

Factors Related to Plastic Waste Management in the Community around Thachin Basin, Thailand: A Multiple Logistic Regression Analysis

Kunthida Kingsawad ^{1*}, Nantira Vorakarnchanabun ², Sumolrat Nimkingrat ³, Kritkantorn Suwannaphan ⁴

¹ Sirindhorn College of Public Health, Suphan Buri 72000, Thailand.

² Suvarnaphumi Institute of Technology, Faculty of Engineering Science and Technology, Samutprakarn, Thailand.

³ Provincial Public Health Office Si Sa Ket province, Si Sa Ket, Thailand.

⁴ Sirindhorn College of Public Health, Khon Kaen, Thailand.

ARTICLE INFO

ORIGINAL ARTICLE

Article History:

Received: 12 February 2023

Accepted: 20 April 2023

*Corresponding Author:

Kunthida Kingsawad

Email:

kunthida@phcsuphan.ac.th

Tel:

+66 957073562

Keywords:

Waste Management,
Community,
Plastic Waste,
Thailand.

ABSTRACT

Introduction: Solid waste is a global problem, especially plastic waste, which can spread and pollute various elements of the environment such as soil, river, forests, etc. The weakness of the existing plastic waste management model requires holistic management, especially in a community in the basin of Thailand. This study aims to conduct a model of plastic waste management in communities in Thachin basin.

Materials and Methods: Data were collected from 368 households using cluster random sampling in 4 provinces of Thailand (Chainat, Suphan Buri, Nakhon Pathom, and Samut Sakhon). Multiple logistic regressions were conducted for plastic waste situation managing in the community model.

Results: The plastic waste situation was 6-10 pieces per household including a plastic bag, a plastic bag for food, a plastic bottle, and foam. The households had a high level of awareness of plastic waste management with middle-level of plastic waste behavior. The factors associated with plastic waste management in the community were sex (Adjusted Odds Ratio (Adj.OR) = 3.07; 95 % Confidential Interval (CI): 1.64 – 5.74), income between 5,001 – 10,000 baht (Adj.OR = 5.13; 95 % CI: 2.49 – 10.58), a member or volunteer in a community committee (Adj.OR = 0.56; 95 % CI: 0.29 – 1.09) and an awareness for plastic waste management (Adj.OR = 5.06; 95 % CI: 2.33 – 11.03).

Conclusion: Participation of stakeholders could improve plastic waste management in the community. Moreover, stakeholders should be strategically more involved in development management and actively participate more than centralized management.

Citation: Kingsawad K, Vorakarnchanabun N, Nimkingrat S. *Factors Related to Plastic Waste Management in the Community among Thachin Basin, Thailand: A Multiple Logistic Regression Analysis*. J Environ Health Sustain Dev. 2023; 8(2): 1970-4.

Introduction

The world has had an economic development with aspects such as industrialization, expanding communities, increasing population, lifestyle, and travel. It affects increased consumption, and extravagant resources ¹. New technologies in daily life are causing increased solid waste. Solid waste is a major global problem, especially plastic waste ^{2,3}. Plastic waste can spread and affect different elements of the environment such as soil, rivers, forests, etc.

The weakness of the existing plastic waste management model requires holistic management, especially in a community in the basin of Thailand ^{4,5}.

In 1992, the solid waste situation in Thailand reached 10.8 million tons. Solid waste increased to 14.3 million tons (32.4%) in 2002, and has since slightly increased every year. In 2018, solid waste was 27.82 million tons including reuse waste (34%), sanitary waste disposal (39%), and unsanitary waste disposal (27%). The unsanitary

waste disposal was plastic waste of almost 2 million tons. Waste contaminates water resources and micro-plastic is found in aquatic animals ⁶.

A wrong waste management is one of the causes of increased pollution. One of the causes of pollution is component and method of solid waste disposal that are un-sanitary. A common method for solid waste disposal in the community is open landfills, which are almost all unsanitary. It affects people around an open landfill such as smell, etc. ⁷. Numerous studies tried to find a measurement for the community about the efficient design of plastic waste management. It was a microbial community able to degrade plastic waste, even those currently resisting biodegradations ⁸. Most of the solid waste is plastic waste. Plastic waste cannot decompose and increases every year. Plastic pollution is increasing as a product of disposable plastic products, especially in the water. Thailand is in a significant plastic waste crisis and is struggling to solve the problem of plastic pollution. Most people in Thailand live in the basin affected by the plastic pollution problem.

Thachin basin is the main river in the lowest middle region connecting the Choa Phra Ya River in Thailand that passes Chainat province, Suphan Buri province, Nakhon Pathom province, and Samut Sakhon province. People in the basin use Thachin river for daily life and it has been affected by waste management, especially plastic waste ⁹. This study aimed to conduct a plastic waste management model in the community around Thachin basin.

Materials and Methods

Study samples

In this cross-sectional study, the samples were collected by cluster random sampling in 4 provinces of Thailand (Chainat, Suphan Buri, Nakhon Pathom, and Samut Sakhon). The sample size was calculated for relative analysis of various variables ¹⁰. The sample size was 368 households collected during May - June, 2020.

Questionnaire

A questionnaire was created using Google forms. It consisted of 4 parts including individual (age, sex, education, occupation, income, family

members, member, and information), plastic waste situation in households (amount, type of plastic waste, and waste disposal), behavior of using plastic, plastic waste management behavior (8 questions), and awareness of plastic waste management behavior (11 questions).

Statistical analysis

Plastic waste management of households was analyzed using descriptive statistics and multiple logistic regression statistics. Multiple logistic regression was used for analyzing the association between plastic waste management of households and individual factors of households, behaviour of plastic using, plastic waste management behavior, and awareness of plastic waste management behavior for final model.

Ethical issues

This research was conducted in accordance with the Declaration of Helsinki, and the protocol was approved by the Ethics Committee of Sirindhorn College of Public Health, Suphan Buri, Thailand, No. PHCSP-A2563/01-10.

Results

More than half of the samples were woman (54.8%) with mean age 50.08 years old. The educational level of 42.66% was primary school and 36.14% were employees. The subjects' income was between 5,001 and 10,000 Baht per person. There were 2-5 members in the family (65.49%), and more than half of them were a member of a group of community (199 people) (54.08%). The sample had information from 355 people (96.47%). Those who got information from television/radio were 112 persons (30.43%).

The plastic waste situation was 6-10 pieces per household (45.92%) including a plastic bag, a plastic bag for food, a plastic bottle, and foam. Most households had plastic waste management (96.20%) and hygienic practices (83.62%). However, most households had plastic waste problems (86.14%) (Table 1). The households had a high level of awareness for plastic waste management, but their plastic waste management behavior was at middle level.

Table 1: Number and percentage of plastic waste in the household of thachin basin (n = 368)

Plastic waste in the household	Number	Percentage (%)
Amount of plastic used		
0 – 5 pieces	158	42.93
6 – 10 pieces	169	45.92
11 – 15 pieces	29	7.88
15 – 20 pieces	12	3.26
Type of plastic waste/week		
A plastic bag	195	52.99
A plastic bag for food	128	34.78
A plastic bottle	35	9.51
A foam for food	10	2.72
Plastic waste management of the household		
No	14	3.80
Yes	354	96.20
Open dump	58	16.38
Landfill	2	0.57
Management by local government	294	83.05
Plastic waste reused		
No	90	24.46
Yes	278	75.54
Plastic waste classification		
No	58	15.76
Yes	310	84.24
Plastic waste is a problem in household		
No	51	13.86
Yes	317	86.14

Factors associated with plastic waste management in the households around Thachin basin (Bivariate analysis)

In this study, multiple logistic regression analysis was conducted by backward elimination to find the best model. The factors associated with plastic waste management in community were sex

(OR = 3.07; 95 % CI: 1.64 – 5.74), income between 5,001 and 10,000 baht (OR = 5.13; 95 % CI: 2.49 – 10.58), a member or volunteer in a community committee (OR = 0.56; 95 % CI: 0.29 – 1.09), and awareness for plastic waste management (OR = 5.06; 95 % CI: 2.33 – 11.03) (Table 2).

Table 2: The factors associated with plastic waste management among households of Thachin basin (n = 368)

Factor	Number	% of plastic waste management	Crude OR	Adj. OR	95%CI	P-value
Sex						0.0000*
Male	131	77.51	1	1		
Female	165	82.91	1.41	3.07	1.64 – 5.74	
Income (Baht)						0.0000*
≤ 5,000	83	67.48	1	1		
5,001 – 10,000	141	88.68	3.78	5.13	2.49 – 10.58	
10,001 – 20,000	48	84.21	2.57	3.13	1.28 – 8.59	
> 20,001	24	82.76	2.31	2.29	0.74 – 7.09	
Group of community						0.0089*
No	148	87.57	1	1		
Yes	148	74.37	0.41	0.56	0.29 – 1.09	
Plastic waste is a problem in households						0.0116*
No	34	66.67	1	1		
Yes	262	82.65	2.38	5.06	2.33 – 11.03	

Discussion

Guidelines for plastic waste management in Thachin basin households should focus on information especially television/radio, and also they have to be easy to use in daily life and affect behavior¹¹.

Today, people are using fabric bags more than plastic bags due to the information by television/radio. It can change households' behaviors. Local government is a factor that can affect plastic waste management. It can be the specification of a policy, measurement or guideline, such as a guideline for solid waste management, 3Rs, etc.^{2, 5, 6}. Recycling is a measurement for collecting plastic waste.¹²

The government gives an authority to the local government to manage solid waste, sewage, and wastewater by determining plan and procedures in decentralizations to the local administrative organization B.E. 2542¹³.

Plastic waste management is not the responsibility of anyone in a community. It is a co-responsibility between people and the local government. A local government can create waste management legislation, policy, and measurement and people should follow the policy^{3,14}. The participation of stakeholders can improve plastic waste management in the community⁷. Moreover, stakeholders should be strategically involved in development management and actively participate rather than centralizing management with the concern of volume reduction and resource recovery for sustainable development^{15,16}.

The COVID-19 pandemic has affected the increase in the amount of plastic waste in Thailand. The high risk group of people were quarantined at home. Most people preferred to use food delivery. Therefore, plastic waste management was required to plan for plastic waste disposal. Education is of importance in reducing plastic waste, since it can change knowledge, attitude, and behavior for plastic waste management¹⁷.

In this study, it was found that by educating members of a community group, they can be helpful during the pandemic.

Conclusion

The situation of plastic waste around Thachin basin, especially plastic bags, has become a problem. More than half of them were members of the community group. A member in a community committee or volunteer can increase awareness for plastic waste management. Participation of households can improve plastic waste management in the community. Moreover, volunteers will become stakeholders and should be more strategically involved in development management and actively participate rather than centralized management.

Acknowledgments

The authors thank the member of local government and people of basin for their valuable feedback.

Funding

This study was supported by the Sirindhorn College of Public Health, Suphan Buri, Thailand.

Conflict of interest

The authors have no conflict of interest.

This is an Open-Access article distributed in accordance with the terms of the Creative Commons Attribution (CC BY 4.0) license, which permits others to distribute, remix, adapt, and build upon this work for commercial use.

References

1. Suwannaphant K, Vonok L, Kingsawad K, et al. Quality of life of the pineapple planters in association with chemical pesticide and chemical fertilizer used in health region 8, Thailand. *International Journal of Public Health and Clinical Sciences*. 2020;7(4):167-77.
2. Health Impact Assessment Guideline for Water Resource Development Project. Bangkok: Department of Health, Ministry of Public Health; 2012.
3. Jayangkula K. Health and environmental impacts from solid waste management: a case study of solid waste management of the khlong sam administrative organization in khlong luang sub-district, Pathum Thani Province. *Eau*

- Heritage Journal Social Science and Humanities. 2012;2(1):154-65.
4. Huang S, Wang H, Ahmad W, et al. Plastic waste management strategies and their environmental aspects: A scientometric analysis and comprehensive review. *Int J Environ Res Public Health*. 2022;19(8):4556.
 5. Pumpinyo S, Koojaroenprasit S. Use of the 3Rs concept in household waste management: a case study of ayutthaya municipality. *Journal of Environmental Management*. 2017;13(1):79-92.
 6. Pollution Control Department, Ministry of Natural Resources and Environment. A guidance of Reduce, Reuse and Recycle. 2nd Edition. Bangkok: Kochikorn Publishing; 2007.
 7. Meenakhon J. People Participation in Community Garbage Management Tambol Bang Nang Li, Amphawa District, Samut Songkram Province [Research project]. Suan Sunandha Rajabhat University; 2011.
 8. Singh P, Sharma VP. Integrated plastic waste management: environmental and improved health approaches. *Procedia Environ Sci*. 2016;35:692-700.
 9. Regional Environmental Office 5. Environmental Situation Quality Report. Bangkok: General affairs division office of the permanent secretary natural resources and environment; 2009.
 10. Hsieh FY, Bloch DA, Larson MD. A simple method of sample size calculation for linear and logistic regression. *Stat Med*. 1998;17(14):1623-34.
 11. Enviro Consulting Ltd, University of Birmingham with Risk and Policy Analytics Ltd. Review of Environmental Health Effect of Waste Management: Municipal Solid Waste and Similar Waste. UK: Department for Environment, Food and Rural Affairs; 2004.
 12. Idumah CI, Nwuzor IC. Novel trends in plastic waste management. *SN Appl Sci*. 2019;1:1-4.
 13. Adulyadej B. Determining plan and procedures in decentralizations to the local administrative organization. Bangkok: Office of the decentralization to the local government organization committee; 1999.
 14. Imam A, Mohammed B, Wilson DC, et al. Solid waste management in Abuja, Nigeria. *Waste Manag*. 2008;28(2):468-72.
 15. Nanda S, Berruti F. Municipal solid waste management and landfilling technologies: a review. *Environ Chem Lett*. 2021;19:1433-56.
 16. Morrissey AJ, Browne J. Waste management models and their application to sustainable waste management. *Waste Manag*. 2004;24(3):297-308.
 17. Chow CF, So WM, Cheung TY, et al. Plastic waste problem and education for plastic waste management. In book: *Emerging Practices in Scholarship of Learning and Teaching in a Digital Era*. 2017:125-40.