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HETEROGENEOUS PRACTICES OF SOLID WASTE MANAGEMENT AMONG URBAN HOUSEHOLDS IN KERALA, INDIA

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Abstract

As the global population grows and the demand for food and other essentials rises, that leads to the generation of increasing amounts of waste daily by the households. Poor management of solid waste poses serious health hazards and contributes to the spread of infectious diseases, underscoring the need for improved and scientifically informed waste management strategies. Here, the study examines the present practices of waste management mechanism followed by the urban households in Kerala, India. The data used in this analysis comes from primary data of 384 urban households of Kerala. The results show that a substantial number of households dispose of organic waste by digging in the compound followed by deploying Kudumbasree. The traditional practice of composting waste at the household level, once widespread, has now fallen into disuse and requires revival. The practice of household level composting of waste which was very common earlier has now become defunct and needs to be revived. Households rely on rag pickers for disposing of recyclable wastes, e-waste, bulbs, tube lights and glasses. Even though local government of Kerala took clean Kerala challenge, substantial part of the sample household depends on burning for disposing carry bags. Households face many challenges while disposing of solid waste such as irregular collection and poor transportation, unscientific disposal, shortage of land, low income, inefficient laws and policies etc.

Key Words: solid waste, waste management, waste disposal, Kerala

1. Introduction

The generation of solid waste has emerged as a growing environmental and public health concern worldwide, especially in developing nations. The fast expansion of industrial activities stimulated by rapid population growth has produced vast amounts of solid and liquid wastes that pollute the environment and destroy resources (UNEP, 2004). In the developing countries, solid waste generation and it's poor management has become a more challenging issue for the impending days. It is estimates that the amount of MSW (Municipal Solid Waste) will rise from the current 1.3 billion tonnes per year to 2.2 billion tonnes per year by 2025, with much of the increase coming from rapidly growing cities in developing countries (World Bank report, 2012). In developed countries, per capita waste generation increased nearly three-fold over the last two decades, reaching a level five to six times higher than that in developing countries (Saha, 2013). If current trends continue, the world may see a five-fold increase in waste generation by the year 2025 (Palczynski et al., 2002,

Okalebo, 2014). The present annual quantity of solid waste generated in Indian cities has increased from 6 million tonnes in 1947 to 48 million tonnes in 1997 with an annual growth rate of 4.25 per cent, and it is expected to increase to 300 million tonnes by 2047 (CPCB, 2004; Sharholy et al., 2008)). High population, rapid economic growth and change in living standard accelerate the generation of municipal solid waste in Indian cities (CPCB, 2004; Sharholy et al., 2008). The quantity of wastes generated from households varies, according to income, food habits, age, lifestyle, educational and occupational status (Afroz et al., 2008; Kayode, 2011; Limbu, 2013; Olayungbo et al., 2014; Trang et al., 2017).

The government of Kerala (Kerala Economic Review, 2004) estimated that about 2500 tonnes of solid wastes are generated per day in the State of which about 50 per cent is collected for disposal. The study identified that increasing urbanisation, changing lifestyle and rise in tourism are the main reason for the rise in waste generation in Kerala. Half of the solid waste in Kerala is generated from household waste since the collection of wastes from residence is not done properly most of the domestic wastes ends up in the streets or barren lands in the city (Varma, 2007).

Management of waste is a demanding and challenging undertaking in all European countries, with important implications for human health and well-being, environmental preservation, sustainability and economy (WHO, 2015). As urbanisation continues to take place, the management of solid waste is becoming a major public health and environmental concern in urban areas of many developing countries (Ogawa, 2008). The solid waste management system in a developing countries displays an array of problems including low collection coverage and irregular collection services, crude open dumping and burning without air and water pollution control and the breeding of flies and vermin (Ogawa, 2008). Uncontrolled generation of solid waste and improper disposal coupled with poor collection services poses a great threat to the environmental quality and human health (Jin et al., 2006; Afroz et al., 2009). Uncontrolled dumping and poor household solid waste management leads to contamination of water, attraction of insects and rodents and increases flooding due to blockage of drainage canals or gullies (Andrew, 2009) which has a negative impact on environmental and human health (Rakib et al., 2014). Improper disposal of waste leads to obnoxious conditions and the spread of communicable diseases (Yedla & Kansal, 2003).

The solid waste issue highlights the need for the proper management and relocate the dumpsite to a safe distance from all human settlements and provide resettlement and environmental education programs for all persons living less than fifty meters away from the dumpsite as interim measures (Sankoh et al., 2013). The landfill is the most popularly used method of waste disposal which includes burying the waste in lands all over the world that pollute underground water, ultimately causing waterborne diseases (Salifu, 2001). All these studies recommend following a policy of waste minimisation and elimination of landfills. Open dumping and open burning must be strongly discharged by considering the overall negative impact (Ejas et al., 2010). The study (Abul, 2010) recommends that dumpsites should be properly located and managed to minimise its effects on the environment.

The management of solid waste is today one of the important obligatory functions of the Local Government Areas (LGAs) in the entire country, but the fact is now changing with the realisation that local authorities are not capable of managing waste on their own (Henry et al., 2006). Experts believe that India is following a flawed system of waste disposal and management SWM is one of the basic essential services being provided by Municipal Authorities in India to keep urban centres clean and hygienic (Lohri, 2014). However, it is one of the most poorly rendered services, i.e. the system applied are unscientific in some areas whereas outdated and inefficient, and population coverage is low in other areas (Dheeraj et al., 2013).

As a densely populated states in India, households in Kerala contribute 49 per cent (Koshy, 2010) of the total solid waste generated in Kerala, followed by hotels, marriage halls, institutions, shops, etc. Hence, studies show that managing household waste is a crucial factor in managing wastes in urban areas. KSIDC (Kerala State Industrial Development Corporation) provides a solution to Kerala's waste crisis by suggesting setting up of waste disposal units at household level via composting /vermin culture or the installation of biogas units, the participation of NGO's and community organisations etc. can significantly aid in addressing the solid

waste management crisis. Kudumbasree also plays a dominant role in the door-to-door waste collection from households throughout Kerala.

The study aims to examine the present practice of solid waste management mechanism carried out by the urban households in Kerala. Specifically, this involves an analysis of the heterogeneous practices of waste management followed by urban households in Kerala. It involves an analysis of the perception and practices of waste disposal, practice of storage and segregation followed and current issues and challenges pertaining to waste disposal.

2. Data source and methods

The study requires primary data which are collected from 384 sample households in Kerala through stratified random sampling method. This is also supplemented by data gathered from the focus group discussion with Kudumbasree, Corporation sanitary workers, 'Niravu' (private service provider), waste treatment plant workers and interview with plant manager, Njeliyanparambu waste treatment plant, Kozhikode Corporation. However, the major focus is on the households in Kozhikode Corporation..

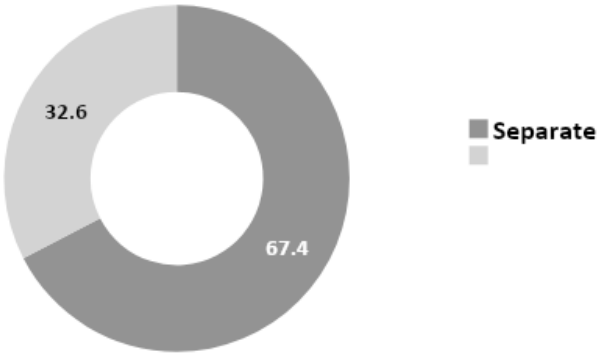
3. Results and discussions

This section focuses on different waste management practices followed by households in Kerala towards wastes like organic, inorganic like non-recyclable plastic, recyclable plastics, glasses, lights and e-waste.

3.1 Segregation of Waste

The best strategies for effective waste management are to separate garbage at the source, encourage recycling or reuse of separated materials, reduce the amount of waste and the load on landfills, and supply raw materials to manufacturers. Waste should be separated at the source for easy collection and transportation for final disposal, and people should segregate the inorganic waste such as papers, plastics, fused bulbs, blades, glass wares and empty bottles at the source (Andrew, 2009). Segregation of waste at source is the key to 'Recycling Revolution' being promoted by the Ministry of Environmental Protection (MoEP). It begins at home, with residents' segregates their trash into different categories like organic, inorganic, wet, dry etc. Segregation of waste at source is still in early stages in Kerala and is operational only in Thiruvananthapuram and Kozhikode Corporations, Quilandy Municipality, Chunakkara Village Panchayat and in a few local governments (Kerala economic review, 2017). The practice of solid waste segregation among households is given in Figure .1.
Usually, Kudumbasree collects only organic waste from households, and they are not ready to collect inorganic waste. On the other hand, the residence association with the help of 'Niravu' collects inorganic waste from the households. Corporation sanitary workers collect both organic and inorganic waste, and they provide a separate bin for organic and inorganic waste. This nature of waste collection agencies also induces the public to segregate waste and make the public aware about the need for waste segregation.

Figure 1: Segregation of Solid Waste



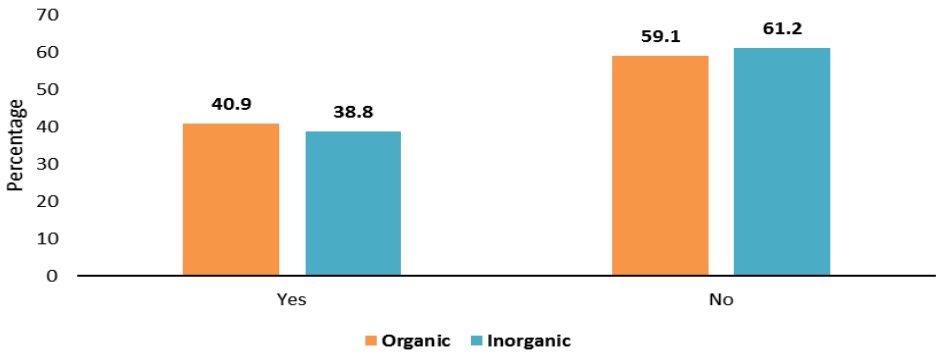
Source: Estimated from primary data

A substantial part of the households segregate waste into organic and inorganic which is a good symptom for better waste management. Out of the total households, 32.6 per cent do not practice segregation, and they put forward various reasons for non-segregation like unawareness about segregation, wastage of time, the absence of a ready market for recyclable waste and difficult to afford separate bin for organic and inorganic waste. The households who follows segregation are aware of the need for segregation for efficient and effective disposal. Some households practice segregation for getting manure from organic waste and having the market for recyclable waste.

3.2 Practice of Storage

The storage of waste at its source is a critical component of effective solid waste management. Households, shops, and establishments generate solid waste on a daily basis, and it is essential that this waste is properly stored at the point of generation until it can be collected for appropriate disposal (Ministry of Housing and Urban Affairs). Some households in Kozhikode Corporation follow the practice of storage of solid waste until its collection and proper disposal. Figure 2 represents the availability of a storage facility across the households.

Figure 2: Practice of Storage



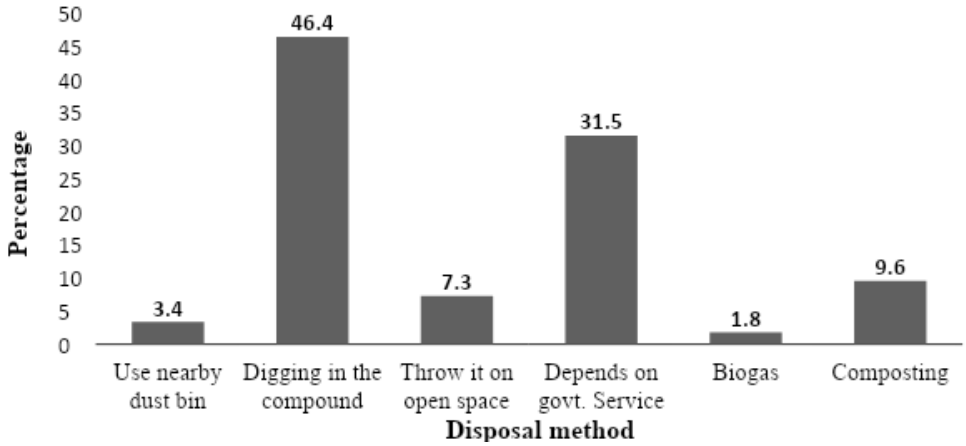
Source: Estimated from primary data

Figure 2 represents majority of the households do not practice storage of both organic and inorganic waste. Only 40.9 per cent of the households have a storage facility for organic waste and use the durable plastic container for storing. However, in the case of inorganic waste, a major part of the households do not follow such practice. This is because of the irregular nature of the service provider in the collection of inorganic waste. Moreover, households have to encounter several unforeseen problems such as foul smell, breeding of flies, mosquitoes, etc. while storing waste for a long time.

3.3 Disposal of Organic Waste

Cent per cent of the sample households generate organic waste, and they follow different mechanism to dispose of organic waste such as using nearby dustbin, digging in their compound, throwing, employing Kudumbasree volunteers, biogas and composting. The different management mechanism practised by the households are given in Figure 3.

Figure 3: Disposal of Organic Waste



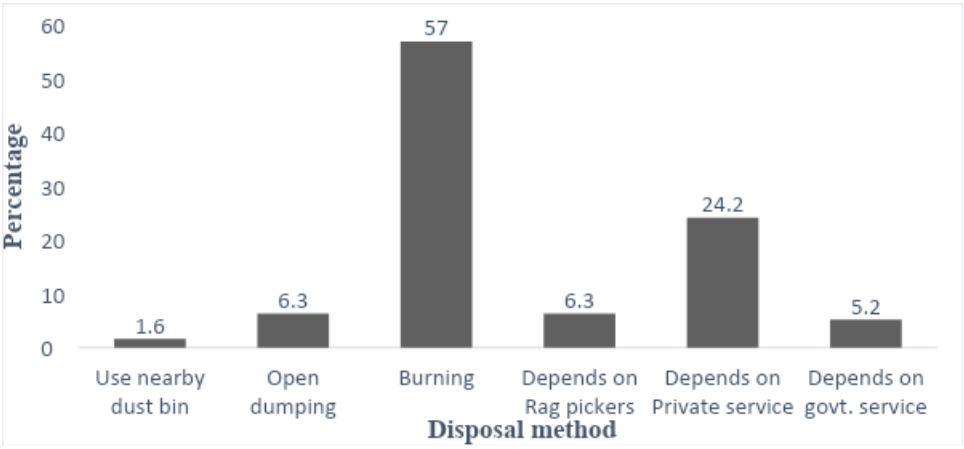
Source: Estimated from primary data

Figure 3 shows that majority of the sample dispose of their organic waste by digging in the compound, and 31.5 per cent rely on public service like Kudumbasree or Corporation sanitary workers. Kudumbasree volunteers collect waste from 18 circles of Corporation every day except Sunday at a reasonable rate. Sanitary workers employed by the Corporation collect both organic and inorganic waste from two coastal wards among the 15 sample wards. A notable feature is that 9.6 per cent of the households dispose of their organic waste by composting like pipe compost, and pit compost. They are satisfied with the composting mechanism because they got enough manure for maintaining their garden. Only a negligible percentage of the households are converting organic waste into biogas and produced cooking gas for which the price is rising nowadays. Government provide financial assistance for maintaining both biogas and composting, and 5.7 per cent of the households have benefitted government assistance for maintaining both biogas and compost. The practice of household-level composting, once widespread, has now largely fallen into disuse and needs to be revived. The composition of MSW shows mostly organic matter (45.3 per cent), so composting is a good method for treatment (Sharholy et al., 2008).

3.4 Disposal of Non-recyclable Plastic

Similar to organic waste, cent per cent of the households generate plastic wastes because today plastic is an unavoidable part of daily consumption. Even though the Corporation had taken many steps to make it plastic free, nowadays all the food items are delivered in plastic carry bag majority of which are non-recyclable. The heterogeneous practices of non-recyclable plastic waste disposal across households are presented in Figure 4.

Figure 4: Disposal of Non-recyclable Plastic



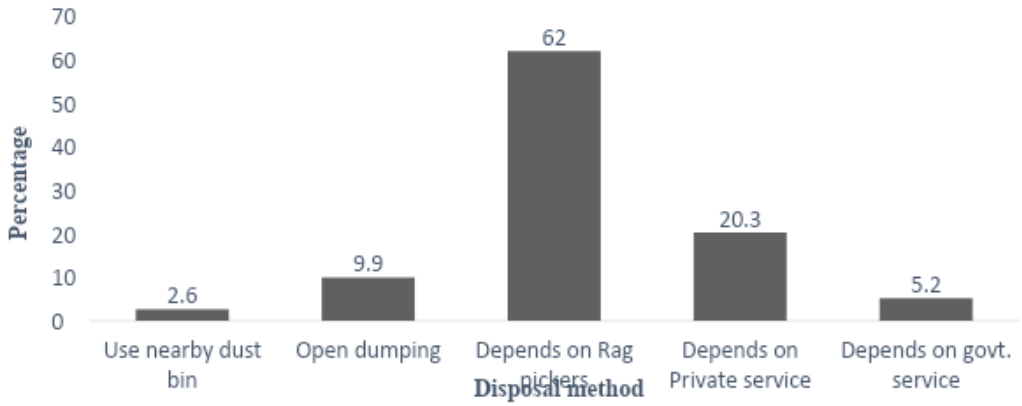
Source: Estimated from primary data

Figure 4 shows majority of household choose burning for disposing of non-recyclable plastic especially plastic carry bags as there is no other option before them. The burning of plastic waste generates toxic gases like dioxin, carbon monoxide etc. which is injurious to human health and natural environment. Kudumbasree volunteers are not willing to collect inorganic waste from households. Corporation sanitary workers collect plastic waste, but their service is limited to two wards. The private service provider under the banner of 'Niravu' collects plastic wastes from Kozhikode Corporation, and 24.2 per cent of households rely on these agencies, but they are irregular in the collection. Rag pickers are not willing to collect non-recyclable plastic. However, a negligible per cent relies on rag pickers for managing non- recyclable plastic like carry bags and bottle.

3.5 Disposal of Recyclable Plastic

Recyclable plastic waste constitutes a notable share in total household solid wastes. The Corporation had a plastic waste recycling unit at West Hill. In the earlier stage, plastic wastes were collected from households once in a week and dumped at Corporation owned industrial estate at West Hill. Later, this recycling unit was shut down due to technical issues (Govind 2011. NGOs like residential associations took interest in collecting recyclable plastic waste with the help of 'Niravu', a privately owned agency. Disposal mechanism followed by the households is shown in Figure 5.

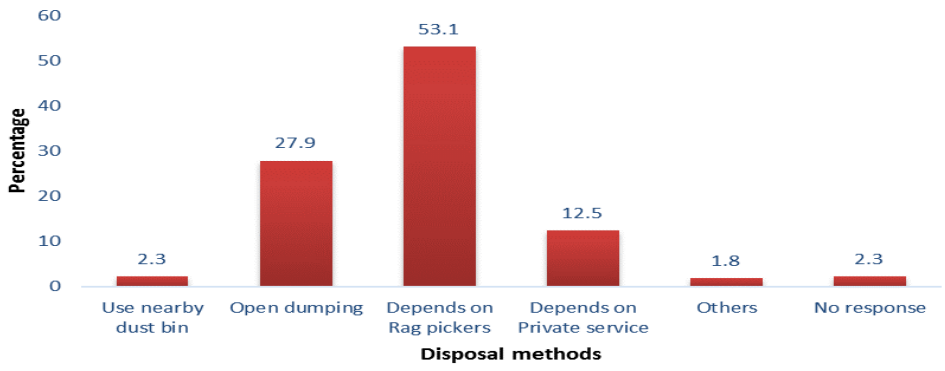
Figure 5: Disposal of Recyclable Plastic



Source: Estimated from primary data

In the case of recyclable plastic disposal, a large proportion of the sample rely on rag pickers which is a common phenomenon in Kerala, and 20.3 per cent rely on private service provider under 'Niravu'. People's concern about waste recycling is considered as a good symptom of environmental awareness.

Figure 6. Disposal of Bulb and Glasses



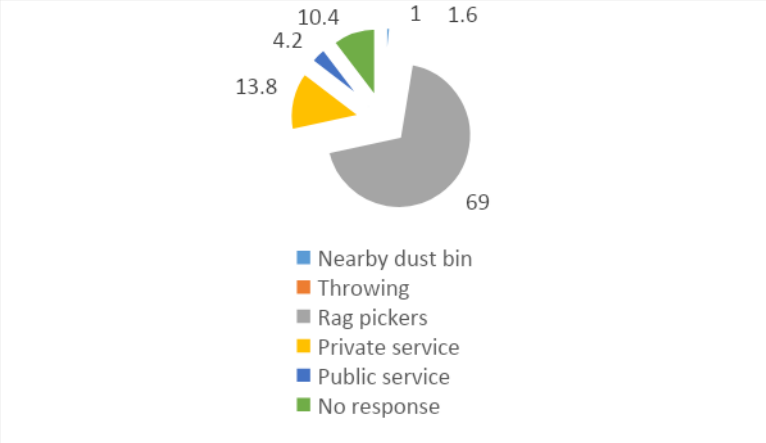
Source: Estimated from primary data

Figure 6. shows majority of the households depend on rag pickers for disposing of the bulb, tube lights and glasses. A dangerous fact is that 27.9 per cent of households openly dump these waste either in their courtyard or open space. They have no other option before them to dispose of such kind of a waste since rag-pickers do not collect all types of glasses and lights. Some of the households rely on private service for disposing of such kind of wastes.

3.6 Disposal of e-waste

Nowadays e-waste also contributes a share in total solid waste generated among the households. Mobile phones, chargers, parts of other electronic items, etc. are the common e-waste among the households. Figure 7 shows the disposal mechanism followed by the households concerning e-waste disposal and found that 69 per cent relies on rag pickers for disposing of e-waste.

Figure 7. Disposal of e-waste



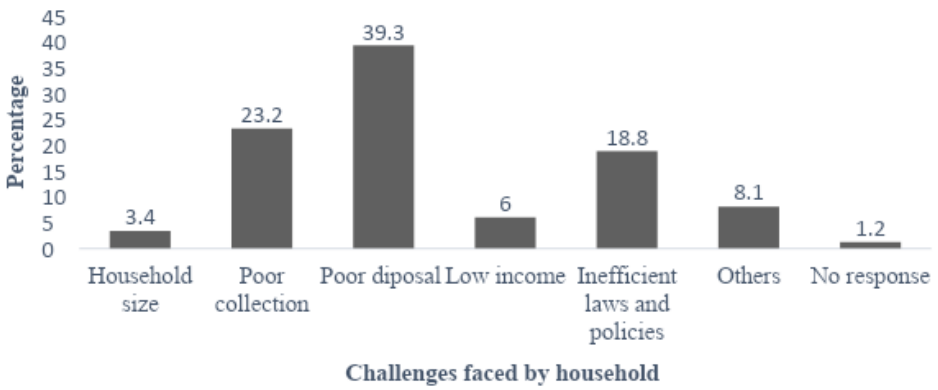
Source: Estimated from primary data

Besides organic and inorganic waste, other wastes such as old clothes, sanitary pads, furniture etc are generated in households. A substantial percentage of the households dispose of old clothes to the needy ones. When it comes to the disposal of sanitary pads, 88.1 per cent choose burning stating that there is no other choice to dispose of it. It is found that burning of such types of waste emits toxic gases like dioxin and carbon monoxide which causing negative externalities like environmental pollution and health hazards.

3.7 Challenges Associated with Waste Management

Every economy regardless of it is developed or not, encounters this serious issue. Kozhikode Corporation does not have an exemption too. The household has to face challenges like the irregular collection, improper transportation, substandard disposal, household size, shortage of land, low income, inefficient laws and policies etc. Figure 8 represents the challenges faced by the households in Kozhikode Corporation.

Figure 8: Challenges of Waste Management



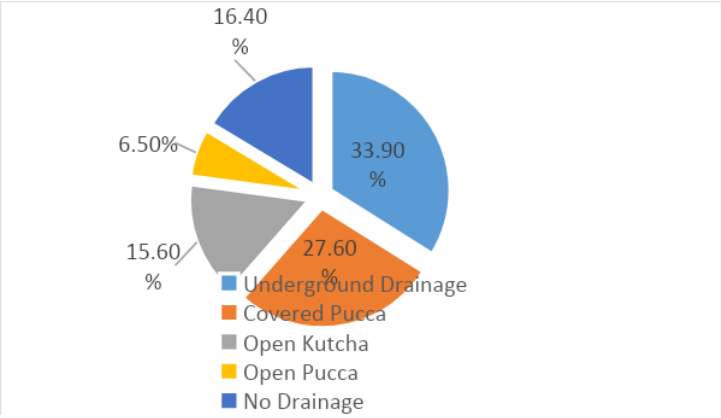
Source: Estimated from primary data

Figure 8 indicates that poor disposal methods are the prime challenge faced by the households while managing solid waste followed by an irregular collection of waste and inefficient laws and policies. Low-Income and high household size slightly affect waste management.

3.8 Drainage and Latrine Facility

Drainage types have been categorized as (i) underground: drains or pipes laid below the earth surface (ii) covered pucca: covered drains made of pucca materials like pipes, bricks, stones, cement concrete, etc. (iii) open pucca: open drains made of pucca materials like pipes, bricks, stones, cement concrete, etc. (iv) open kutcha: ordinary channels cut through the ground to allow water to pass and (v) no drainage (Waste Management and Disposal Survey, 2014-15). Drainage system followed by the households is comparatively good in the heart of the city. The Figure 9 shows 33.9 per cent of the households are equipped with underground drainage system followed by covered pucca, open kutcha and open pucca. However, 16.4 per cent follow no drainage system as they do not have any facility to construct drainage due to small homestead.

Figure 9: Nature of Drainage System



Source: Estimated from primary data

In the case of latrine facility, 98.2 per cent have a septic tank with the flush system. However, 1.6 per cent of households use community latrine facilities. This group is concentrated in the Kalluthan Kadavu colony, the heart of the city where 100 households are thickly populated having only two cents of land for each and community latrine facilities are provided by the Corporation for men and women separately.

4. Conclusion and Policy implications

The preceding analysis of current solid waste management practices among households in Kozhikode Corporation implies the varied and complex approaches to waste disposal, along with the issues and challenges faced in this domain. Households exhibit a range of waste management behaviors, reflecting both adherence to traditional methods and adoption of newer practices. Public and private service providers are actively involved in waste collection, each playing distinct roles. Public entities like Kudumbasree are primarily responsible for collecting organic waste, ensuring regular pickup from households. In contrast, private service providers focus on inorganic waste collection, often in collaboration with residents' associations. This dual system of waste management highlights the fragmented nature of the current approach and points to the urgent need for a more cohesive and comprehensive strategy to effectively address the growing complexities of waste disposal in the region.

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