Trash and Threat: Assessing Knowledge, Attitude, and Practice on Solid Waste Management among Rural Communities in Longhouse Sibu, Sarawak

***Lim Siong Hee[1], Sam Froze Jiee[1], Dayang Suhana binti Abg. Madzhi[2]**

[1]Department of Community Medicine and Public Health, Faculty of Medicine and Health Science, UNIMAS, Jln Datuk Mohammad Musa, 94300 Kota Samarahan, Sarawak, Malaysia.

[2]Department of Otolaryngology Head and Neck Surgery, Faculty of Medicine and Health Sciences, Universiti Malaysia Sarawak. Datuk Mohammad Musa Road, 94300, Kota Samarahan, Sarawak, Malaysia.

***Correspondence Author**

DOI: https://doi.org/10.47772/IJRISS.2026.100300578

Received: 27 March 2026; Accepted: 02 April 2026; Published: 20 April 2026

Objective: To assess knowledge, attitudes, and practices (KAP) related to solid waste management (SWM) among rural longhouse communities in Sibu, Sarawak, and to examine factors influencing behavioural outcomes.

Methods: A cross-sectional community-based study was conducted among 51 residents using universal sampling. Data were collected באמצעות a trilingual interviewer-administered questionnaire adapted from Eshete et al. (2023). Descriptive and inferential analyses (t-tests and Pearson correlations) were performed using SPSS Version 27.0, with significance set at $p < 0.05$.

Results: Respondents demonstrated moderate knowledge, positive attitudes, and suboptimal practices. Knowledge was positively correlated with attitude ($r = 0.424$, $p = 0.002$) and practice ($r = 0.371$, $p = 0.007$). Age showed a significant negative association with all KAP domains. Despite high awareness, sustainable practices such as recycling (31.4%) and waste segregation (37.3%) remained low.

Conclusion: The findings highlight a significant knowledge–practice gap driven by structural and contextual constraints. Interventions should prioritise community-based education, decentralised waste systems, and policy implementation tailored to rural settings.

Keywords: Solid waste management; Knowledge, attitude, and practice (KAP); Rural community; Environmental health; Sarawak.

INTRODUCTION

Solid waste management (SWM) is a major environmental and public health concern worldwide, particularly in developing regions where infrastructure and awareness are limited. The World Health Organization (2024) defines solid waste as discarded materials originating from residential, commercial, industrial, and institutional activities, with over two billion tonnes generated globally each year. In Malaysia, the daily solid waste generation reached approximately 38,427 tonnes in 2021, equivalent to 1.17 kg per capita per day (Shahril, 2022).

Improper SWM practices such as open dumping and uncontrolled burning contribute significantly to air and water pollution, land degradation, and disease transmission, including dengue, leptospirosis, and rabies (Wada et al, 2025). In Sarawak, only five of 46 landfills are sanitary, with the remainder operating as open dumpsites that attract disease vectors and release toxic leachate (Ismail et al, 2023).

Behavioural factors are critical in addressing these challenges. The effectiveness of waste management depends largely on community knowledge, attitudes, and practices (KAP). Studies consistently demonstrate that individuals with limited knowledge of SWM often exhibit poor disposal practices despite expressing positive attitudes (Owojori et al, 2022). Conversely, improving environmental literacy has been shown to enhance responsible waste behaviours, including recycling and composting (Debrah et al, 2021).

Rural communities in Sarawak, particularly those living in traditional longhouses, face additional challenges such as limited access to waste collection services, poor infrastructure, and low participation in government waste initiatives. Consequently, illegal dumping, open burning, and inadequate segregation remain prevalent (Ismail et al, 2023). Understanding the KAP levels of these communities is vital to design targeted interventions that promote sustainable waste management.

This study aimed to assess the knowledge, attitude, and practice of solid waste management among rural longhouse residents in Sibu, Sarawak, and to examine the relationships between sociodemographic characteristics and KAP variables.

This study is further informed by behavioural science frameworks, particularly the Theory of Planned Behaviour (TPB) and the Health Belief Model (HBM). The TPB posits that behavior is influenced by attitudes, subjective norms, and perceived behavioral control, highlighting the role of environmental constraints in shaping action. Meanwhile, the HBM emphasizes perceived susceptibility, perceived benefits, and barriers as determinants of health-related behaviors. These frameworks are particularly relevant in rural waste management contexts, where structural limitations and sociocultural norms may inhibit the translation of knowledge into practice. Applying these theoretical lenses enables a more comprehensive understanding of the observed knowledge–practice gap.

MATERIALS AND METHODOLOGY

Study design and setting

A cross-sectional study was conducted from 14 July to 29 August 2025 among residents of Moses Longhouse, Sibu, Sarawak. The longhouse was selected due to its rural location, limited formal waste facilities, and community-based housing structure that allows for uniform data collection.

Sampling and participants

A universal sampling technique was employed, including all residents aged 18 years and above who met the inclusion criteria and consented to participate. The inclusion criteria comprised Malaysian citizens residing in the longhouse, able to communicate in Malay or Iban, and willing to provide informed consent. Residents who declined participation were excluded. A total of 51 respondents participated.

Instrumentation

Data were collected using a trilingual (English–Malay–Iban) interview-administered questionnaire adapted from Eshete et al. (2023). The instrument consisted of four sections:

Section A: Sociodemographic characteristics (gender, age, marital status, ethnicity, education, occupation, income, household size, and waste collection availability).

Section B: Knowledge on SWM (11 dichotomous “Yes/No” questions).

Section C: Attitude towards SWM (10 Likert-scale items, from 1 = Strongly Disagree to 5 = Strongly Agree).

Section D: Practice on SWM (10 dichotomous “Yes/No” questions).

A pilot test was conducted among 30 respondents from Sibu Jaya, Jalan Oya, and Jalan Lanang to ensure clarity, reliability, and face validity.

Data collection

Data collection was conducted through face-to-face interviews by trained enumerators. This method ensured inclusivity among participants with limited literacy. Informed consent was obtained from each participant before data collection.

Data analysis

Data were entered and analysed using SPSS Version 27.0.1.0 (IBM Corp., Chicago, USA). Descriptive statistics (frequency, percentage, mean, and standard deviation) were used to summarise sociodemographic data and KAP scores. Inferential statistics included independent t-tests and Pearson's correlation to assess relationships between variables. A p-value < 0.05 was considered statistically significant.

RESULTS

Sociodemographic characteristics

Among the 51 respondents, the mean age was 47.2 ± 15.2 years. Females constituted 70.6%, while males made up 29.4%. Most respondents were Iban (96.1%), Christian (86.3%), and married (80.4%). Educational attainment was modest, 17.6% had no formal education, 51% had secondary education, and only 2% had tertiary education. Nearly half (47.1%) had household incomes below RM 1000, and 96.1% reported access to waste collection services.

Knowledge of solid waste management

Respondents demonstrated moderate knowledge of SWM. Almost all participants (100%) agreed that improper waste disposal causes environmental pollution, and 90.2% recognised that burning household waste is harmful. However, only 54.9% knew about composting and 54.9% were aware of bin colour coding systems.

Attitude toward solid waste management

Attitudes were generally positive. Most respondents strongly agreed that SWM is important for community health (70.6%) and that households are responsible for their own waste (66.7%). A majority (62.7%) strongly disagreed with burning waste, and 68.6% agreed that more community education is needed.

Practice of solid waste management

Waste handling practices were mixed. While 94.1% disposed of waste in designated collection areas and 84.3% encouraged proper practices within their households, only 37.3% separated household waste and 31.4% practiced recycling. Furthermore, 86.3% had never attended a talk on waste management.

Correlation analysis

Age showed significant negative correlations with knowledge ($r = –0.408$, $p = 0.003$), attitude ($r = –0.351$, $p = 0.012$), and practice ($r = –0.286$, $p = 0.042$). Weak but significant positive correlations were observed between knowledge and attitude ($r = 0.424$, $p = 0.002$) and knowledge and practice ($r = 0.371$, $p = 0.007$), suggesting that improved knowledge modestly enhances positive behaviours.

DISCUSSION

This study reveals a persistent and important discrepancy between knowledge, attitude, and actual waste management practices among rural longhouse communities in Sibu, Sarawak. While respondents demonstrated moderate knowledge and generally positive attitudes towards solid waste management (SWM), the translation of these into consistent sustainable practices particularly waste segregation and recycling remains limited. This divergence reflects a well-documented "knowledge–practice gap" in environmental health behaviour, suggesting that awareness alone is insufficient to drive behavioural change.

Critically, the findings indicate that this gap is not merely a result of individual-level deficiencies, but is strongly shaped by structural and contextual constraints. Despite high awareness of the harmful effects of improper waste disposal, only a minority of respondents engaged in recycling or waste separation. This suggests that behavioural intention is constrained by environmental feasibility, consistent with the Theory of Planned Behaviour, where perceived behavioural control significantly influences action. In the context of rural Sarawak, limited access to recycling facilities, absence of structured waste segregation systems, and logistical challenges in waste collection likely reduce the practicality of adopting sustainable practices, regardless of individual awareness.

Furthermore, the low participation in waste management education programmes (86.3% never attended any talks) highlights a systemic gap in community engagement and health promotion strategies. Current interventions appear to be sporadic, urban-centric, or insufficiently tailored to rural sociocultural contexts. Unlike urban populations, longhouse communities often rely on informal knowledge transmission and collective norms, which may perpetuate traditional practices such as open burning. This underscores the need to shift from passive information dissemination to community-embedded, participatory approaches that actively involve local leaders and utilise culturally appropriate communication channels.

The observed negative association between age and KAP scores provides further insight into behavioural dynamics within the community. Younger individuals demonstrated higher knowledge and more favourable practices, likely reflecting greater exposure to formal education, digital information platforms, and contemporary environmental narratives. In contrast, older populations may adhere to entrenched practices shaped by historical absence of formal waste systems. This generational divide suggests that interventions must be age-sensitive, combining digital engagement strategies for younger groups with experiential, community-based learning for older residents.

Interestingly, education level and income were not significantly associated with KAP outcomes. While this may initially appear counterintuitive, it likely reflects the relative homogeneity of the study population, as well as the overriding influence of shared environmental constraints. In such settings, even individuals with higher awareness or resources are limited by the absence of enabling infrastructure. This finding reinforces the argument that waste management behaviour in rural settings is less an issue of individual capacity and more a function of systemic provision and governance.

The weak but significant correlations between knowledge and both attitude and practice further support this interpretation. While knowledge contributes to shaping positive attitudes, its effect on behaviour remains modest without supportive conditions. This aligns with emerging evidence that environmental behaviour is co-produced by knowledge, social norms, infrastructure, and policy enforcement, rather than driven by awareness alone.

From a policy perspective, the findings expose critical gaps in rural waste governance in Sarawak. Although national frameworks such as the Solid Waste and Public Cleansing Management Act emphasise structured waste systems, their implementation in rural and remote areas remains limited. The reliance on centralised waste management models may not be suitable for geographically dispersed and infrastructure-limited communities such as longhouses. There is therefore a need to reorient policy towards decentralised, community-based waste management systems, including small-scale recycling hubs, composting initiatives, and locally managed waste segregation schemes.

Additionally, enforcement mechanisms appear weak or inconsistently applied in rural contexts, allowing environmentally harmful practices such as open burning to persist. Strengthening regulatory oversight, coupled with incentive-based approaches (e.g., community rewards for recycling participation), may enhance compliance and sustainability.

Overall, this study highlights that addressing SWM challenges in rural Sarawak requires moving beyond knowledge-based interventions towards integrated, context-sensitive strategies that combine infrastructure development, behavioural insights, community participation, and policy reform. Without addressing these

structural determinants, efforts to improve environmental awareness alone are unlikely to achieve meaningful or sustained behavioural change.

Policy Implications and Recommendations

To address the identified gaps, a multi-level and context-specific approach is required:

1. Decentralised Waste Management Systems

Centralised waste management models are often unsuitable for rural longhouse settings. Policymakers should promote decentralised approaches, including community-managed recycling points, composting initiatives, and small-scale waste processing systems adapted to local contexts.

2. Infrastructure and Accessibility Enhancement

The provision of accessible and functional waste segregation facilities is critical. Without enabling infrastructure, behavioural change interventions are unlikely to succeed. Investment in rural waste logistics, including regular collection and segregation support, should be prioritised.

3. Community-Based Behavioural Interventions

Interventions should move beyond conventional awareness campaigns towards participatory, community-driven models. Engagement of longhouse leaders, local health workers, and schools can facilitate culturally appropriate messaging and enhance collective responsibility.

4. Strengthening Policy Implementation and Enforcement

Existing national policies on solid waste management require stronger enforcement in rural areas. Regulatory measures against open burning and illegal dumping should be consistently applied, complemented by incentive-based mechanisms to encourage compliance.

5. Integration of Behavioural Science Approaches

Interventions should incorporate behavioural frameworks such as TPB and HBM to address perceived barriers, social norms, and behavioural control. Tailored strategies that account for local beliefs and practices are essential for sustainable impact.

6. Targeted Age-Specific Strategies

Given the generational differences observed, digital and school-based interventions may be effective for younger populations, while community workshops and peer-led initiatives may be more appropriate for older residents.

CONCLUSION

This study demonstrates that while rural longhouse communities in Sibu possess moderate knowledge and generally positive attitudes towards solid waste management, these do not consistently translate into sustainable practices. The persistence of low recycling and waste segregation behaviours highlights a critical knowledge–practice gap that is shaped not only by individual awareness but also by structural, environmental, and sociocultural constraints.

The findings reinforce that behaviour change in environmental health is not solely knowledge-dependent but is strongly influenced by perceived behavioural control, accessibility of facilities, and prevailing community norms. The significant influence of age further suggests generational differences in environmental engagement, necessitating targeted and context-sensitive interventions.

Importantly, the results underscore that rural waste management challenges in Sarawak are systemic rather than individual. Without addressing infrastructural limitations, policy implementation gaps, and weak community engagement, efforts to improve awareness alone are unlikely to yield meaningful or sustained improvements in practice.

Limitations

This study was limited by its small sample size (n = 51) confined to a single longhouse community, which may limit generalisability. Limited resources and financial constraint limit the coverage and further data collection. Data were self-reported and may be subject to recall and social desirability bias. The absence of observational validation (e.g., waste audits) restricts verification of actual practices. Confounding factors such as access to education, income, and prior exposure to environmental campaigns were not fully controlled.

Declarations

Ethical approval was obtained from the Institutional Review Board vide Letter No. FME/25/04 dated 28/01/2025 with the reference no: UNIMAS/TNC(PI)/09 – 65/01 Jld.4 (20).

Declaration of Interest

The authors declare no competing interests. This research was conducted independently without financial or institutional influence. All respondents provided informed consent prior to participation, and ethical approval was obtained from the relevant institutional committee.

Consent for publication

Not applicable.

Availability of data and materials

The dataset analyzed during the current study is available from the corresponding author on reasonable request.

Funding

Nil

Authors' contributions

LSH served as the principal investigator, providing overall project leadership, manuscript preparation, data collection, data analysis, manuscript revision, proofreading and coordination. SFJ contributed to the conceptual framework and methodological design, offering input grounded in their respective fields of expertise. All authors reviewed and approved the final version of the manuscript. DS draft and proofread the manuscript.

ACKNOWLEDGEMENTS

The authors would like to extend their heartfelt gratitude to University Malaysia Sarawak for institutional guidance and ethical oversight. The authors would like to extend their heartfelt gratitude to the older adult participants and their families for their generous willingness to share their time and experiences in this study. Their invaluable contributions and commitment to the research have provided rich insights that are deeply appreciated.

REFERENCES

1. Abdel-Shafy H.I., & Mansour M.S.M. (2024). Knowledge, attitude, and practices regarding SWM in Egypt. Journal of Bioscience and Applied Research, 10(1), 1–12.

2. Abubakar M., Benjamin R., & Jiang L. (2023). Public health implications of poor waste management. Environmental Health Perspectives, 131(4), 502–509.
3. Ajzen I. (1991). The theory of planned behavior. Organizational Behavior and Human Decision Processes, 50(2), 179–211.
4. Alazaiza M., et al. (2024). The role of 5R principles in waste reduction in developing countries. Waste Management, 168, 34–43.
5. Castin F., et al. (2022). Urban–rural disparity in waste management in Malaysia. Asian Journal of Environment and Ecology, 17(2), 98–110.
6. Chen Y., & Gao H. (2022). Predictors of environmental behaviour among university students. Journal of Environmental Psychology, 81, 101780.
7. Debrah J., et al. (2021). Environmental education and behavioural change in waste management. Resources, Conservation and Recycling, 168, 105–127.
8. Eshete A. et al. (2023). Knowledge, attitude, and practice of solid waste management among households in Ethiopia. BMC Public Health, 23(1), 2435.
9. Gharagozloo F., & Ghazizade R. (2023). Socioeconomic determinants of waste management behaviour. Journal of Environmental Science and Policy, 144, 88–98.
10. Hassooni R., Debrah K., & Alazaiza M. (2024). Interrelationship between knowledge, attitude, and practice of SWM. International Journal of Environmental Studies, 81(1), 54–69.
11. Ismail H., Haliza A., & Tang J. (2023). Sanitary landfill management in Sarawak: Current state and challenges. Waste Management & Research, 41(6), 912–924.
12. Moh D., & Abd Manaf L. (2014). Waste awareness and recycling practices in Malaysian rural communities. Journal of Environmental Management, 136(2), 31–39.
13. Nathanson J. (2025). Solid Waste Management Principles. Encyclopedia Britannica.
14. Owojori S., Liu Y., & Hassan M. (2022). Community participation and waste segregation practices. Sustainability, 14(9), 5289–5301.
15. Pabian L., & Pabian B. (2023). Age-related patterns in environmental behaviour. Environmental Sociology, 9(4), 312–326.
16. Rosenstock IM. (1974). Historical origins of the health belief model. Health Education Monographs, 2(4), 328–335.
17. Santoso I., et al. (2025). Predicting zero-waste behaviour: The role of social norms and behavioural control. Sustainability, 17(3), 1125–1136.
18. Shahril N. (2022). Solid Waste Generation Statistics in Malaysia. Ministry of Environment and Water.
19. Tang J. (2020). Solid waste management challenges in Sarawak. Journal of Environmental Management Malaysia, 24(3), 155–165.
20. Tang J. (2020). Waste management infrastructure in Sarawak: A review. Malaysian Journal of Environmental Engineering, 10(2), 67–78.
21. Wada S. et al. (2025). Spatiotemporal mapping of canine rabies in Sarawak. Tropical Medicine & Health, 53(2), 120–130.
22. Zurbrugg C., Gfrerer M., & Ashadi H. (2012). Decentralised community-based solid waste management. Waste Management, 32(11), 2301–2310.