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SOLID WASTE MANAGEMENT INFORMATION AND MALARIA PREVENTION: EXPLORING THE PLANNED BEHAVIOUR OF UNDERGRADUATES IN AHMADU BELLO UNIVERSITY, ZARIA

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Abstract

This study explores how undergraduates at Ahmadu Bello University, Zaria, engage with information on Solid Waste Management for malaria prevention. Two objectives were addressed in the study to include: To examine the attitudes of undergraduates towards solid waste management for the prevention of malaria in Ahmadu Bello University, Zaria. And to ascertain the constructs of the theory of planned behaviour that explains the attitudes of undergraduates towards solid waste management for the prevention of malaria in Ahmadu Bello University, Zaria? A qualitative case study design was adopted, with nine purposefully selected undergraduates interviewed using semi-structured questions. Data were audio-recorded, transcribed, and analyzed through qualitative content analysis to identify recurring themes. Findings revealed that students' SWM practices are influenced by their attitudes toward waste disposal (behavioral beliefs), perceived expectations of peers and authorities (normative beliefs), and confidence in their ability to manage waste effectively (control beliefs). . The study concludes that knowledge alone is insufficient to drive behavioral change. Instead, an integrated approach combining environmental education, infrastructural support, policy enforcement, and normative reinforcement is essential for fostering responsible SWM and reducing malaria risk on university campuses.

Keywords: Solid Waste Management (SWM), Malaria Prevention, Theory of Planned Behavior (TPB), Undergraduates, Information

Introduction

Malaria remains one of the most serious public health problems in Nigeria. It continues to account for the highest proportion of global cases and deaths (Park et al. 2023). The *World Malaria Report 2023* indicates that Nigeria contributed about 27% of the 249 million malaria cases recorded worldwide and 31% of malaria-related deaths (World Health Organization, 2023). Although control measures such as insecticide-treated nets, artemisinin-based combination therapies, and most recently malaria vaccines have been introduced, the disease persists largely because of entrenched environmental and behavioral factors (Olufadewa et al., 2022). Among these, poor solid waste management (SWM) practices play a particularly significant role.

Consequently, indiscriminate dumping of refuse, blocked drainage channels, and open containers that collect stagnant water create ideal breeding habitats for *Anopheles* mosquitoes, the primary malaria vectors (Oluwadepo et al., 2025). In Lagos, Daramola et al. (2024) reported how unmanaged waste sites sustain transmission cycles by providing year-round larval habitats. Similarly, Maiha and Yusuf (2025) linked poor waste disposal practices in urban communities to higher malaria incidence, underscoring the importance of effective waste governance for public health.

Unfortunately, the role of **information** in this context is often overlooked, yet it is central to effective prevention. Information on SWM provides the knowledge base on which individuals and groups make daily sanitation decisions. Studies in environmental and health communication show that when people have timely access to clear and credible information, their capacity to engage in preventive practices improves (Panjaitan et al., 2023). However, information gaps remain significant in Nigeria. Weak dissemination strategies, low information literacy, and poor integration of health and environmental information systems reduce the likelihood that individuals will act on available guidance (Adesina et al., 2021).

Along this line, behavioral science perspectives further highlight that access to information does not automatically translate into practice. The **Theory of Planned Behaviour (TPB)**, developed by Ajzen (1991), argues that behavioral intention is shaped by three factors: attitudes, perceived social norms, and perceived behavioral control. This model has been successfully applied in Nigeria to explain youths' pro-environmental practices such as waste sorting and litter prevention (Ojedokun et al., 2022; Akpana et al., 2024). Its application to malaria-related SWM information remains under studied.

University students provide an important case group: they live in densely populated environments where waste management practices directly affect health, and they also

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represent a future professional class whose information use and dissemination behaviors can influence wider society. By focusing on attitudes, norms, and perceived control in relation to SWM information, this study aims to generate insights that can inform both institutional health promotion and community-based malaria prevention strategies.

Statement of the problem

Malaria remains a significant public health concern in Nigeria despite decades of interventions by both national and international stakeholders. Strategies such as integrated vector management (IVM), accurate diagnosis, improved case management, seasonal malaria chemoprevention, and public health education have been widely adopted (World Health Organization, 2022; Obeagu & Obeagu, 2024). The IVM approach, which integrates biological and chemical methods, is valued for its ecological sustainability, cost-effectiveness, and potential to curb malaria transmission (Mbabazi *et al.*, 2022). Preventive measures such as the use of long-lasting insecticide-treated nets (LLINs), mosquito repellents, protective clothing, larviciding, indoor residual spraying (IRS), and outdoor spraying form core elements of malaria control (WHO, 2022). However, despite these extensive efforts, malaria prevalence in Nigeria remains among the highest globally, pointing to a persistent gap between available interventions and their effective use within communities (Akinwale *et al.*, 2025).

One critical gap lies in the neglect of environmental conditions that foster mosquito breeding. Poor solid waste management (SWM), including indiscriminate dumping and blocked drainage systems, often creates stagnant water bodies that serve as breeding sites for Anopheles mosquitoes (Abdullahi *et al.*, 2024; Mhango, 2025). While biomedical strategies receive considerable attention, information dissemination on malaria prevention rarely highlights this environmental link, limiting community awareness and behavioral response. University campuses, which generate large volumes of waste but often lack adequate management systems, illustrate this challenge clearly (Ezeudu *et al.*, 2021; Ugwu *et al.*, 2021). Undergraduates, though highly literate and socially active, may not translate access to information into practice without supportive attitudes, norms, and perceived control, as outlined in the Theory of Planned Behaviour (Ajzen, 1991; Case & Given, 2016). Examining how students engage with SWM and malaria prevention information is therefore critical, not only because they face direct exposure risks but also because they serve as future professionals and potential agents of change in fostering environmentally responsible practices.

This study explores how undergraduates at Ahmadu Bello University, Zaria, engage with information on Solid Waste Management for malaria prevention, drawing on the Theory of Planned Behaviour framework.

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Objectives of the Study

The following are the objectives of this study:

- i. To examine the attitudes of undergraduates towards solid waste management for the prevention of malaria in Ahmadu Bello University, Zaria.
- ii. To ascertain the constructs of the theory of planned behaviour that explains the attitudes of undergraduates towards solid waste management for the prevention of malaria in Ahmadu Bello University, Zaria?

Theoretical Lens

The Theory of Planned Behavior (TPB), developed by Ajzen (1991) from the earlier Theory of Reasoned Action, explains behavior as a function of intentions shaped by attitudes, subjective norms, and perceived behavioral control. The constructs of TPB include: i) Attitude toward the behaviour, ii) Subjective norms and iii) Perceived behavioural control (PBC). In the context of undergraduates' engagement with solid waste management (SWM) for malaria prevention, TPB provides a useful framework by highlighting that students' waste disposal practices are influenced not only by access to information but also by their attitudes toward proper waste management (behavioral beliefs), the perceived expectations of peers, lecturers, and authorities (normative beliefs), and their confidence in having the necessary skills, resources, and enabling environment (control beliefs). Together, these factors determine their intentions, which ultimately guide their actual waste management behaviors.

Attitude of undergraduates towards solid waste management

Studies on undergraduates' solid waste management (SWM) practices reveal mixed outcomes, with many students showing limited or fragmented awareness (Owojori et al., 2022; Adeyemi & Adedeji, 2025) and engaging in improper disposal methods such as indiscriminate dumping or burning of solid waste (Aladejebi & Oladapo, 2024), while others, such as students at the University of Malaya, demonstrate acceptable knowledge, attitudes, and practices (Hassan & Rosli, 2022). Despite varying awareness levels, barriers like inadequate facilities (Amarachukwu et al., 2022) and motivational gaps (Owojori et al., 2022) often hinder sustainable behavior. Policy enforcement, infrastructural support, and reward-penalty systems have proven effective in promoting compliance (Cai *et al.*, 2025), while economic incentives, participatory education, and environmental awareness are also key drivers of improved behavior (Owojori et al., 2022; Okamgba & Nwafor, 2025). Psychosocial determinants such as attitudes, subjective norms, and perceived behavioral control further shape students' intentions and practices (Kobylinska, 2022), with knowledge serving as a mediating factor for specific behaviors like segregation and recycling (Hassooni, *et al.*, 2024). Overall, the literature suggests

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that fostering effective student engagement in SWM requires an integrated approach that combines education, infrastructure, incentives, and normative reinforcement tailored to the university context.

SWM and Information

The reviewed studies emphasize the pivotal role of information access, sources, and communication strategies in shaping waste management behaviors, though they diverge on the most effective approaches. While Wang et al. (2022) and Raghu and Rodrigues (2022) stress that information influences behavior indirectly through trusted, contextually relevant, and norm-activating content. Akintayo et al. (2023) highlight the importance of localized and culturally embedded knowledge, such as indigenous sources, in Nigeria. Channel effectiveness appears context-dependent: Singh et al. (2022) underscore the growing impact of digital platforms in India, whereas Akintayo et al. (2023) find traditional and indigenous methods more effective in Nigerian settings. Similarly, Nwafor (2024) identify institutional platforms like orientation programs, campus radio, and university websites as practical channels, contrasting with Wang et al.'s (2022) call for more targeted publicity in China. Despite this diversity, the literature agrees that information alone cannot drive sustainable waste practices without supportive infrastructure, enabling policies, and cultural alignment, making integrated approaches essential.

Methodology

This study adopted a qualitative case study design to explore participants' perspectives within their real-life context. This design was adopted because it provides a holistic and in-depth understanding of the knowledge and attitude of Undergraduates on solid Waste Management Information in Ahmadu Bello University, Zaria. Semi-structured interviews were conducted with nine purposefully selected participants, allowing flexibility to probe emerging themes while addressing the study objectives. The interviews were audio-recorded, transcribed verbatim, and analyzed using qualitative content analysis, which involved systematic coding and categorization to identify recurring patterns. This approach was chosen for its ability to capture rich, detailed narratives that cannot be reduced to numerical data (Creswell & Poth, 2016), ensuring the findings remained grounded in participants' lived experiences.

Findings and Discussions

Objective 1: *To examine the attitudes of undergraduates towards solid waste management for the prevention of malaria in Ahmadu Bello University, Zaria.*

Table 1: Attitudes of undergraduates towards solid waste management for the prevention of malaria in Ahmadu Bello university Zaria

Objective	Categories	Subcategories
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Objective 1: To examine the attitudes of undergraduates towards solid waste management for the prevention of malaria in Ahmadu Bello university Zaria?	1. Positive Attitude towards solid waste management.	1.1 Because i don't like smell so i flush the toilet always.
		1.2 I don't like dirty environment so; I sweep and make sure that the dirty pots or plates are kept clean.
		1.3 I take responsibility of trashing in the dumpsite too.
	2. Negative Attitude toward solid waste management.	2.1 Poor attitude because I sock in water cooking utensil that contain food remains due to lectures and sometimes laziness of going up and down these stairs.
		2.2 I show none involvement toward solid waste management.
	3. Neutral Attitude toward solid waste management.	3.1 My attitude towards solid waste management is not fair besides the environment I find my stay here does not motivate me because other students' behaviours are poor too

The Attitudes of undergraduates towards solid waste management for the prevention of malaria in Ahmadu Bello university Zaria includes i) Positive attitudes ii) Negative attitudes and iii) Neutral attitudes.

The study indicates that students at Ahmadu Bello University, Zaria, display varied attitudes toward waste management, which directly influence malaria risk on campus. Students who actively disposed of waste properly, maintained clean surroundings, and used safe food storage practices demonstrated positive behavioral beliefs consistent with the Theory of Planned Behaviour (TPB), where attitudes strengthen intentions and shape actual practices (Ajzen, 1991). This aligns with the first construct of TPB which postulates the relationship of attitude to behavioural intention. Positive attitude implies proper waste management, while negative attitude implies poor waste management which consequently leads to a higher prevalence of malaria cases. Such practices reduce mosquito breeding sites and align with earlier Nigerian studies showing that proper waste handling lowers malaria

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prevalence, as reported in Ilorin where blocked drains and open solid waste dumping were significantly associated with higher malaria incidence (Aluko *et al.*, 2022).

Conversely, students who neglected waste disposal or remained indifferent despite awareness reflected weak subjective norms and low perceived behavioural control, both central barriers within the TPB framework. These negative and neutral attitudes sustain unsanitary conditions conducive to malaria transmission, echoing findings from urban Nigeria where high knowledge of waste management did not translate into consistent practice, resulting in open dumping and increased malaria risk (Kilay *et al.*, 2025). Similar patterns in Cross River and Lagos States reveal that infrastructural gaps such as inadequate disposal facilities and proximity to dumpsites exacerbate malaria vulnerability (Ojim *et al.*, 2025; Ichipi, 2023). Overall, the results suggest that while awareness is widespread, students' intentions and behaviors are constrained by environmental barriers and social influences, underscoring the need for strengthened institutional infrastructure and community-driven waste education to shift norms and enhance malaria prevention.

Objective 2: *To ascertain the constructs of the theory of planned behaviour that explains the attitudes of undergraduates towards solid waste management for the prevention of malaria in Ahmadu Bello University, Zaria?*

The study revealed that students' perceptions and practices around solid waste management (SWM) in relation to malaria prevention can be clearly interpreted through the Theory of Planned Behaviour (TPB). In terms of **attitudes**, students who expressed positive views about cleanliness such as *"I always make sure my surroundings are clean because mosquitoes breed in dirty places"* demonstrated strong behavioral beliefs that link proper waste disposal with malaria prevention. Such positive attitudes were often reflected in consistent practices such as sweeping, using waste bins, and covering water containers. This aligns with evidence from Ilorin, where communities with stronger attitudes toward drainage and waste maintenance recorded significantly lower malaria prevalence (Yaquub, 2023). Conversely, students with negative or indifferent attitudes illustrated in comments such as *"Even if I dispose my waste, others will still litter"* undermine their own intentions. This reflects weak outcome expectations, which according to TPB, diminish the likelihood of preventive action.

Subjective norms were also critical. Some students noted that *"when my friends or hostel mates clean, I join them"*, underscoring the influence of peer expectations on waste management. Where such collective norms are absent, individual efforts are often abandoned, consistent with Kwun Omang *et al.* (2021), who found that weak community enforcement of proper waste disposal in Bekwarra, Nigeria, contributed to higher malaria incidence. Similarly, **perceived behavioral control** shaped students' ability to act. Those who cited lack of waste bins or inadequate municipal

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collection (“*Sometimes I want to throw waste properly, but there are no bins around*”) expressed constraints that lowered their perceived control, thereby weakening the intention–behavior link. This mirrors findings in Lagos, where Ichipi and Senekane (2023) highlighted that even when residents recognized the health risks of waste accumulation, poor infrastructure and illegal dumping reduced their capacity to act effectively. Collectively, these findings reinforce TPB’s explanatory power: while positive attitudes are present among students, weak norms and low perceived control hinder consistent SWM practices, sustaining malaria risks on campus and in surrounding communities.

Table 2: Mapping of Students’ Quotes to TPB Constructs with Supporting Studies

TPB Construct	Illustrative Student Quotes	Interpretation	Supporting Study
Attitude toward behavior	<i>“I always make sure my surroundings are clean because mosquitoes breed in dirty places.”</i>	Positive beliefs about outcomes of proper waste management and malaria prevention.	Eberechukwu (2024) found that awareness of mosquito breeding sites significantly shaped preventive practices among Nigerian youths. Kitole et al. (2024) reported that weak individual attitudes are reinforced by perceptions of collective neglect in waste management.
	<i>“Even if I dispose my waste, others will still litter.”</i>	Negative/indifferent attitude reduces motivation for consistent SWM practices.	Welty (2023) observed that peer and household norms strongly influenced malaria prevention behaviors in Nigerian communities.
Subjective norms	<i>“When my friends or hostel mates clean, I join them.”</i>	Peer influence and collective norms shape participation in waste disposal.	

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	<i>"Nobody cares in this area; people just throw rubbish anywhere."</i>	Lack of community norms discourages compliance with SWM.	Abdulazeez <i>et al.</i> (2025) highlighted that absence of communal enforcement mechanisms worsens indiscriminate waste disposal in Nigerian cities.
Perceived behavioral control	<i>"Sometimes I want to throw waste properly, but there are no bins around."</i>	Infrastructural barriers reduce perceived control over SWM practices.	Ojuri <i>et al.</i> (2024) emphasized inadequate waste facilities as a critical barrier to effective waste management in Nigerian universities.
	<i>"The waste collectors don't come regularly, so rubbish just piles up."</i>	External constraints undermine ability to sustain malaria-preventive behaviors.	Mustapha (2022) reported that irregular waste collection services directly contributed to malaria prevalence in Kaduna State.

Conclusion

By applying the Theory of Planned Behavior, this study extends understanding of how attitudes, subjective norms, and perceived behavioral control shape waste management behaviors with direct implications for malaria prevention in a university setting. The findings shows that while students often recognize the health risks associated with poor sanitation, structural barriers and weak normative pressures limit their ability to act consistently on these intentions. Theoretically, the study reinforces TPB's explanatory power in public health contexts by illustrating how behavioral intentions are moderated by environmental and social constraints. Practically, the results point to the need for integrated interventions that combine infrastructural improvements, stronger institutional policies, and community-driven

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campaigns to embed responsible waste practices as a collective norm. Such measures would not only enhance environmental health but also play a pivotal role in reducing malaria transmission among student populations.

Recommendations

The following recommendations are proffered:

1. University libraries should embed health and environmental information into their services by curating targeted resources on malaria prevention and sustainable waste management. This could take the form of digital repositories, exhibitions, reading lists, and information literacy sessions that emphasize the link between poor waste practices and malaria prevalence. Such initiatives help shape **attitudes** by fostering positive evaluations of proper waste disposal and preventive health practices.

Implications for Policy and Practice: Policymakers should support libraries with funding and partnerships to sustain these knowledge dissemination efforts, while university administrators should formally integrate such information programs into student orientation and health campaigns.

2. Libraries can strengthen **subjective norms** and **perceived behavioral control** by hosting collaborative platforms (such as student forums, campaigns, and partnerships with campus health units) that encourage collective responsibility for sanitation and malaria control. By showcasing peer involvement and offering practical resources (e.g., toolkits for community clean-ups, training materials), libraries reinforce social expectations and equip students with the skills and confidence to take meaningful action.

Implications for Policy and Practice: Institutions should adopt policies that recognize libraries as partners in health promotion, mandating regular collaborations between libraries, health services, and student bodies. National health campaigns could also leverage academic libraries as decentralized hubs for community-driven awareness and engagement.

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