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Article

Determinants of Household Waste Management Behavior within the Fourth Pillar of Community-Based Total Sanitation (CBTS) in Indonesia

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Abstract

The 4th pillar of the Community-Based Total Sanitation (CBTS) program emphasizes household waste management, which is crucial due to the significant contribution of household waste to environmental pollution. This study aimed to analyze the influence of knowledge, education, and triggering on the implementation of the 4th pillar of CBTS in Mojosulur Village, Mojosari District, Mojokerto Regency in 2025. An analytic observational design with a cross-sectional approach was applied, involving 92 housewives selected through systematic random sampling. Data were collected using questionnaires to measure knowledge, education, and triggering experience, and observation sheets to evaluate household waste management practices. The results showed that the overall implementation of the 4th pillar of CBTS was still low, with only 15.2% of households practicing proper waste management. The Chi-Square test indicated that knowledge had no significant association with CBTS 4th pillar implementation ($p = 0.109$), while education ($p = 0.004$) and triggering ($p = 0.000$) were significantly associated. These findings highlight that higher education and structured triggering activities play a key role in strengthening household waste management. Local governments and environmental health officers are recommended to intensify triggering interventions and strengthen community education programs, focusing on the three main components of CBTS enabling environment, increasing demand, and increasing supply to promote sustainable waste management behavior at the household level.

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Introduction

Waste is a pressing global environmental issue due to rapid population growth and increasing consumption [1]. Ineffective waste management contributes to soil, water, and air pollution, as well as negative impacts on public health and climate change [2-7]. Without systematic interventions, waste will remain a major obstacle to achieving environmental protection and sustainable development goals.

In Indonesia, households are the largest contributors to waste. National data show that more than half of annual waste originates from households, with East Java reporting similar proportions. In Mojokerto District, 57% of the 164 thousand tons of waste produced annually also comes from households (SIPSN, 2024). Mojosulur Village, one of the waste-producing areas in Mojokerto, faces

increasing challenges in managing daily household waste. This highlights the urgent need for effective household waste management interventions [8]–[9].

To address this issue, the Ministry of Health launched the Community-Based Total Sanitation (CBTS) program through Regulation No. 3 of 2014. CBTS consists of five pillars, with the 4th pillar focusing on household waste management (HWM). Despite extensive promotion, the implementation of the 4th pillar remains low in many communities. Previous studies have demonstrated that knowledge [10]–[11] and education [12]–[13] significantly influence household waste management behavior.

Another important determinant is *triggering*, a participatory approach aimed at motivating communities to adopt better sanitation and waste practices. While some studies have linked counseling and community education to improved behavior [14]–[15], evidence on the specific role of triggering in the implementation of CBTS's 4th pillar remains limited. This research gap is particularly relevant in Mojokusur, where implementation levels are still low despite existing interventions. Also study in Kelurahan Cisalak involving 366 people showed that counseling has a relationship with household waste sorting behavior [16].

This study aims to analyze the influence of knowledge, education, and triggering on the implementation of the 4th pillar of CBTS in Mojokusur Village, Mojokerto. By focusing on these determinants, the study provides evidence for more targeted strategies to strengthen household waste management in the community.

Materials and Method

Research Design and Approach

This study is an analytical observational study with a cross-sectional approach that aims to analyze the relationship between knowledge level, education level, and involvement in triggering activities with the implementation of the 4th pillar of Community-Based Total Sanitation (CBTS) at the household level. The cross-sectional approach was chosen because it allows data collection at one time to observe the relationship between variables in the population of housewives in Mojokusur Village, Mojokusari District, Mojokerto Regency.

Location and Time of Research

The research was conducted in Mojokusur Village, a village located in the administrative area of Mojokusari Sub-district, Mojokerto District, East Java Province. The selection of this location was based on the high generation of household waste and the non-optimal implementation of the 4th pillar of CBTS in the area. Research activities, starting from instrument preparation, data collection, to analysis, were carried out in the period of January to June 2025.

Population and Sampling Technique

The population in this study were all housewives who lived permanently in Mojokusur Village. Determination of the number of samples was carried out using the Lemeshow formula which is suitable for populations whose exact number is unknown. Based on the calculation results, a sample size of 92 housewives was obtained. The sampling technique was conducted using the systematic random sampling method, which utilized a list of family cards from village officials to ensure a representative and random sample distribution. Inclusion criteria were housewives who permanently resided in Mojokusur Village and were able to understand and respond to the questionnaire, while the exclusion criteria were housewives who refused to provide consent or were severely ill and unable to be interviewed.

Research Variables

The independent variables in this study include knowledge level, education level, and experience in participating in triggering activities. The level of knowledge was measured using a closed questionnaire consisting of 10 statement items with two answer options, namely "yes" and "no". Each

correct answer was given a score of one, and the wrong answer was given a point of zero. The total point was then classified into three categories, namely good (7 – 10 points), sufficient (4 – 6 points), and deficient (0 – 3 points). Education level was categorized based on the last level of education completed by the respondent, ranging from elementary school or equivalent to university. Triggering experience was identified using a questionnaire by selecting options from two categories, namely ever participated or never participated in CBTS triggering activities.

The dependent variable in this study was the implementation of the 4th pillar of CBTS in households, which was measured using an observation sheet. Implementation was categorized as "implementing" if the household met the three main indicators, namely a trash bin that meets the requirements (has a lid, is strong, and easy to clean), the separation of waste between organic and inorganic, and the absence of scattered garbage in the home environment. If one or more of these indicators are not met, it is categorized as "not implementing".

Data Collection Procedure

Data collection was conducted through a combination of interviews, direct field observations, and questionnaires filled out by respondents. Interviews were conducted by researchers to collect information regarding the independent variables. Observations were conducted by visiting respondents' homes and recording actual conditions related to household waste management using a pre-prepared observation sheet. The questionnaire and observation instruments were first tested for validity and reliability on a 10% sample outside the research location to ensure data accuracy and reliability. The validity test using Pearson Correlation showed that all items had r-count values greater than the r-table (0.2673; $p < 0.05$), confirming their validity. Reliability testing with Cronbach's Alpha produced a value of 0.761, exceeding the r-table (0.6319), indicating good internal consistency and reliability of the instrument.

Data Analysis Technique

The collected data were analyzed univariately and bivariately. Univariate analysis was used to describe the frequency distribution and percentage of each variable. Meanwhile, to determine the relationship between the independent variable and the dependent variable, bivariate analysis was used with the Chi-Square test at a significance level of 95% ($\alpha = 0.05$). A p -value < 0.05 was considered statistically significant. This study was limited to bivariate analysis. Multivariate analysis, such as logistic regression, was not conducted, so potential confounding factors (e.g., age, socioeconomic status) were not controlled. This limitation should be considered when interpreting the results.

Research Ethics

This study has received ethical approval from the Health Research Ethics Committee of the Surabaya Ministry of Health Polytechnic with registration number No.K/1504/KEPK Poltekkes_Sby/V/2025. Before data collection began, all respondents were given an explanation of the purpose, benefits, and procedures of the study, and were asked to sign an informed consent letter as a form of willingness to voluntarily participate in the study.

Results

Based on the results presented in Table 1, it was found that most housewives in Mojokusur Village had a good level of knowledge regarding household waste management, accounting for 47.83%. This finding indicates that nearly half of the respondents already possess a solid understanding of the principles of the fourth pillar of CBTS. However, there remains a group with moderate (31.53%) and low knowledge levels (20.65%), suggesting the need for more intensive educational efforts, particularly for those with limited understanding.

In terms of education, the majority of respondents were high school graduates or equivalent (32.61%), followed by college graduates (27.17%). This condition reflects that most housewives have completed secondary to higher education, which may serve as an important asset in information uptake

and behavioral change. Nevertheless, 23.91% of respondents had only completed elementary education or had never attended school, requiring simpler and more targeted communication approaches in CBTS program dissemination.

Tabel 1. Distribution of Knowledge Level, Education, Triggering, and Implementation of the 4th Pillar of CBTS of Housewives in Mojosulur Village, Mojosari Sub-district, Mojokerto District in 2025.

Variabel	Kategori	Jumlah Responden	Persentase (%)
Knowledge Level	Good (7–10)	44	47.83
	Fair (4–6)	29	31.53
	Less (0–3)	19	20.65
	Total	92	100
Education Level	Elementary School / Equivalent / Not in School	22	23.91
	Junior High School / Equivalent	15	16.31
	High School / Equivalent	30	32.61
	Higher Education	25	27.17
	Total	92	100
Triggering	Ever	10	10.87
	Never	82	89.13
	Total	92	100
Implementation of the 4th Pillar of CBTS	Apply	14	15.22
	Not Implementing	78	84.78
	Total	92	100

Meanwhile, the distribution of triggering activity history revealed that the majority of housewives (89.13%) had never participated in such activities, with only 10.87% reporting prior experience. This indicates that triggering, as a strategic approach to behavioral change, remains very limited in practice. The low coverage of triggering may contribute to the low level of active community participation in managing household waste in accordance with the fourth pillar of CBTS. This is further supported by the finding that only 15.22% of respondents fully implemented the fourth CBTS pillar, while the majority (84.78%) had not.

These findings highlight that although some respondents have good knowledge and relatively high education levels, this has not fully translated into concrete household-level practices. The low implementation of the fourth pillar of CBTS may be influenced by the lack of triggering activities, limited facilities, and minimal monitoring and evaluation of existing programs. Therefore, interventions that integrate educational improvement, broader coverage of triggering, and provision of waste management facilities are crucial to encourage the sustainable implementation of the fourth CBTS pillar in Mojosulur Village.

The results of research on the Effect of Knowledge Level on the Implementation of the 4th Pillar of CBTS of Housewives in Mojosulur Village, Mojosari Sub-district, Mojokerto District in 2025 are presented in table 2.

Based on the results in Table 2 regarding the distribution of the implementation of the fourth pillar of CBTS, a more comprehensive picture was obtained of the relationship between knowledge level, education level, and triggering experience with household waste management practices in Mojosulur Village. In terms of knowledge level, although most housewives were in the good knowledge category, not all of them implemented the fourth CBTS pillar. As many as 20.46% of those with good knowledge applied the pillar, while only 17.24% of those with moderate knowledge did so, and none in the low-knowledge group implemented it. However, the statistical test results showed that

knowledge level was not significantly associated with the implementation of the fourth CBTS pillar ($p = 0.109$). This indicates that knowledge alone is not sufficient to drive concrete actions in household waste management.

Tabel 2

Distribution of CBTS 4th Pillar Implementation Based on Knowledge Level, Education Level, and Triggering of Housewives in Mojosulur Village, Mojosari Sub-district, Mojokerto District in 2025

Variable	Category	Applyin n (%)	Not Applying n (%)	Total n (%)	p- value
Knowledge Level	Good (7–10)	9 (20.46%)	35 (79.54%)	44 (47.83%)	0.109
	Fair (4–6)	5 (17.24%)	24 (82.76%)	29 (31.52%)	
	Less (0–3)	0 (0%)	19 (100%)	19 (20.65%)	
Education Level	Higher Education	9 (36.00%)	16 (64.00%)	25 (27.17%)	0.004
	High School / Equivalent	4 (13.33%)	26 (86.67%)	30 (32.61%)	
	Junior High School / Equivalent	1 (6.66%)	14 (93.34%)	15 (16.31%)	
	Elementary School / Equivalent / Not in school	0 (0%)	22 (100%)	22 (23.91%)	
	Ever	9 (90.00%)	1 (10.00%)	10 (10.87%)	
Triggering	Never	5 (6.10%)	77 (93.90%)	82 (89.13%)	0.000
	Total	14 (15.22%)	78 (84.78%)	92 (100%)	

In contrast, education level demonstrated a clearer influence on this behavior. Housewives with higher education (college graduates) were the group most likely to implement the fourth CBTS pillar, at 36.00%. The proportions were lower among those with senior high school and junior high school education, at 13.33% and 6.66%, respectively. Meanwhile, none of the housewives with only elementary education or no schooling implemented this pillar. The statistical analysis showed a significant relationship between education level and the implementation of the fourth CBTS pillar ($p = 0.004$). This finding reinforces that the higher one's education level, the greater the likelihood of developing awareness and the ability to apply waste management practices aligned with CBTS principles.

Furthermore, triggering experience was proven to be a highly influential factor in encouraging the implementation of the fourth CBTS pillar. As many as 90.00% of housewives who had participated in triggering activities practiced proper household waste management, in stark contrast to only 6.10% among those who had never participated. Statistical testing revealed a highly significant relationship ($p = 0.000$). This demonstrates that triggering activities play a crucial role in shaping awareness and fostering positive behaviors related to sanitation and household waste management. Overall, these findings indicate that educational interventions such as triggering and empowerment through education can have a tangible impact on improving community sanitation behaviors, whereas knowledge alone without practical reinforcement is insufficient to drive behavioral change.

Discussion

This study found that knowledge level was not significantly associated with the implementation of the 4th pillar of CBTS, while education and triggering participation showed significant effects. These findings highlight that knowledge alone is insufficient to drive behavioral change in household waste management. [17]. Although many respondents possessed good knowledge, practical barriers such as economic limitations, lack of facilities, and prevailing cultural practices (e.g., open burning) constrained the translation of knowledge into action. This aligns with previous studies indicating that knowledge does not necessarily lead to practice when structural and environmental support is absent [16].

In contrast, education was strongly associated with better implementation. Higher education equips individuals with cognitive skills, critical thinking, and the capacity to process information, thereby enhancing their ability to apply waste management principles. This is consistent with studies showing that more educated communities demonstrate greater awareness and adaptability in adopting sanitation practices. Education also reflects broader socioeconomic factors, as those with higher education may have greater access to resources and institutional support. [18]–[19]

Triggering emerged as the most influential factor. Nearly all participants with triggering experience implemented the 4th pillar, underscoring its effectiveness as a participatory and behavior-focused intervention. Unlike knowledge acquisition, triggering directly engages communities in problem identification and collective action planning, fostering emotional involvement and social accountability [20]. These elements explain why triggering can generate stronger behavioral change [21] compared to passive information delivery.

Overall, the findings suggest that strengthening education and expanding the coverage of triggering activities are critical strategies for improving CBTS implementation. Knowledge enhancement efforts should be supported with practical interventions like doing the implementation of interactive and continuous counseling, supported by printed media such as leaflets, posters, and pamphlets, as well as accessible digital media, to accelerate knowledge acquisition. Then provision of facilities, and continuous monitoring to overcome structural barriers [22]. Future studies should explore the roles of cultural norms, economic status, and program accessibility as mediating factors that influence the relationship between knowledge, education, and sanitation behavior.

Conclusions

This study found that household waste management behavior in Mojosulur Village is significantly influenced by education level and participation in triggering activities, while knowledge alone does not show a significant effect. Housewives with higher education are more likely to adopt proper waste management practices, and those who participated in triggering demonstrated much higher compliance with the 4th pillar of CBTS. These findings highlight the importance of strengthening non-formal education and expanding the coverage of triggering activities as effective approaches to improving sanitation behavior. Practically, local governments and health workers should prioritize continuous community triggering, targeted education programs, and support facilities such as waste banks or composting units to enable sustainable household waste management. Such interventions can realistically be implemented in Mojosulur and replicated in other rural areas facing similar challenges.

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Informed Consent Statement

Informed consent was obtained from all respondents involved in this study

Conflicts of Interest

The authors declare no conflicts of interest

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