

Assessment of Awareness, Attitudes and Disposal Practices of Electronic waste Among Arts and Science College Students in Chengalpattu District: A Cross-Sectional Study

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ABSTRACT

Background: Arts and Science college students represent a large, heterogeneous segment of the young population who are active consumers of electronic devices. Despite this, their e-waste literacy and disposal behaviours remain poorly characterised. This study aimed to assess e-waste awareness, disposal practices, and perceptions among Arts and Science college students in Chengalpattu district, Tamil Nadu.

Objectives: To evaluate e-waste literacy, attitudes, disposal practices, and willingness to participate in e-waste recycling programmes among Arts and Science students.

Methods: A cross-sectional study was conducted among 402 Arts and Science college students in Chengalpattu district using stratified multistage random sampling. Colleges were selected by simple random sampling from a stratified frame, and students within colleges were selected by systematic random sampling. Data were collected using a validated semi-structured questionnaire and analysed using SPSS v22.0.

Results: Among Arts and Science students, 23.4% were aware of e-waste existence and 40.7% recognised associated health hazards. The majority (44.3%) believed e-waste should be disposed of with regular waste. Improper disposal with solid waste was reported by 43.5% of students. Only 15.4% segregated and deposited e-waste at collection centres. Lack of awareness was cited as the principal cause of e-waste burden by 49.6% of the overall cohort. Willingness to participate in recycling programmes was 73.9%.

Conclusions: E-waste literacy among Arts and Science students is low and disposal practices remain suboptimal. The high willingness to engage in recycling programmes presents an opportunity for targeted, curriculum-integrated e-waste education.

Keywords: E-waste; Electronic waste disposal; Arts and Science students; E-waste literacy; Cross-sectional study; India.

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INTRODUCTION

The proliferation of consumer electronics has accelerated the generation of electronic waste (e-waste) at an unprecedented rate. Globally, approximately 50 million tonnes of e-waste are produced annually, with a projected annual increase of 4–5%.^{1,2} Despite containing recoverable materials, e-waste is classified as hazardous owing to its toxic constituents, including lead, mercury, and dioxins, which pose significant risks to human health and the environment.³

India ranks third in Asia and fifth globally in e-waste generation, yet only 20% is formally collected and recycled.^{4,5} The informal processing of e-waste through open burning and acid leaching has been associated with silicosis, acid burns, circulatory failure, and groundwater contamination.^{6,7} Weak enforcement of environmental legislation compounds the public health burden.⁸

Arts and Science students constitute the largest group within the collegiate population and are frequent users of mobile phones, tablets, and computers. Yet this group has received limited attention in e-waste research.

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Understanding their knowledge, attitudes, and practices is essential to designing effective interventions within non-technical academic settings.

OBJECTIVES

Primary objective :

To Assess the awareness of e-waste existence, health hazards, environmental hazards, recycling facilities, and relevant policies among Arts and Science students.

Secondary objectives :

To Evaluate the attitudes toward e-waste disposal.

To document the current e-waste disposal practices.

To Assess the willingness to participate in e-waste recycling programmes.

METHODS

3.1 Study Design and Setting

A community-based descriptive cross-sectional study was conducted among Arts and Science college students in Chengalpattu district, Tamil Nadu, India, over four months (August–November 2024).

Study Population and Eligibility Criteria

The target population comprised students enrolled full-time in Arts and Science degree programmes at affiliated colleges in Chengalpattu district.

Inclusion criteria: students aged ≥ 18 years who provided written informed consent.

Exclusion criteria: students absent on the day of data collection, visiting students, and those who declined to participate.

Sample Size

Sample size was calculated using $n = Z^2 p(1-p)/d^2$, with $Z = 1.96$, $p = 0.648$ (from Suguna et al., 2021⁹), and

$d = 0.05$. The minimum required was 350; after adding a 15% non-response buffer, a final sample of 402 students was recruited.

Sampling Method :

Stratified multistage random sampling was employed. An exhaustive list of Arts and Science colleges in Chengalpattu district was obtained from the affiliating university. Colleges were selected by simple random sampling (SRS) without replacement using a random number table. Within each college, students were selected by systematic random sampling using a calculated sampling interval ($k = \text{enrolled strength} \div \text{required quota}$), with a random start between 1 and k .

Data Collection and Analysis

A validated, pre-tested semi-structured questionnaire with six domains (e-waste literacy, attitude, disposal practices, equipment usage, perception of e-waste burden, and willingness to participate) was self-administered during scheduled class hours. Data were analysed using SPSS v22.0; chi-square tests were used for associations ($p < 0.05$ significant).

Ethical Considerations

Institutional Ethics Committee approval was obtained. All procedures followed the Declaration of Helsinki. Participation was voluntary and anonymous.

RESULTS

A total of 402 Arts and Science students participated in the study. Findings are presented below across the domains of e-waste literacy, attitudes toward disposal, disposal practices, and willingness to participate in recycling initiatives.

E-waste Literacy

Table 1. E-waste literacy among Arts and Science students ($n = 402$)

Domain	Arts & Science Students, n (%)
Awareness of e-waste existence	94 (23.4%)
Health hazards of e-waste	164 (40.7%)
Environmental hazards of e-waste	84 (20.8%)
Availability of recycling facilities	165 (41.0%)
Policies, regulations, and laws	119 (29.6%)

Overall awareness of e-waste as a distinct waste category was limited, with only 94 of 402 students (23.4%) reporting familiarity with the term and concept, leaving the substantial majority (76.6%) unaware that discarded electronic items constitute a separate, hazardous waste stream. Awareness of the health hazards associated with e-waste was considerably higher, reported by 164 students (40.7%) — nearly double the level of basic awareness — suggesting that health-related messaging, even if informal, reaches students more effectively than foundational e-waste literacy.

Knowledge of the environmental hazards of e-waste was the least recognised domain, at 84 students (20.8%), indicating a specific gap in understanding of ecological consequences such as soil and groundwater contamination from improperly discarded electronics. In contrast,

awareness of the availability of recycling facilities was the highest of all five domains, reported by 165 students (41.0%), which is a notable finding given that this same cohort demonstrated poor actual utilisation of such facilities in their disposal practices (Table 3). This awareness–practice gap is discussed further below. Awareness of relevant e-waste policies, regulations, and laws was reported by 119 students (29.6%), reflecting limited penetration of regulatory and institutional information among this population despite the existence of national e-waste management rules.

Taken together, the literacy findings reveal a fragmented pattern: awareness clusters around health consequences and the existence of recycling infrastructure, while conceptual understanding of e-waste itself, its

environmental impact, and the governing policy framework remain considerably weaker.

Attitudes Toward E-waste Disposal

Table 2. Attitude toward disposal of old electronic equipment (n = 402)

Attitude	Arts & Science Students, n (%)
Should be disposed of with regular waste	178 (44.3%)
Should be recycled by manufacturers	224 (55.7%)

When asked how old electronic equipment ought to be disposed of, a slight majority of 224 students (55.7%) held the appropriate view that such items should be routed back to manufacturers or authorised recyclers for safe processing. However, a substantial minority of 178 students (44.3%) — nearly one in every two respondents

— believed that e-waste could be discarded along with regular household waste. This near-even split indicates that correct attitudes toward disposal are not yet the clear majority position within this population, and that misconceptions about the hazardous nature of e-waste remain widespread enough to warrant targeted correction.

DISPOSAL PRACTICES

Table 3. E-waste disposal practices among Arts and Science students (n = 402)

Disposal Practice	Arts & Science Students, n (%)
Sell or exchange (second-hand)	114 (28.4%)
Dispose with regular solid waste	175 (43.5%)
Segregate and deposit at collection centres	62 (15.4%)
Store for future use	51 (12.7%)

Actual disposal behaviour mirrored, and in some respects exceeded, the attitudinal gaps identified above. Disposal with regular solid waste was the single most common practice, reported by 175 students (43.5%), closely matching the 44.3% who considered this an acceptable approach in Table 2 — indicating strong consistency between stated attitude and actual behaviour for this improper disposal route. Selling or exchanging used devices, typically through informal second-hand markets or local vendors, was the second most common practice, reported by 114 students (28.4%); while this practice extends the functional life of a device, it does not guarantee environmentally sound end-of-life processing once the device is eventually discarded by a subsequent owner.

Only 62 students (15.4%) reported segregating e-waste and depositing it at designated collection centres. This discrepancy of roughly 26 percentage points between awareness and actual use of collection centres constitutes a clear awareness–practice gap, suggesting that barriers beyond simple lack of knowledge, such as inconvenience, inaccessibility, or low perceived urgency, may be limiting appropriate disposal. A further 51 students (12.7%) reported simply storing unused electronic items rather than disposing of them through any channel, a pattern consistent with hoarding behaviour documented in other student populations and one that defers rather than resolves the disposal problem.

Willingness to Participate in Recycling Programmes

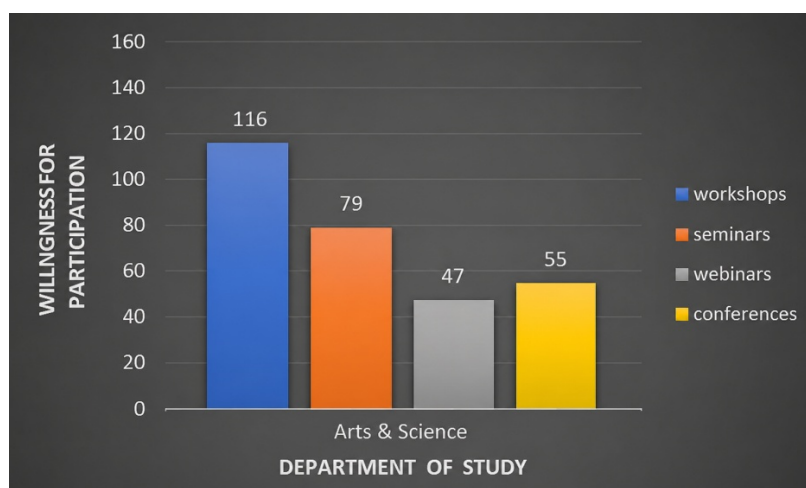


Figure 1 : Willingness of students to Participate in Recycling Programmes

Despite the gaps in literacy and the suboptimal disposal practices documented above, willingness to engage with corrective interventions was high: 297 of 402 students (73.9%) expressed willingness to participate in e-waste recycling programmes if such opportunities were made

available, with structured workshops emerging as the preferred format for engagement. This finding stands in marked contrast to the comparatively low levels of current e-waste literacy and appropriate disposal behaviour, and indicates a receptive population for whom the primary

barrier appears to be a lack of accessible awareness and infrastructure rather than active disinterest or resistance.

DISCUSSION

The overall e-waste awareness among Arts and Science students in this study (23.4%) was substantially lower than the 64.8% documented among urban households by Suguna et al.,⁹ highlighting the inadequacy of current informal awareness pathways for reaching the collegiate population. The finding that 43.5% disposed of e-waste with regular waste is consistent with global trends reported by Widmer et al.,¹ who noted that 80% of e-waste worldwide enters unregulated waste streams.

The relatively higher awareness of recycling facilities (41.0%) compared to environmental hazard awareness (20.8%) among this group suggests that knowledge is fragmented rather than integrated. Targeted educational campaigns addressing the full spectrum of e-waste hazards — including environmental impacts such as groundwater contamination — are warranted. Ongondo et al. similarly found that students in non-technical disciplines tend to store rather than recycle e-waste, a finding mirrored in this cohort (12.7% store for future use).⁵

The conspicuously high willingness to participate in recycling programmes (73.9%) is a critical finding. Wath et al. demonstrated that structured awareness initiatives yield substantial improvements in e-waste disposal behaviour in youth cohorts.¹⁰ This receptivity should be leveraged through college-based workshops and curriculum integration.

CONCLUSION

E-waste literacy among Arts and Science college students in Chengalpattu district is low, and the majority engage in improper disposal practices. Despite this, the high willingness to participate in recycling programmes offers a clear intervention opportunity. Integration of e-waste awareness into Arts and Science curricula, combined with institution-level collection facilities and enforcement of e-waste regulations, is strongly recommended.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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Nil

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