

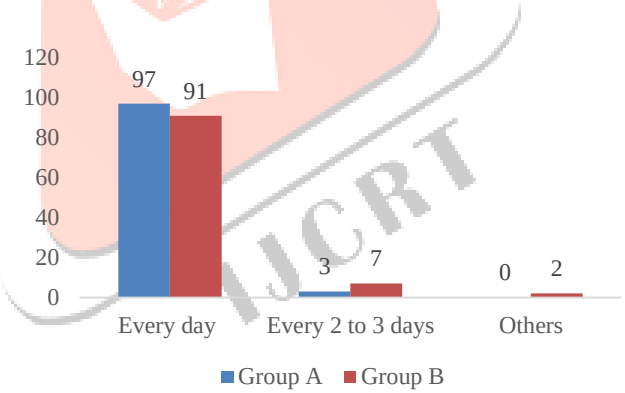
When asked about the kind of storage arrangements the residents have at their home, more than one fourth of the respondents i.e. 44% use basket for storage, followed by Plastic Bags by 37% respondents, while 1% of the respondents use sack and dumped at the backyard or use the kitchen garden for the storage and disposal of their solid waste at home. The data shows that group A is storing the household solid waste in baskets, whereas group B is using different plastic bags for storage.



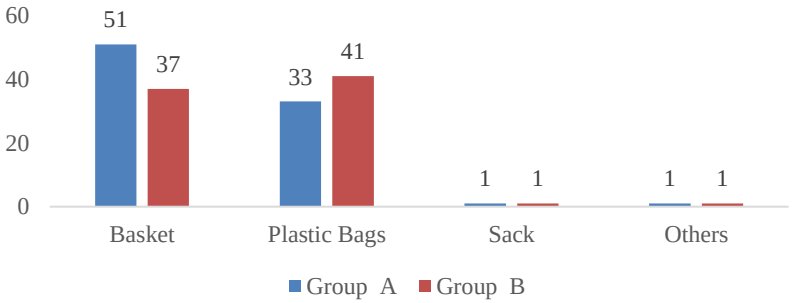
Disposal Practices Adopted by Households

The data represent the household solid waste disposal practices adopted by the respondents. Nearly half, i.e. 98 (49%) respondents dispose of their household solid waste by giving it to the garbage collector, of these 51 residents are from group A, while 47 are from group B, followed by disposing off to the privately hired garbage collector, to which 45% of the respondents agreed. While on the other hand, 10 (5%) respondents gave it away to the municipal corporation trucks or vans. None of the respondents from both groups dispose of their household solid waste in the open or nearby dumping areas.

Frequency of Disposal of Solid Waste by Households



The data shows the frequency of disposal of solid waste by the residents of group A & group B. When asked about how frequently they dispose off their household solid waste, 94% of the respondents reported that they disposed off their household solid waste on an everyday basis. 97 residents from group A and 91 from group B agreed to follow the same routine. Only 10 respondents were found to dispose off the solid waste after 2-3 days, of which 7 belonged to group B and 3 to group A. Whereas only 2 respondents from group B agreed that they dispose off their household solid waste whenever they find time, as they often live there. None of the respondents were in the habit of keeping the solid waste at home and usually disposed of it very frequently.

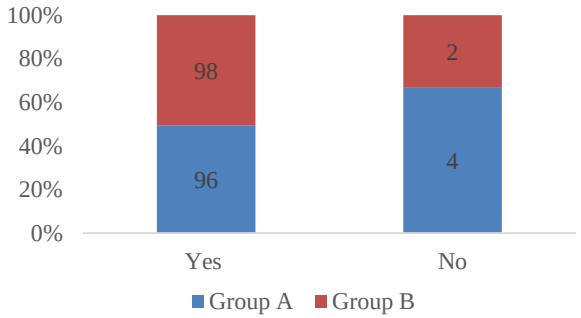


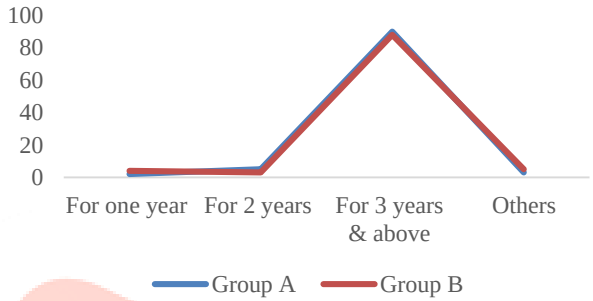
Time Preference of Disposing off Solid Waste by Households

The data shows the time preferred by the respondents to throw away the solid waste of their households. More than half of the respondents, i.e. 53% prefer to dispose off in the early morning hours. Of these 57 residents from group A follow this routine, while 49 residents from group B follow the same. While 27% of the respondents prefer to dispose off the solid household waste in the late morning hours. The 29 houses from group B practice it while 25 houses from group A practice it. On the other hand, 17% of the respondents who do not have their preferred timings to dispose off the solid waste as per the time of the private garbage collectors, 3% prefer at noon

time. None of the respondents like to dispose off during the afternoon or late night, neither from group A nor from group B.

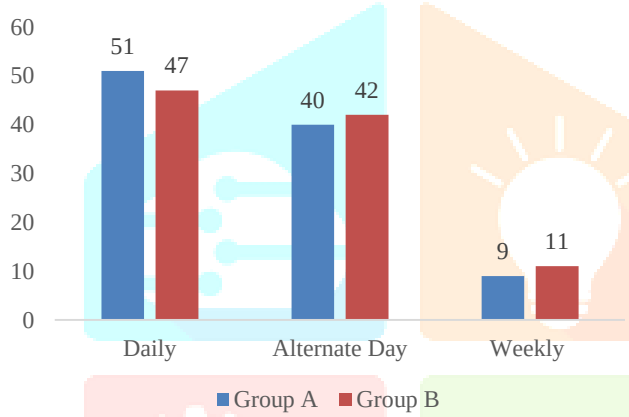
When asked for how long the respondents have been enjoying the services of the garbage collectors for household solid waste. 89% of the respondents agreed that they have been enjoying these services for more than 3 years, and of these, 90 were from group A and 88 from group B. While on the other hand, 4% of the respondents each informed that they have been giving their household solid waste to garbage collectors for either the last 2 years or for almost one year only. 3% of the respondents admitted that they are not taking any services from the garbage collectors.





Frequency of Municipal Garbage Collector Vans

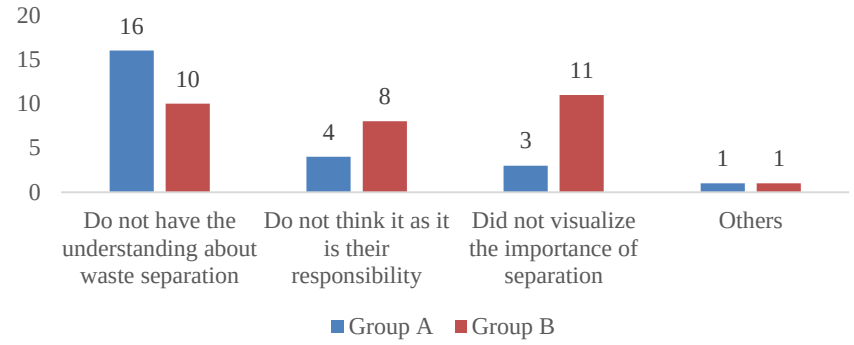
The data represents the frequency of Municipal Corporations' Garbage collection vans in group A and group B. Almost half of the residents (49%) agreed that the Municipal Corporation's Garbage collection vans in both areas come daily, wherein 51 group A residents and 47 residents from group B agreed to the same. This was closely followed by 41% of the respondents who agreed that the garbage collectors come on every alternate day to collect the solid waste from both areas under study, among them 40 were from group A, while 42 were from group B. While 10% of the respondents said that the Municipal Garbage collectors come weekly to collect the waste from the Sarvodya Enclave in Delhi and Mayfield Gardens in Gurugram.



Awareness about Solid Waste Segregation

When people were asked about their awareness regarding awareness about biodegradable and non-biodegradable solid wastes, it was found that around 97% of the respondents were aware of the solid waste segregation and of these 96 were from South Delhi and 98 from Gurugram who confess that they were aware of solid waste segregation while surprisingly 3% confessed that they have no information about the same. And when asked about practising the household solid waste segregation, 54 of the residents admitted that they do not practice the solid waste segregation at the source. Surprisingly, 73% practice the household solid waste separation, among these 76 households were from group A and 70 were from group B.

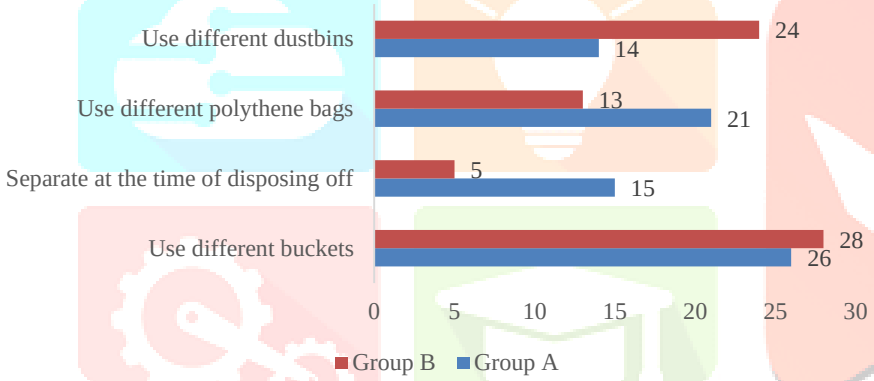
Ways adopted by the respondents to segregate Solid Waste



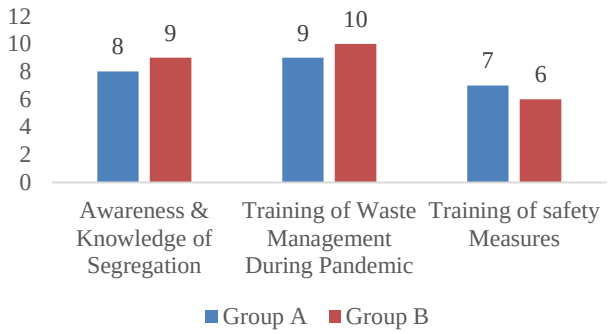
To understand how residents help in solid waste management, they were asked about the ways they separate the solid waste at home. As the previous data shows that 146 respondents practice solid waste separation at the source from the areas under study in Delhi and Gurugram, of these 54 households surveyed use different buckets to segregate the waste at home at both places. While 38 households separate the waste by using different dustbins at their respective houses. Among these 24 belong to group B while 14 belong to group A. On the other hand, 34 households use polythene bags as their practice to segregate household solid waste, and of these, 21 were from group A, while 13 were from group B. Just 20 families segregate solid waste at the time of disposing off.

Reasons for not segregating the Solid Waste

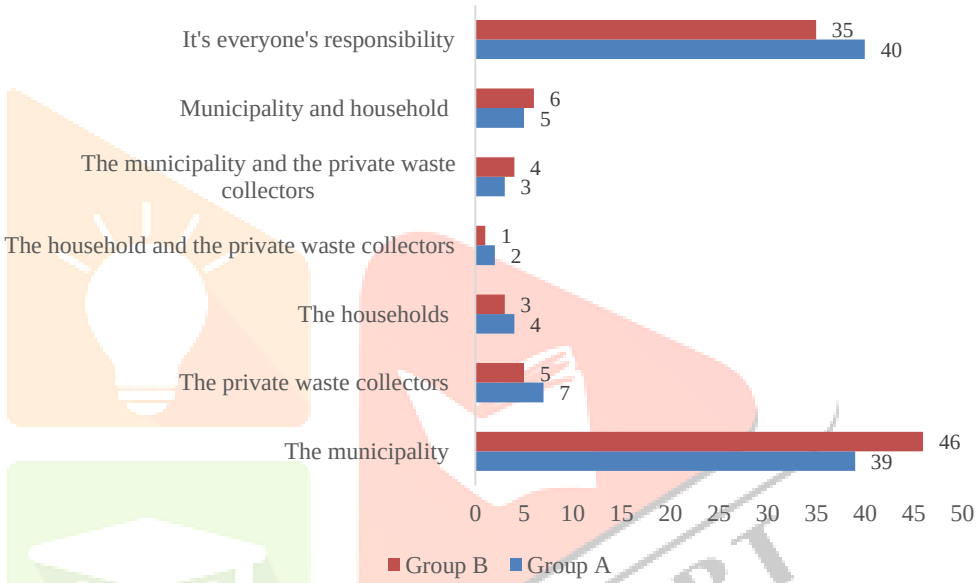
The data shows that almost all the respondents are aware of solid waste segregation, but still, they do not practice solid waste management. To understand the reasons behind the same, the residents of South Delhi and Gurugram were asked to share their reasons. 13% of the respondents claimed that they do not have an understanding of waste separation; of these, 16 were residents of group A and 10 were residents of group B. On the other side, 7% believed that they did not visualise the importance of the separation of household solid waste, while 6% said that they did not think of it as their responsibility. The residents of group B strongly believe in it than the residents of group A.



Responsibility of Solid Waste Management



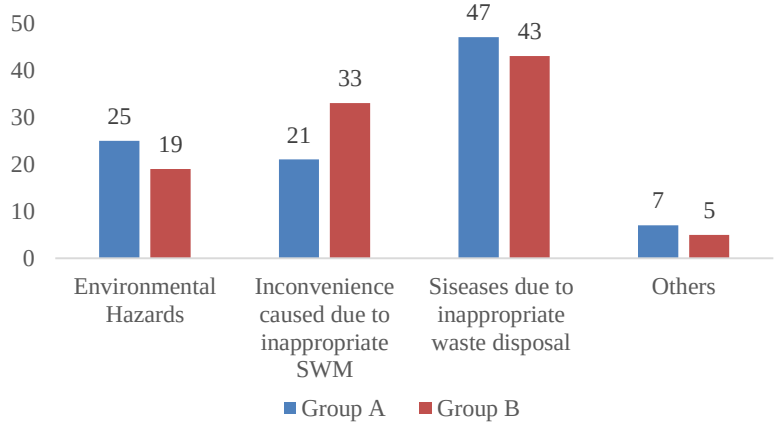
The statistics represents the responses related to the question as to where the responsibility for solid waste management rests; more than one fourth of the respondents i.e. 43% believe that local municipality or the municipal corporation of their respective area is responsible for the household solid waste management, of these 46 were residents of group B and 39 were residents of group A. On the other side, 38% of the respondents believed that it is the collective responsibility of the municipal corporation, private collectors and the household, i.e. residents to manage the household solid waste management, which is the opinion of 40 residents of group A and 35 of group B. While 6% of the respondents each believe that it is either the responsibility of private waste collectors only, or the municipality and household together are responsible for the same. Whereas 4% of the respondents each believe that the households are the ones who should do it, or municipality and private waste collectors should together be responsible for the management, only 2% of people believed that it is the duty of both the household and the private waste collectors.



The opinion of the residents of both areas is that the responsibility of household solid waste management should either be with the municipal corporations only or should be the collective responsibility of the municipal corporation, private collectors and the households.

Challenges & Issues of Solid Waste Collectors

The data shows the challenges and issues faced by solid waste collectors, both municipal and private collectors of the area under study. When asked about the same from the waste collectors, almost all the respondents, i.e. 96%, confessed that the biggest challenge they were facing was the training for management of household solid waste. On the other hand, 63% of the garbage collectors confessed that proper training should have been given regarding the safety measures. While 81% of the collectors from both South Delhi & Gurugram were not fully aware and informed about the segregation of household solid waste. Almost all the collectors said that they were given the proper training about the appropriate behaviour and were provided with gloves, caps, soaps and sanitisers.



Importance of Solid Waste Management

The data depicts the importance of solid waste management in the eyes of respondents. 45% of the respondents feel that solid waste management is important to avoid the spread of diseases; of these, 47 were residents of group A and 43 from group B. 27% consider the inconvenience caused due to inappropriate management of solid waste is the need that solid waste be managed properly, only 22% considered that it impacts the environment negatively and is an important issue.

Findings

The following are the important findings of the present research:

- The women outnumbered men as more than 60% were women. There were more females who participated from Group A and 57 from Group B out of 124 total women respondents.
- Being capital region and from Millennium City, all the respondents were literate and educated above the 12th Grade.
- The data indicates that most of the respondents belonged to the middle class or affluent classes in terms of income from both areas under study.
- 82% of the respondents were living in a nuclear setup up having 3-4 members in their family.
- ***Wood Grasses, Leaves, Paper Waste & Food,*** as the solid household waste, which was generated by 53% of the households, followed by ***Bones & Metals*** and ***Plastics and Textiles.***
- 83% of the respondents agreed that they had solid waste storage at their home, while 17% of the respondents disagreed to the same.
- Respondents use a basket for storage, followed by Plastic Bags for the storage and disposal of their solid waste at home.
- 98 (49%) respondents dispose-off their household solid waste by giving it to the garbage collector, followed by disposing off it to the privately hired garbage collector, to which 45% of the respondents agreed.
- 94% of the respondents reported that they disposed off their household solid waste on an everyday basis.
- 53% prefer to dispose off in the early morning hours, while 27% of the respondents prefer to dispose off the solid household waste in the late morning hours.
- 89% of the respondents agreed that they have been enjoying the services of private collectors for more than 3 years.
- Nearly half of the respondents confessed that the Municipal Corporations' Garbage collection vans in both areas collect the solid waste on a daily basis, followed by 41% of the respondents who agreed that the garbage collectors come every day to collect the solid waste.
- Almost all the respondents were aware of the solid waste segregation, and surprisingly, 3% confessed that they had no information about the same.
- 54 of the residents admitted that they do not practice the solid waste segregation at the source, surprisingly, 73% practice the household solid waste separation.
- 80% use different methods to segregate the solid waste at home, while 20 families segregate solid waste at the time of disposing off.
- 13% of the respondents claimed that they do not have an understanding of waste separation, and 7% believed that they did not visualise the importance of the separation of household solid waste, while 6% said that they did not think of it as their responsibility.
- The residents of both areas believe that it should be the collective responsibility of the municipal corporation, private collectors and the households for solid waste management.
- The respondents feel that solid waste management is important to avoid the spread of diseases and to protect the environment.
- Almost all the garbage collectors confessed that the biggest challenge they were facing was the training for management of household solid waste, but agreed that proper training was given regarding the safety measures and about the appropriate behaviour.

Conclusion

Various issues and challenges raised in household solid waste segregation and disposal suggest that the effectiveness of solid waste segregation can be increased by public awareness and participation, as well as by the private sector and non-governmental organisations. The general public should be made aware of the health risks associated with improper waste segregation. Waste pickup from house to house should be planned using strategies such as routine, pre-planned schedule and timing. The collecting bins need to be branded and well-built with instructions. Large-capacity metallic containers with lids that can hold more waste than is anticipated should be available. The storage facilities should be managed by the municipal authority to prevent the creation of unsanitary conditions. The MSW vehicles need to be properly maintained, and the older vehicles should be gradually replaced with the Dumper Placer. The Municipal waste containers at Dhalaos (dumping areas) should be designed for mechanical loading and unloading. The location for dhalaos also needs to be chosen appropriately. The storage facilities should be monitored by the municipal authority to prevent the creation of unhealthy conditions. The MSW containers need to be properly maintained, and the old vehicles should be gradually replaced with the Dumper Placer. Compostable garbage is not currently separated from other non-biodegradable and recyclable waste at the source level of waste generation and collection. Better options and chances for the scientific disposal of trash would result from proper segregation. Recyclables might be delivered immediately to recycling facilities, which would then pay the companies a specific sum, increasing their revenue. In addition to creating jobs, these actions would help to formalise the current unofficial recycling unit setup. Additionally, it would lead to several benefits, including the ability to upgrade technology, higher-quality products, the preservation of the nation's precious raw material resources, a reduction in the amount of space needed for landfills, a less energy-intensive method of producing some goods, and the employment of workers in the recycling sector. One efficient method of providing reasonably priced services is to organise the unorganised sector and support microbusinesses. Rag pickers and other marginalised communities can improve their living and working conditions by promoting and developing recycling. In India, the majority of MSW is disposed of in an uncontrolled way on land. Inadequate disposal methods cause issues that harm the health of people and animals and can cause financial, environmental, and biological losses.

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