HOUSEHOLD WASTE SEGREGATION IN A WARD OF A BUDHANILKANTHA MUNICIPALITY, KATHMANDU, NEPAL

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ABSTRACT

The process of urbanization, which is perceived as a sign of progress, results increased number of households and their increased consumption of goods and services. This increases the volume of daily household waste which if not properly managed, can lead to various diseases and epidemics. Segregation of household waste into biodegradable and non-biodegradable wastes can make household waste management easier as the biodegradable waste whose proportion is more than 60% of the daily household waste, can be managed at household or local level. Similarly, a large proportion of non-biodegradable waste can be recycled. This would remove great burden faced by the distant landfill sites where urban wastes are disposed on a regular basis. This study was done in a ward of Budhanilkantha Municipality, an urban municipality of Kathmandu Valley, which involved 592 households. Out of these households, 65% of the total practiced waste segregation. However, the practice of household waste segregation was not significantly associated with different levels of education status or the monthly income of the family. It was also not significantly associated with the presence of open area around the house.

KEYWORDS

Waste, segregation, Budhanilkantha, ward

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DOI: https://doi.org/10.3126/nmcj.v26i3.69883

***Received on**: June 20, 2024*
***Accepted for publication**: July 26, 2024*

INTRODUCTION

The generation of waste as a result of urbanization is increasing at an alarming rate. More than 1 million tons of municipal solid waste are generated in Asia every day which mainly consists of household wastes and this figure is expected to reach 1.8 million tons by 2025 AD.[1] The World Bank Report 2012 estimated that South Asia Region will have an urban waste generation of 0.77kg/capita/day from the projected urban population of 734 million by the year 2025 AD.[2] Epidemics of vector borne disease and zoonotic disease has been linked to poor management of urban solid waste. As disease epidemics are increasing with urban populations growing, sustainable solid waste management is crucial for prevention of such epidemics.[3] Waste segregation is the first step to any successful waste management policy.[4] Waste segregation means dividing the waste into organic waste usually generated by eating at households, and other non-organic wastes like plastics, papers and metals. With the segregation of waste at the source point the amount of waste going to the landfill is greatly reduced.[5] Waste segregation at source may also ease handling, processing and recycling of wastes and overall reduction in the waste management cost.[6]

The Kathmandu valley has the annual growth rate of 4% of population. With unorganized urbanization, poor solid waste management system has led to groundwater pollution inside the valley.[7] Solid waste management has been a challenge for over a decade in Kathmandu Valley.[8] It will continue to be a public health problem for this valley as there are 2 metropolitan cities and 16 urban municipalities out of 21 municipalities inside the valley.

Budhanilkantha Municipality which is one of the urban municipality inside Kathmandu Valley, has annual growth rate of 4.78% which is 5 times higher than Nepal's annual growth rate of 0.92 percent.[9] As waste segregation at household level helps in reducing and handling the household wastes, studies like this which is carried out in a simplest administrative unit, which is a ward, can help overcome this challenge by providing information, based on which various eco-friendly waste management related intervention programs can be introduced.

MATERIALS AND METHODS

After getting ethical approval from the Institutional Review Committee of Nepal Medical College (Ref. No. 071-078/79) and the ward office data was collected from 592 households in Ward 13 (Chunikhel) of Budhanilkantha Municipality in September 2022. The permission was also taken from Department of Community Medicine for using the data collected by the medical and dental undergraduates using structured questionnaire during their community survey.

The households which were selected based on convenience sampling comprise 23.9 % of the total households of the ward which has total of 2478 households.[9] A community based descriptive study was carried out to know the percentage of households practicing domestic waste segregation and if this practice was associated with the education and income of the family members and with the presence of setback area which is the area between house and the boundary of the property. The household members who were available during the time of data collection and willing to take part in the study were included in the study and help was taken from community volunteers of that area.

For the category of monthly family income category modified Kuppuswamy scale in context to Nepal was used.[10] The category of caste/ethnicity was based on National Population and Housing Census 2021. The families were considered to be practicing waste segregation if they separated biodegradable waste from kitchen from other types of non-biodegradable domestic wastes like plastics, metals, papers and others.

Data related to their household waste management was taken along with the socio demographic profiles. Data was entered in SPSS 16 and chi square test was applied with the level of significance set at 0.05.

RESULTS

Almost 64% of the families were Newars, followed by Hill Brahmins/Kshetris which comprised around 14% of the total households covered. Around 55% of the households were nuclear families and only 26% lived on rent and for the rest the property was self-owned. Almost 42% of the households had the monthly income within the range of NRs 24,351 to 48,750, followed by around 35% of the households whose monthly income was more than NRs. 48,750 and 23% had the income less than NRs. 24,350.

As shown in Table 2 around 58% of the households had at least one member who had completed bachelor degree and almost 61% of

Table 1: Social profile of the households (n=592)

	Households (n)	%
Caste/Ethnicity		
Newar	376	63.5
Hill *Brahmin/ Kshetri*	82	13.9
Rai/Limbu	41	6.9
Tamang	39	6.6
Others	54	9.1
Type of family		
Nuclear	327	55.2
Joint	265	44.8
Ownership of house		
Self-owned	434	73.3
Rented	158	26.7
Monthly income in NRs. (n=586)		
< 24,350	135	23.0
24,351 – 48,750	244	41.7
> 48,750	207	35.3

Table 2: Land availability, education status and waste segregation practice of the households (n=592)

	Number of households	%
Presence of a family member who has completed Bachelor degree		
Yes	346	58.4
No	246	41.6
Presence of a family member who has completed high school degree		
Yes	360	60.8
No	232	39.2
Presence of setback in the house		
Yes	501	84.6
No	91	15.4
Household waste segregation		
Yes	385	65.0
No	207	35.0

the households had a member who completed high school degree. 84.6 percent of the houses of the families surveyed had some space between the walls of house and the boundary of the property known as setback and 65% of the households which means nearly two thirds of the households surveyed were practicing waste segregation.

As shown in Table 3 the practice of household waste segregation was not associated with presence of an educated member, who had completed high school or the bachelor degree in the family. The percentage of households with a member having a bachelor degree and practicing waste segregation was slightly lower than the percentage of households not having a member with a bachelor degree and still practicing waste segregation and both the values were around 65 percentages. Similarly, even though the families did not have any member who had completed high school education, the practice of waste segregation was even slightly higher than amongst those families who had a member with a high school degree.

It was also not associated with availability of space around the house or setback as the percentage of waste segregation practice was almost similar in those households which had setback and those which did not.

Table 3: Association of household waste segregation practice with educational status, presence of setback area and monthly family income

	Household waste segregation			P value
	Yes	No		
Presence of a family member who has completed Bachelor level education (n=592)				
Yes	224 (64.7%)	122 (35.3%)	346 (100%)	0.86
No	161 (65.4%)	85 (34.6%)	246 (100%)	
Presence of a family member who had high school degree (n=592)				
Yes	233 (64.7%)	127 (35.3%)	360 (100%)	0.84
No	152 (65.5%)	80 (34.5%)	232 (100%)	
Presence of setback area in house (n=592)				
Yes	326 (65.1%)	175 (34.9%)	501 (100%)	0.97
No	59 (64.8%)	32 (35.2%)	91 (100%)	
Monthly income of the family (NRs.), (n=586)				
< 24,350	98 (72.6%)	37 (27.4%)	135 (100%)	0.73
24,351 – 48,750	171 (70.1%)	73 (29.9%)	244 (100%)	
> 48,350	142 (68.6%)	65 (31.4%)	207 (100%)	

In the context to family monthly income, those families which had the lowest income had slightly higher percentage of households practicing waste segregation (72.6%) compared to the families which had highest income (68.6%) but the association was not significant.

DISCUSSION

If the household waste is not adequately collected, separated, and treated, as is often the case in the urban areas of low- and medium-income countries, not only the toxic components but also all waste can potentially become hazardous, generating long term and cumulative environmental and human health impacts.[11]

According to a national survey conducted by Central Bureau of Statistics, Nepal, the average quantity of organic waste per municipality was 1153 metric tons in 2016 which increased to 1206 metric tons in another two years. Similarly, the combined quantity of inorganic waste average of 698 metric tons increased to 743 metric tons in the same period.[12] A study which applied three-stage stratified cluster sampling to evaluate solid waste collected from 336 households in Kathmandu Metropolitan City found that 497.3 g/capita/day of solid waste was generated from households and household waste constituents included 71% organic wastes, 12% plastics, 7.5% paper and paper products, 5% dirt and construction debris and 1% hazardous wastes. Segregation of waste at the source point highly reduces the amount of waste going to the landfill.[13]

It was shown that in this study which included 592 households, 65% of the households practiced waste segregation. This finding fits with the finding of a study conducted in 401 households of Gorkha Municipality (published in the year 2018) which showed that out of 401 households selected from all wards of Gorkha Municipality by stratified sampling, about 67% of the respondents were willing to segregate waste in future if the government enforces the law. However, the responsibility of local body in enforcing solid waste segregation at the household has clearly been stated in the Solid waste management act of Nepal 2011, though not implemented effectively.[14]

A study was done in Delhi in 2013 AD comprising of 3,047 respondents indicated that 60% of the respondents did not know the difference between biodegradable and non-biodegradable wastes and only 2% segregated wastes. The subjects were chosen by stratified random sampling from different municipalities with socioeconomic status as the stratifying variable.[15] However, in this study, it was shown that households having an educated member (who are expected to know the difference between biodegradable and non-biodegradable waste) had no influence on the practice of waste segregation. An online survey done on 1406 participants from Ghana in 2022 to see the willingness of the citizens to segregate solid household waste also showed that there was no association between educational status and awareness of waste segregation with p-value of 0.759. This study recommended that the central government through local authorities and community-based organizations should work on awareness creation among the citizens on the need for source separation of household solid waste. This could be done effectively by incorporating a waste management segment in the basic school curriculum.[16] Another community based study conducted among 236 residents of Fiche Town of Ethiopia in 2022 showed that the knowledge of reduce, reuse and recycle and access to door to door waste collection were found to be significantly associated with good waste management practice.[17]

In a study done in China,[18] it was shown that waste segregation was relatively difficult in high rise apartments in the cities so the solid waste generated from each household was mixed and collected in bags. According to that study, to a certain extent, the convenience of discarding waste is also responsible for the low rate of solid waste separation. A study conducted among 235 households in a city in Malaysia[6] showed that although 86% of the respondents were aware of waste segregation only 42% of the respondents were separating waste at their residence. Lack of facility, inconvenience and time factors were some of the reasons for the participants not practicing waste segregation.[6] However, in this study, the presence of open area in household boundary, or the setback, was not significantly associated with the practice of household waste segregation (Table 3). In this study, the level of family income was also not significantly associated with the practice of household waste segregation (Table 3). Similarly, a survey done in communities of Indonesia in 2022 surprisingly showed that the high level of education or income did not guarantee that the person will participate in environment friendly waste management activities and that participation of local leaders and the government was very important in success of such programs.[19] Similarly, a study conducted in Barishal City of Bangladesh in 2022 with aim of knowing people's perception on waste management showed that people were of impression that imposing strict rules related to waste disposal and allocating more budget on waste management by the municipal authorities was necessary for the proper household waste management.[20]

Efficient waste management practices can lead to significant cost savings for governments, businesses, and households and additionally, revenue can be generated through the sale of recycled materials.[21]

Hence, along with rapid urbanization the problem which arise as the result of increased household waste has to be realized, especially in developing country like Nepal. People should be educated on the importance of waste segregation and motivated to have this practice applied at household level, which is one of the basic step in proper household waste management. This should be done by the local municipal authorities and community participation should be ensured. If properly managed it can even give economic benefits but if not properly managed, it can lead to epidemics and have other disastrous consequences.

Limitations of the study were that this study has used convenience sampling in a single ward of Budhanilkantha municipality. This study only looks at the practice of waste segregation without studying the amount of various types waste generated and response bias may also be present.

ACKNOWLEDGEMENTS

I would like to thank the medical and dental undergraduate students who helped in collecting the data for my research.

Conflict of interest: None

Source of research fund: None

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