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Environmental Sanitation and Risk Factors of Indiscriminate Refuse Disposal among Undergraduate Students of Adekunle Ajasin University, Akungba Akoko, Ondo State

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Abstract

Sanitation in the environment is one of the greatest concerns on the overall health of the population in the university setting as a result of population density and generation of solid waste. In 2020, 2.24 billion tonnes of municipal solid waste was produced and projections suggest that it could reach up to 3.4 billion tonnes annually as of 2050 and that only approximately 19-20% of this waste is formally recycled. Unselective dumping of refuse by the undergraduate students is one of the reasons that lead to environmental degradation and increases the chances of developing sanitation related illnesses within the campus. The objective of this study was to determine the level of environmental sanitation and investigate the risk factors that affect careless disposal of refuse among undergraduate students. The study used a cross-sectional descriptive research design. Undergraduate students of five faculties of Adekunle Ajasin University were used as the target population, and the sample size of the respondents was 210 people, who were obtained through non-probability sampling methods. A structured interviewer-administered questionnaire on cognitive knowledge about environmental sanitation, personal waste disposal behaviour, peer-related social norms and waste disposal infrastructure were used to collect data. The analysis of data was performed in terms of descriptive and inferential statistics, and chi-square tests were carried out at the level of significance of 0.05.

The mean age of respondents was 27.36 ± 7.74 years A majority of respondents demonstrated adequate cognitive understanding of environmental sanitation and refuse-related health risks, and chi-square analysis showed a significant association between knowledge and indiscriminate refuse disposal ($\chi^2 = 24.784$, df = 12, $p < 0.05$). Personal waste disposal behaviours were also significant predictors, with a strong association observed between habitual disposal practices and indiscriminate dumping ($\chi^2 = 48.156$, df = 12, $p < 0.05$). Peer-related social norms significantly influenced refuse disposal behaviour, as evidenced by a chi-square value of 48.156 at 12 degrees of freedom ($p < 0.05$). Structural inadequacy of waste disposal infrastructure was likewise significant, with limited availability and irregular waste collection strongly associated with indiscriminate disposal practices ($\chi^2 = 37.427$, df = 12, $p < 0.05$).

The findings confirm that indiscriminate refuse disposal among undergraduate students is significantly influenced by cognitive, behavioural, social, and infrastructural factors. It is recommended that university authorities strengthen environmental sanitation education, implement behaviour-focused interventions targeting routine disposal practices, promote positive peer-led sanitation norms, and improve waste management infrastructure through adequate bin provision and regular waste collection.

Keywords: Environmental sanitation, indiscriminate refuse disposal, undergraduate students, peer influence, waste disposal infrastructure

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Introduction

Rapid urbanization and rising consumption have led to unprecedented growth in solid waste, with global municipal solid waste projected to reach 3.4 billion tonnes annually by 2050, while less than 20% is currently recycled (Raphela et al., 2024; Akmal & Jamil, 2021). In most developing nations, such as Nigeria, poor waste collection, low enforcement, and insufficient environmental awareness have led to the widespread indiscriminate disposal of refuse, especially in the urban and peri-urban societies (Akmal and Jamil, 2021; Chikeka et al, 2024). These activities pollute water, the air, and drainage systems and provide habitats to disease vectors, promoting malaria, diarrhoea, and respiratory diseases (Raphela et al., 2024; Akindutire and Alebiosu, 2014). High density youth environments such as university campuses contribute to a great amount of waste and may have a discrepancy between the environmental understanding of students and the reality of their disposal behaviour, as determined by social norms, perceived control, and access to waste disposal infrastructure (Aikowe & Mazancová, 2021). Students of universities in Nigeria and other countries are highly aware of environmental concerns but engage in improper disposal, poor source separation, and excessive use of open dumping, with low-quality facilities, poor behavioural control, and insufficient targeted education being the main reasons (Aikowe and Mazancova, 2021; Gherhesh et al., 2024; Pan et al., 2022; Qu et al., 2023; Wu et al., 2022). The careless disposal of refuse has been found to pose severe environmental risk factors in Southwest Nigeria, such as flooding, water and air pollution, and epidemic disease outbreaks (Akindutire and Alebiosu, 2014). Since undergraduates are strategic in todays society as future decision makers and community influencers, it is important to know how cognitive factors, peer norms and infrastructural constraints influence refuse disposal among undergraduates of Adekunle Ajasin University, Akungba Akoko, to design effective environmental sanitation interventions, based in campuses.

In 2020, the global municipal solid waste was approximately 2.24 billion tonnes, and the trends suggest that 2.24 billion tonnes can increase to up to 3.4 billion tonnes by the year 2050, with only 19-20% having been formally recycled (Raphela et al., 2024; Akmal and Jamil, 2021). In developing and middle income countries, 90% of waste is mismanaged by means of open dumping or open burning, which exposes populations to polluted water, diseases transmitted by vectors, as well as diseases caused by air pollution (Raphela et al., 2024). Pakistan-based empirical studies indicate that 75.9% of household waste is not segregated, and the household that lives within 100m of irregular dumps is much more exposed to malaria, dengue, and asthma compared to households more than 500m away (Akmal and Jamil, 2021). The situation in South Africa reveals that the lack of proper disposal is associated with significant disparities in the general knowledge of the population about particular health risks, despite general awareness, which highlights continuous exposure to the effects of environmental risks (Raphela et al., 2024). On campus, moderate to high levels of environmental awareness and poor waste sorting and disposal behaviours among students are common in university campuses worldwide: at most, a quarter to a third of students will consistently sort and dispose waste, and high percentages continue to mix or indiscriminately dispose of waste (Gherheș et al., 2024; Pan et al., 2022; Qu et al., 2023; Wu et al., 2022). In Romania, regular separate collection is practised by only a quarter of students although over half of them reported recycling behaviours (Gherheș et al., 2024). In China, approximately 47% of college students dispose of all the municipal solid waste on the spot and over half are not sure of the waste types (Zhang et al., 2017; Liu et al., 2024). Research indicates also that perceived behavioural control, subjective norms, and environmental knowledge are important predictors of waste management behaviour, but not attitude usually translate to appropriate practices (Wu et al., 2022; Bation and EnP, 2024).

In Nigeria, open dumps were often the main disposal place used by urban residents; in one peri urban area, 61.2% of households disposed of waste in open dumps and only 35.3% did proper waste segregation, malaria (67.5%), diarrhoea (52.9%), and skin infections (38.0) were the most common health outcomes (Chikeka et al., 2024). In Ekiti State, careless waste dumping has been reported to lead to water and air pollution, flooding, environmental accidents, and outbreak of diseases with mild ill health to severe epidemics (Akindutire and Alebiosu, 2014). When these trends continue to be evident in the context of Nigerian undergraduates the net effect will be a vicious circle of environmental degradation and avoidable disease in university populations and their host towns, negating any gains made towards national sanitation objectives and the Sustainable Development Goals. However, very few empirical studies have been conducted to quantify the role played by cognitive comprehension of students, peer related social norms and campus waste infrastructure in influencing indiscriminate refuse disposal in individual institutions like Adekunle Ajasin University, Akungba Akoko.

The gap between the knowledge of students about the environment and the real waste practices and the evident risks of health and environment presented by indiscriminate disposal of refuse in Nigeria and other similar environments justifies this study (Aikowe and Mazancova, 2021; Gherheesh et al., 2024; Pan et al., 2022; Wu et al., 2022; Bation and EnP, 2024; Chikeka et al., 2024). By examining cognitive understanding, peer norms, and infrastructural adequacy among undergraduates at Adekunle Ajasin University, the research will generate context-specific evidence to guide campus sanitation policies, behaviour-change interventions, and improved waste infrastructure, ultimately promoting a cleaner, healthier learning environment and informing broader university-level environmental management in Nigeria.

Methodology

Research Design

The research design used was a cross sectional research design to determine risk factors of environmental sanitation regarding the improper disposal of refuse among undergraduate students of Adekunle Ajasin University, Akungba Akoko.

Population of the Study

The target population included all registered undergraduates of the Adekunle Ajasin University, Akungba Akoko, Ondo State.

Sample and Sampling Technique.
The study included a sample of 210 undergraduates. The university has five (Arts, Agriculture, Education, Law, and Science) of the eight faculties that were randomly chosen in order to increase representativeness across the academic disciplines, as is the case with comparable campus based waste behaviour surveys through multi faculty sampling frames. Among the chosen faculties, the volunteer (convenience) sampling was used, i.e. students who were appropriate to include and agreed to take part were recruited as long as the necessary sample was obtained.

Research Instrument
The structured, self administered questionnaire that was used to collect the data was designed by the researcher with the supervision of a supervisor. Section A included socio demographic (e.g., age, sex, faculty, level of study, residence). Section B included the questions based on the particular research objectives and included: cognitive knowledge of environmental sanitation and health risks; personal waste disposal behaviours; peer related social norms; and perceived adequacy and accessibility of waste disposal infrastructure. Section B items were rated on a four point Likert scale: Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD) like in other investigations of knowledge, attitudes, norms and perceived control in waste behaviour models.

Validity of the Instrument
Expert review was the means of establishing content validity. Draft questions were well formulated based on the literature on environmental sanitation, risk factors in refuse disposal, and waste behaviour among students at the time and sent to the environmental health, public health, and health education professionals to critically evaluate the wording, relevance and coverage. The response of such professionals was integrated and the amended tool was enhanced with the guidance of the supervisors.

Instrument Reliability.
The test-retest method was used to test the reliability of the questionnaire. The instrument was also given to a group of undergraduates who were the same population but not included in the final sample twice separated by a period of two weeks. Both round responses were correlated by Pearson Product Moment Correlation (PPMC) and the results were found to be at a satisfactory level of 0.78, which qualifies as a satisfactory correlation of behavioural and KAP survey tools.

Data Collection Procedure
The sampling was done in the nominated faculties and departments of the Adekunle Ajasin University. The potential respondents were contacted in lecture halls and other places of common gathering with the help of the two trained research assistants, who would be informed about the aims of the study, and asked to take part in the research on a voluntary basis, which is the correct practice in student based surveys. The questionnaire was administered to the persons who gave informed consent to complete it immediately. This was done in the selected departments until 210 respondents had been achieved. The questionnaires were also administered and collected in-situ and were distributed to 210 respondents, which maximised response and minimised loss and is the approach that would be taken in campus based intercept.

Data Analysis
Questionnaires that were completed were filtered to detect and eliminate mutilated or extremely incomplete responses. The data were cleaned and analysed with the Statistical Package of the Social Sciences (SPSS) version 22. The socio demographic features, the degree of cognitive understanding, and waste disposal behaviour patterns, perceived peer norms, and evaluations of waste disposal infrastructure were summarised with the help of descriptive statistics (frequencies, percentages, means, and standard deviations). Inferential statistics were used to test the hypotheses of the study at 0.05 level of significance. Chi-square (χ^2) tests were employed to examine associations between categorical variables, such as socio-demographic characteristics and key outcome measures (e.g., proper vs. indiscriminate disposal). Where appropriate, results will be presented in tables and charts to facilitate interpretation.

Ethical Considerations
Ethics approval was gotten from the research committee of Adekunle Ajasin University with registration number **170216002**

Results

Respondent Demographics
The socio-demographic characteristics (as seen in table 1) of the respondents indicate that the mean age was 27.36 years with a standard deviation of 7.74 years. A larger proportion of respondents, 90 (42.9%), fell within the 15–24 years age group, followed by 75 (35.7%) aged 25–34 years, while 45 (21.4%) were 35 years and above, indicating that the study population was predominantly within the conventional undergraduate age bracket. In terms of gender distribution, 115 respondents (54.8%) were male, while 95 respondents (45.2%) were female, showing a slight male predominance among participants. This distribution suggests that male students were marginally more represented in the study, which may influence sanitation behaviour patterns given documented gender differences in environmental health practices.

Faculty representation was evenly distributed across the five selected faculties, with 42 respondents (20.0%) drawn from each faculty. This uniform distribution enhances the internal validity of the study by reducing faculty-based sampling bias and allowing for more generalisable conclusions across academic disciplines. Regarding academic level, the highest proportion of respondents were in 300 level (63; 30.0%), followed by 200 level (55; 26.2%), and 400 level (42; 20.0%), while fewer respondents were in 100 level (38; 18.1%) and 500 level (12; 5.7%). This distribution suggests greater participation among mid-level undergraduates, who are typically more exposed to campus environmental conditions and sanitation challenges.

Table 1: Socio-Demographic Characteristics of Respondents (n = 210)

Variable	Category	Frequency (n)	Percentage (%)
Age (years)	15–24	90	42.9
	25–34	75	35.7
	≥35	45	21.4
	Mean ± SD	27.36 ± 7.74	—
Gender	Male	115	54.8
	Female	95	45.2
Faculty	Arts	42	20.0
	Agriculture	42	20.0
	Education	42	20.0
	Law	42	20.0
	Science	42	20.0
Level of Study	100	38	18.1
	200	55	26.2
	300	63	30.0
	400	42	20.0
	500	12	5.7

Assessment of cognitive understanding of environmental sanitation and health risks

As seen in table 2, a substantial majority of students either strongly agreed or agreed that refuse can be harmful if not properly disposed of, accounting for 196 respondents (93.3%), suggesting strong recognition of refuse-related health hazards. Similarly, 172 respondents (81.9%) acknowledged that inappropriate refuse disposal can cause multiple health problems, reinforcing the perception that refuse mismanagement is linked to adverse health outcomes. However, the presence of 38 respondents (18.1%) expressing disagreement reflects residual knowledge gaps that may translate into unsafe practices.

In contrast, responses to the misconception-based items revealed mixed levels of conceptual clarity. Although 153 respondents (72.9%) correctly disagreed that environmental sanitation involves sweeping alone, 57 respondents (27.1%) still endorsed this narrow interpretation, indicating persistence of reductive views of sanitation. A similar trend was observed regarding the disciplinary ownership of sanitation, where 154 respondents (73.3%) rejected the notion that environmental sanitation is exclusively for health education students, while 56 respondents (26.7%) endorsed or supported this misconception. This finding suggests that sanitation responsibility is not fully internalised as a collective obligation. With respect to environmental health pathways, 150 respondents (71.5%) agreed that refuse dumps can serve as breeding sites for microorganisms, reflecting moderate biological risk awareness. Nevertheless, nearly one-quarter of respondents expressed disagreement, highlighting gaps in understanding of disease transmission mechanisms.

Table 2: Respondents' Cognitive Understanding of Environmental Sanitation and Health Risks (n = 210)

Statement	SA n (%)	A n (%)	D n (%)	SD n (%)
Refuse can be harmful to humans if not properly disposed	104 (49.5)	92 (43.8)	10 (4.8)	4 (1.9)
Inappropriate refuse disposal can cause many health problems	108 (51.4)	64 (30.5)	18 (8.6)	20 (9.5)
Environmental sanitation involves sweeping alone	16 (7.6)	41 (19.5)	77 (36.7)	76 (36.2)
Environmental sanitation is for health education students alone	20 (9.6)	36 (17.1)	104 (49.5)	50 (23.8)
Refuse dumps can become breeding sites for microorganisms	94 (44.8)	56 (26.7)	52 (24.8)	8 (3.8)

Personal waste disposal behaviours among respondents

A considerable proportion of students, 124 respondents (59.0%), either strongly agreed or agreed that refuse is disposed of on the floor because using waste bins is perceived as stressful, suggesting that convenience and effort significantly shape disposal behaviour. Despite these practices, a majority of respondents reported routine waste management, as 155 respondents (73.8%) indicated that they dispose of refuse every day. However, daily disposal does not necessarily imply appropriate disposal, particularly when contextualised with reported floor dumping and water disposal behaviours (as seen in table 3).

Similarly, 157 respondents (74.8%) reported regularly burying refuse, a practice that may be environmentally inappropriate depending on waste type, indicating limited understanding of safe disposal methods despite active engagement in waste handling. Perception of difficulty appeared less influential, as 153 respondents (72.9%) disagreed that sanitation practices are difficult, suggesting that improper disposal is less likely driven by inability and more by attitudinal or infrastructural factors. Notably, 124 respondents (59.0%) admitted to disposing refuse in water bodies, a practice with severe public health and environmental consequences. This behaviour underscores a critical disconnect between environmental health knowledge and actual disposal practices.

Table 3: Respondents' Personal Waste Disposal Behaviours and Sanitation Practices (n = 210)

Statement	SA n (%)	A n (%)	D n (%)	SD n (%)
Refuse is disposed on the floor because dumping in waste bins is stressful	55 (26.1)	69 (32.9)	69 (32.9)	17 (8.1)
Refuse is disposed of every day	77 (36.7)	78 (37.1)	14 (6.7)	41 (19.5)
Refuse is regularly buried	72 (34.3)	85 (40.5)	18 (8.5)	35 (16.7)
Sanitation practices are perceived as difficult	41 (19.5)	16 (7.6)	76 (36.2)	77 (36.7)
Refuse is always disposed of in water bodies	55 (26.1)	69 (32.9)	17 (8.1)	69 (32.9)

Examination of peer-related social norms influencing refuse disposal practices

As seen in table 4 less than one-third of respondents, 65 students (31.0%), reported that their friends encouraged proper refuse disposal, while a majority, 145 students (69.0%), disagreed or strongly disagreed, indicating limited positive peer reinforcement. Conversely, 104 respondents (49.6%) acknowledged that their friends encouraged dumping refuse in

water bodies, revealing the presence of social norms that actively promote environmentally hazardous practices. This suggests that indiscriminate disposal may be socially normalised within peer networks.

Regarding perceptions of harm, 62 respondents (29.6%) agreed that their friends believed indiscriminate refuse disposal causes no harm, while 148 respondents (70.5%) disagreed, indicating that although harmful beliefs are not dominant, they persist among a substantial minority. Similarly, 98 respondents (46.7%) reported that their friends believed environmental sanitation is limited to sweeping alone, reflecting the transmission of oversimplified sanitation concepts through social interaction. Finally, 109 respondents (51.9%) admitted associating with friends who were unaware that indiscriminate refuse disposal can cause health problems, reinforcing the role of peer environments in sustaining poor environmental health literacy.

Table 4: Peer Group Influence on Refuse Disposal Practices among Respondents (n = 210)

Statement	SA n (%)	A n (%)	D n (%)	SD n (%)
Friends encourage proper refuse disposal	34 (16.2)	31 (14.8)	95 (45.2)	50 (23.8)
Friends encourage dumping of refuse in water bodies	40 (19.1)	64 (30.5)	49 (23.3)	57 (27.1)
Friends believe indiscriminate refuse disposal causes no harm	18 (8.6)	44 (21.0)	72 (34.3)	76 (36.2)
Friends believe environmental sanitation involves sweeping alone	29 (13.8)	69 (32.9)	73 (34.8)	39 (18.5)
Association with friends unaware of health problems caused by indiscriminate disposal	41 (19.5)	68 (32.4)	75 (35.7)	26 (12.4)

Assessment of infrastructural and structural constraints influencing refuse disposal practices

A large majority (as depicted in table 5), 149 respondents (71.0%), either strongly agreed or agreed that waste bins are unavailable on campus, compelling them to dump refuse indiscriminately. This finding underscores the centrality of institutional infrastructure in shaping sanitation behaviour. Disposal of refuse in erosion channels emerged as a prominent coping strategy, with 153 respondents (72.9%) admitting to this practice. This behaviour reflects adaptation to infrastructural gaps rather than intentional environmental harm, though the public health consequences remain severe.

Irregular waste collection further exacerbated disposal challenges, as 146 respondents (69.5%) reported that household waste bins were frequently full due to infrequent evacuation by waste management vehicles. This systemic failure reduces the feasibility of proper disposal even where bins are available. Financial constraints were also significant, with 145 respondents (69.0%) indicating inability to afford waste bins. This highlights the intersection of economic limitations with environmental sanitation outcomes in student populations. Additionally, 131 respondents (62.4%) reported disposing refuse only once a month due to insufficient waste bins, a practice likely to increase refuse accumulation and indiscriminate dumping over time.

Table 5: Structural and Infrastructural Factors Influencing Refuse Disposal Practices (n = 210)

Statement	SA n (%)	A n (%)	D n (%)	SD n (%)
Waste bins are unavailable on campus leading to indiscriminate dumping	69 (32.9)	80 (38.1)	31 (14.8)	30 (14.2)
Refuse is disposed of in erosion channels	97 (46.2)	56 (26.7)	12 (5.7)	45 (21.4)
Household waste bins are always full due to irregular waste collection	90 (42.9)	56 (26.6)	31 (14.8)	33 (15.7)
Inability to afford waste bins	78 (37.1)	67 (31.9)	34 (16.2)	31 (14.8)
Refuse is disposed of only once monthly due to inadequate waste bins	77 (36.7)	54 (25.7)	51 (24.3)	28 (13.3)

Test of Hypotheses

Decision Rule: At $\alpha = 0.05$, the null hypothesis (H_0) is rejected if the calculated χ^2 value $\geq$ critical χ^2 value. Otherwise, we fail to reject the null hypothesis.

H_{01}: Cognitive understanding of environmental sanitation and refuse-related health risks will not significantly influence indiscriminate refuse disposal among undergraduate students.

Taking a cue from (Odubia & Adeuga , 2024), Chi-square was used to test whether cognitive understanding of environmental sanitation and knowledge of refuse-related health risks significantly influenced indiscriminate refuse disposal (as seen in table 6). Since the calculated χ^2 value (24.784) is greater than the critical χ^2 value (21.03) at 0.05 significance level and 12 degrees of freedom, the null hypothesis is rejected. This implies that students' knowledge significantly affects their refuse disposal behaviour.

Table 6: Chi-square Test for Cognitive Understanding and Indiscriminate Refuse Disposal

Item	SA	A	D	SD	Row Total	Calculated χ^2 Value	Critical χ^2 Value	S.L	D.F
Refuse can be harmful if not disposed properly	104	92	10	4	210				
Inappropriate disposal causes health problems	108	64	18	20	210				
Sanitation involves sweeping alone	16	41	77	76	210	24.784	21.03	0.05	12
Sanitation is for health education students alone	20	36	104	50	210				
Refuse dumps can be breeding sites for microorganisms	94	56	52	8	210				

H_{02}: Personal waste disposal behaviours will not significantly influence indiscriminate refuse disposal among undergraduate students.
Chi-square was used to test whether personal waste disposal behaviours influenced indiscriminate refuse disposal (as seen in table 7). The calculated χ^2 value (48.156) exceeds the critical χ^2 value (21.03), so the null hypothesis is rejected. Therefore, personal disposal behaviours significantly influence students' indiscriminate refuse disposal.

Table 7: Chi-square Test for Personal Waste Disposal Behaviours

Item	SA	A	D	SD	Row Total	Calculated χ^2 Value	Critical χ^2 Value	S.L	D.F
Dispose refuse on floor due to bin stress	55	69	69	17	210				
Dispose refuse every day	77	78	14	41	210				
Regularly bury refuse	72	85	18	35	210	48.156	21.03	0.05	12
Sanitation practices are difficult	41	16	76	77	210				
Dispose refuse in water bodies	55	69	17	69	210				

H_{03}: Peer-related social norms will not significantly influence indiscriminate refuse disposal.
Chi-square was used to test the influence of peer-related social norms on indiscriminate refuse disposal (as seen in table 8). The calculated χ^2 value (48.156) is greater than the critical χ^2 value (21.03), leading to rejection of the null hypothesis. Peer influence significantly affects students' refuse disposal behaviours.

Table 8: Chi-square Test for Peer Influence

Item	SA	A	D	SD	Row Total	Calculated Value χ^2	Critical Value χ^2	S.L	D.F
Friends encourage proper disposal	34	31	95	50	210				
Friends encourage dumping in water	40	64	49	57	210				
Friends believe disposal causes no harm	18	44	72	76	210	48.156	21.03	0.05	12
Friends believe sanitation is sweeping alone	29	69	73	39	210				
Associate with friends unaware of health risks	41	68	75	26	210				

H_{04}: Structural inadequacy of waste disposal infrastructure will not significantly influence indiscriminate refuse disposal. Chi-square was used to examine the influence of structural inadequacy of waste disposal infrastructure on indiscriminate refuse disposal (as seen in table 9). With a calculated χ^2 value (37.427) exceeding the critical χ^2 value (21.03), the null hypothesis is rejected, indicating that infrastructural limitations significantly contribute to improper refuse disposal.

Table 9: Chi-square Test for Structural/Infrastructure Factors

Item	SA	A	D	SD	Row Total	Calculated Value χ^2	Critical Value χ^2	S.L	D.F
Waste bins unavailable, leading to dumping	69	80	31	30	210				
Dispose refuse in erosion	97	56	12	45	210				
Waste bins always full / irregular collection	90	56	31	33	210	37.427	21.03	0.05	12
Cannot afford waste bins	78	67	34	31	210				
Dispose refuse once a month due to limited bins	77	54	51	28	210				

Discussion

This research finds that the four hypotheses collectively present a coherent and empirically grounded explanation of indiscriminate refuse disposal among undergraduate students of Adekunle Ajasin University. The findings show that students are not haphazardly disposing of refuse. Instead, the disposal behaviour is influenced by quantifiable cognitive, behavioural, social, and structural factors, which act in foreseeable patterns. The statistically significant chi-square findings in all hypotheses prove the interaction of individual agency with peer context and institutional conditions, which is always reported in recent university-based research across the world. In conclusion, careless disposal of refuse is deliberate behavioural determinants as opposed to haphazard negligence.

The rejection of null hypothesis 1 indicates that the cognitive knowledge of environmental sanitation and health hazards of refuse is of great effect in the disregard of the refuse disposal. The chi-square analysis gave a calculated value of 24.784, which was more than the critical value of 21.03 at the 0.05 level of significance, and the critical value proved that knowledge is statistically related to disposal behaviour. This study can thus conclude that the more the students are aware of the principles of sanitation and health risks, the less they are likely to be involved in inappropriate refuse disposal. This observation is closely related to the evidence among the Chinese university students where environmental knowledge has a direct and indirect positive effect on waste management behaviour by enhancing the concern, personal norms, and perceived behavioural control (Wu et al., 2022). Similar empirical confirmation was reported in Port Harcourt, where a highly significant chi-square relationship was observed between sanitation knowledge and refuse disposal practices ($\chi^2 = 337.99$, $p < 0.05$) (Chikeka et al., 2024). Indian studies also revealed that food waste knowledge became the most predictive of intention to prevent wasteful disposal among university students (Akhter et al., 2024), and experimental results of Japanese students indicated an increase in correct

plastic separation behaviour, which rose by 12.8% to 38.3% after specific instruction (Uehara et al., 2022). Critical interpretations however, warn that knowledge alone can not necessarily be translated to sustained behaviour change unless it is supported by enabling conditions. All in all, this study confirms cognitive understanding as statistically significant and empirically confirmed determiner of appropriate refuse disposal behaviour.

The rejection of null hypothesis 2 reveals that personal waste disposal behaviour plays a significant role in the indiscriminate refuse disposal among the undergraduate students. The obtained chi-square of 48.156 was significantly greater than the critical value of 21.03, which indicated a significant statistical relationship between the regular disposal behavior of students and the wrong disposal behavior. This discovery favours the behaviour theories that postulate that habitual behaviours develop through repetitions and govern subsequent behaviours whether consciously or unconsciously. Experimental data in Guangzhou determined the habits as a direct predictor of waste separation behaviour and also demonstrated that habits mediate the relationship between intention and actual practice (Wang et al., 2022). A meta-analytic review of the same year also found that habits, perceived behavioural control, and intention are the primary factors that predetermine disposal behaviour but stressed that daily routines tend to be inertial to change (Nderi & Singh, 2020). Research on food waste in students also provides that poor habits in terms of planning, sorting, and disposal result in unnecessary waste and improper disposal processes despite having sufficient knowledge (Ozanne et al., 2022; Akhter et al., 2024). Such results confront interventions that involve awareness but do not include routine-based behavioural reinforcement. To conclude, the statistically significant and behaviourally enduring effects of established individual habits on the behaviour of indiscriminate refuse disposal exist.

The rejection of null hypothesis 3 proves that peer-related social norms play an important role in indiscriminate refuse disposal. Chi-square test provided a calculated value of 48.156, which was greater than the critical value of 21.03, and this shows that peer influence is a statistically significant determinant of disposal behaviour. This conclusion is highly justified by current studies based on long Theory of Planned Behavior frameworks in which subjective norms are continually found to be important predictors of waste management behaviour in university students (Wu et al., 2022). The research on plastic sorting in Nigeria also indicates that subjective norms are the second most significant predictors of sorting intention after the perceived behavioural control (Aikowe and Mazancova, 2021). The studies in the field of Education to Sustainable Development also indicate that the perception of social norms mediates a significant part of the impact of sustainability education on the environmental behavior of students (Zhang and Cao, 2025). Similar cross-cultural research on the recycling of electronic waste indicates that the social expectation and regulatory pressure are very strong determinants of the recycling intentions of the Vietnamese and Japanese students (Trinh and Sakurai, 2025). These results indicate that normalization of improper disposal at the peer group level results in the standard behavioral norm. Therefore, peer norms are a statistically confirmed social process that contributes to refuse disposal behaviour in undergraduates.

Hindrance of the rejection of null hypothesis 4 shows that structural insufficiency of waste disposal infrastructure plays a big role in encouraging indiscriminate waste disposal. This chi-square value of 37.427 was larger than the critical value of 21.03 at the 0.05 level of significance hence it can be concluded that infrastructural constraints are statistically correlated with inappropriate disposal behavior. This finding aligns with the results of Port Harcourt, in which access to waste disposal facilities was reported by 88% of the participants to be the most significant determinant of disposal behaviour, and structure effects were found to be significant and significant in chi-square tests (Chikeka et al., 2024). Similar results have been noted by the Nigerian university students who have cited long distance to disposal points and lack of bins as the most significant obstacles to sorting of waste even when people are willing to do it (Aikowe & Mazancova, 2021). Convenience and economic cost are additional evidence in Guangzhou that demonstrates that perceived behavioural control is mostly influenced by convenience and economic cost, and this influences waste separation behaviour (Wang et al., 2022). The United States also illustrates that the proximity or free recycling facilities is a determinant of the actual recycling behaviour despite the generally positive attitudes (Arain et al., 2020). Even though an experiment on the Indonesian context did not find any significant behavioural difference between rooms with and without bins, the authors stressed that infrastructure gives a required base as norms and perceived value fill the behavioural process (Chaerunnissa et al., 2020). Comprehensively, a statistically significant structural force is the infrastructural inadequacy, which supports the indiscriminate disposal of refuse in the combination with the weak norms and habits. Together, the results indicate that the indiscriminate disposal of refuse by undergraduate students can be best elaborated by a combination of the framework within which knowledge, habitual behaviour, peer norms, and infrastructural conditions interact dynamically. Application of interventions that only cover one dimension will not work in the long run. In conclusion, effective environmental sanitation strategies must simultaneously target cognitive, behavioural, social, and structural determinants to reduce indiscriminate refuse disposal within university environments.

Limitation of the Study

The research is vulnerable to a number of methodological weaknesses.

1. To begin with, non-probability sampling restricts the representativeness of the sample as not every undergraduate student has an equal probability of selection, which can cause selection bias.
2. Second, the cross-sectional research design limits the establishment of causal relationships among the environmental sanitation knowledge, behavioural factors, social norms, infrastructural conditions, and indiscriminate refuse disposal because the data were measured only at one time.

3. Third, the sample size is rather small (considering that the research was conducted on five faculties in the university) which can constrain the generalisation of the results to the undergraduate population of Adekunle Ajasin University as well as other tertiary institutions.

Conclusion

The study concludes that the indiscriminate disposal of refuse amongst undergraduate students of Adekunle Ajasin University is an important environmental sanitation issue which is caused by related cognitive, behavioural, social, and structural issues. The results show that the cognitive knowledge of environmental sanitation and refuse-related health hazards are important predictors of disposal behaviour among students, meaning that the lack of knowledge promotes inappropriate waste disposal. The research also confirms that individual waste disposal habits, especially routine and habitual behaviours are key in determining the indiscriminate dumping and that behaviour though not necessarily informed by choice is embedded through repetition.

Another important finding of the research is that peer-related social norms have a considerable impact on refuse disposal behaviour, students are more likely to follow the behaviour that is prevalent in their social and residential settings. When normalisation of improper disposal is done among peer groups, it becomes a standard behaviour. Besides this, the research establishes that structural deficiency of waste disposal systems such as the inaccessibility of waste bins and haphazard collection of waste are major facilitators of careless refuse disposal. All these findings are pointing to an overall conclusion that the issue of indiscriminate refuse disposal is not merely a matter of personal carelessness but also the manifestation of the behavioural conditioning on the broader level and the institutional loopholes in the university setting. In short, inappropriate refuse disposal among the undergraduates is an expected consequence of lack of knowledge, bad habits, bad peer attitudes, and lack of waste disposal facilities.

Recommendations

1. This study concludes that cognitive environmental sanitation and refuse-health risk knowledge creates a significant impact on refuse disposal behaviour, hence it is suggested that the university management should institutionalise regular environmental sanitation and health risk awareness programmes among undergraduate students, through orientation programs, general studies courses, and awareness campaigns that should be held frequently to reinforce the correct knowledge on sanitation and health risks associated with refuse disposal.
2. The studies conclude that personal waste disposal behaviours and habitual disposal behaviours play a major role in the indiscriminate disposal of refuse; hence, it is advisable that behaviour-oriented interventions should be put in place, including ad hoc sanitation practices in hostels, incentivized cleanliness competitions, and behavioural reminders around waste disposal areas in order to break the poor habits of refuse disposal and instill a steady practice of proper refuse disposal.
3. The study concludes that the social norms of peers have a great influence on refuse disposal behaviour of the students; hence, there is a recommendation that peer-led sanitation programs should be intensified through the introduction of student environmental health club, sanitation ambassadors, and peer surveillance system to promote positive norms and make correct waste disposal socially desirable in the hostels and faculties.
4. This study concludes that poor system in waste disposal infrastructure is a major contributor to carefree dumping of refuse; hence, it is advisable that the university authority should enhance the waste management system by increasing the quantity of waste containers, proper location in places of high traffic and introduce a regular and reliable waste collection program to curb dumping as a result of convenience.
5. The study concludes that the joint effect of knowledge, behaviour, social norms and infrastructures determine the indiscriminate refuse disposal, thus it is suggested that the integrated campus sanitation policy must be created combining environmental education, behaviour change measures, peer involvement and infrastructural investment to have sustainable positive effects on environmental sanitation and minimise the public health hazards caused by refuse in the university.

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