



Association of Knowledge and Attitude with Household Drug Disposal Practices in Karang Kemiri Village

Hubungan Pengetahuan dan Sikap dengan Praktik Pembuangan Obat Rumah Tangga di Desa Karang Kemiri

Alfrida Widyandari¹, Nia Azzahra², Putu Nilasari³, Anggy Utama Putri⁴,

^{1,2,3} Faculty of Pharmacy, Universitas Kader Bangsa, Palembang, Indonesia

Submitted : 2026-09-04

Revised : 2026-09-19

Accepted : 2026-09-30

Keywords: Attitude; Drug Disposal Practices; Knowledge Level

Correspondence:

Alfrida Widyandari

alfridawidyandari.xiips3@gmail.com



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Abstract

The disposal of damaged, expired, or unused medicines is a measure to prevent environmental pollution, drug misuse, and negative impacts on public health. However, many community members still do not understand the correct procedures for drug disposal, contributing to improper disposal practices. This study aimed to determine the association between knowledge level, attitude, and drug disposal practices among the community of RW 002, Karang Kemiri Village. This was an analytical cross-sectional study involving 100 respondents selected via purposive sampling. Data were collected using a questionnaire that had undergone validity and reliability testing, then analyzed using univariate and bivariate methods, with the Chi-square test used to examine the knowledge–practice relationship and Fisher’s exact test used for the attitude–practice relationship because one expected cell count was below 5, at a significance level of $\alpha = 0.05$. The results showed that 85% of respondents had a low level of knowledge, 57% held a negative attitude, and 91% engaged in poor drug disposal practices. A significant association was found between knowledge level and drug disposal practices (Chi-square test, $p < 0.001$) and between attitude and drug disposal practices (Fisher’s exact test, $p = 0.005$). In conclusion, knowledge level and attitude were significantly associated with drug disposal practices among the community of RW 002, Karang Kemiri Village. Given the cross-sectional design, these findings suggest an association rather than a causal relationship and may inform the development of future educational interventions to improve safe and appropriate household drug disposal practices.

Abstrak

Pembuangan obat yang rusak, kedaluwarsa, atau tidak terpakai merupakan langkah untuk mencegah pencemaran lingkungan, penyalahgunaan obat, dan dampak negatif terhadap kesehatan masyarakat. Namun, banyak anggota masyarakat yang belum memahami prosedur pembuangan obat yang benar, sehingga praktik pembuangan yang tidak tepat masih terjadi. Penelitian ini bertujuan untuk mengetahui hubungan antara tingkat pengetahuan, sikap, dan praktik pembuangan obat pada masyarakat RW 002, Desa Karang Kemiri. Penelitian ini merupakan studi analitik dengan desain *cross-sectional* yang melibatkan 100 responden yang dipilih melalui teknik *purposive sampling*. Data dikumpulkan menggunakan kuesioner yang telah melalui uji validitas dan reliabilitas, kemudian dianalisis menggunakan metode univariat dan bivariat; uji *Chi-square* digunakan untuk menganalisis hubungan antara pengetahuan dan praktik, sedangkan uji *Fisher’s exact* digunakan untuk hubungan antara sikap dan praktik karena terdapat satu sel dengan nilai harapan (*expected count*) kurang dari 5, dengan tingkat signifikansi $\alpha = 0,05$. Hasil penelitian menunjukkan bahwa 85% responden memiliki tingkat pengetahuan rendah, 57% memiliki sikap

negatif, dan 91% melakukan praktik pembuangan obat yang kurang baik. Ditemukan hubungan yang signifikan antara tingkat pengetahuan dan praktik pembuangan obat (uji *Chi-square*, $p < 0,001$) serta antara sikap dan praktik pembuangan obat (uji *Fisher's exact*, $p = 0,005$). Sebagai kesimpulan, tingkat pengetahuan dan sikap memiliki hubungan yang signifikan dengan praktik pembuangan obat pada masyarakat RW 002, Desa Karang Kemiri. Mengingat desain penelitian yang bersifat *cross-sectional*, temuan ini menunjukkan adanya hubungan (asosiasi) dan bukan hubungan sebab-akibat, serta dapat menjadi dasar pengembangan intervensi edukasi di masa mendatang untuk meningkatkan praktik pembuangan obat rumah tangga yang aman dan tepat.

How to Cite: (citation style AMA 11th Ed.)

Widyandari A, Azzahra N, Nilasari P, Putri AU. Association of knowledge and attitude with household drug disposal practices in Karang Kemiri Village. *Jurnal Riset Kefarmasian Indonesia*. 2026;8(3):243-254. doi:10.33759/jrki.v8i3.1062

INTRODUCTION

Household storage of medicine is common in Indonesia, encompassing both drugs currently in use and leftover medicine that is no longer needed. This habit is often not accompanied by proper management, causing medicines to accumulate until they expire; more than half of stored medicines are reportedly not used appropriately, creating the potential for household pharmaceutical waste. Leftover, damaged, and expired medicines kept in households constitute hazardous and toxic waste, since they contain active chemical substances that can endanger health if not handled correctly, indicating that drug management at the household level still requires attention.¹

In this manuscript, drug disposal is used as the principal term and is operationally defined as the practice of discarding, destroying, or returning damaged, expired, or unused medicines through proper, safe procedures—such as controlled destruction at home or the use of pharmacy/medicine take-back programs—so as to prevent environmental contamination, drug misuse, and other negative health impacts. This term is distinguished from the broader concept of household drug management, which additionally encompasses the storage and use of medicines, and from pharmaceutical waste, which refers to the resulting waste material rather than the disposal practice itself. Although related terms such as medicine disposal, destruction of medicine, and pharmaceutical waste management appear in the literature cited throughout this manuscript, drug disposal is used consistently hereafter to refer to the specific practice measured in this study.

Improper drug disposal such as discarding medicines into household trash, water drainage systems, or through open burning can cause environmental pollution, ecosystem disruption, an increased risk of antibiotic resistance, and even drug misuse or illegal circulation, underscoring the need for public understanding and awareness of safe disposal procedures.²

Nevertheless, previous studies indicate that many community members still do not understand the correct procedures for drug disposal. Several reports describe practices such as discarding medicines directly into the trash or drainage system without considering the resulting risks, reflecting persistently low public literacy regarding drug disposal.³ This lack of understanding is inseparable from limited public access to information on safe disposal procedures; education on household drug management remains uneven, so many community members are unaware of the recommended steps, reinforcing the importance of the role of health workers in providing sustained health education.⁴

A study conducted in Ngrayun, Ponorogo, found that although most respondents were already aware that careless drug disposal can have negative consequences, their knowledge of the correct disposal method remained low, indicating that awareness alone is not sufficient to drive appropriate behavioral change.⁵ This gap between knowledge and practice is one of the challenges in household drug disposal, since individuals who are aware of the risks do not necessarily adopt appropriate behavior; a more comprehensive approach is therefore required to promote behavioral change, as both internal and external factors can influence the consistency between what is known and what is practiced. Beyond knowledge, attitude also plays an important role in shaping individual behavior, reflecting a person's tendency to respond to a given object, which subsequently influences the decisions and actions taken. The Knowledge, Attitude, Practice (KAP) framework assumes that knowledge serves as the foundation for attitude formation, and that attitude in turn may influence a person's practice. However, several studies have found that this relationship is not always linear or significant,⁶ indicating that other factors also play a role in shaping behavior.

Other studies have reported a significant relationship between knowledge, action, and public perception regarding drug management, indicating inconsistency across research findings and, consequently, a need for further investigation.⁷ Studies conducted in several other regions likewise show that community knowledge of drug disposal remains low to moderate; findings from Padaelo Village, for example, indicated that the level of public knowledge concerning drug disposal was still low, suggesting that more intensive education efforts are still required.

On the other hand, community practice in disposing of medicines also remains suboptimal. Many community members discard medicines without any special treatment, such as crushing them or mixing them with other substances before disposal, indicating that safe drug disposal practices have not yet become customary in the community.⁸

This issue can be examined across global, national, and local levels. Globally, pharmaceutical waste is an increasing source of environmental pollution; nationally, the high rate of household drug storage contributes to a growing volume of drug waste; and locally, low knowledge, attitude, and practice regarding proper drug disposal are still found. To date, no data specifically describe the relationship between knowledge level, attitude, and drug disposal practices among the community of RW 002, Karang Kemiri Village, Belitang Sub-district, East Ogan Komering Ulu Regency. This study therefore aimed to determine the association between knowledge level and attitude toward drug disposal practices among this community, so that the findings may serve as a basis for planning more effective health education and intervention programs.

METHODS

This study used a quantitative method with an analytic observational design and a cross-sectional approach⁹, in which the variables of knowledge, attitude, and drug disposal practice were measured at the same point in time. The study was conducted in RW 002, Karang Kemiri Village, Belitang Sub-district, East Ogan Komering Ulu Regency, from June to July 2026.

The population comprised all residents of RW 002, Karang Kemiri Village aged 19 years or older who had ever owned or stored medicine at home. Sampling used a purposive technique, in which respondents had to meet the following inclusion criteria: aged 19 years or older; had ever stored or owned medicine at home; and resided in RW

002, Karang Kemiri Village. Respondents were excluded if they were unwilling to participate or had difficulty communicating. For descriptive purposes, respondents' age was subsequently grouped into three categories, as presented in Table 3. The minimum required sample size was estimated using the Slovin formula ($N = 800$; $e = 10\%$), which yielded 89 respondents; this figure served as a reference in determining the final sample of 100 respondents obtained through purposive sampling.

Primary data were collected directly through a structured questionnaire completed by residents of RW 002, Karang Kemiri Village. Prior to use, the questionnaire was tested for validity and reliability among a separate group of 30 respondents who were not included in the main study sample of 100 respondents. An item was considered valid if the calculated r exceeded the r -table value (0.361 at a significance level of 0.05); reliability was assessed using Cronbach's alpha, with a value greater than 0.70 indicating that the instrument was reliable.¹⁰ Data processing followed five stages: editing, coding, data entry, data cleaning, and tabulating.¹¹

Data were analyzed in two stages. Univariate analysis was used to describe the characteristics of each variable. Knowledge and drug disposal practice were each measured using a structured questionnaire scored as correct/appropriate (score 1) or incorrect/inappropriate (score 0) per item, whereas attitude was measured using a four-point Likert-type scale (Always = score 4, Often = score 3, Sometimes = score 2, Never = score 1). For each variable, the total score obtained was converted into a percentage and categorized as good/positive ($\geq 75\%$) or poor/negative ($< 75\%$)⁹. Bivariate analysis was performed using the Chi-square test to examine the association between the independent variables (knowledge level and attitude) and the dependent variable (drug disposal practice), with a significance level of $\alpha = 0.05$; a p -value ≤ 0.05 indicated a significant association between the independent and dependent variables, while a p -value > 0.05 indicated no significant association. Fisher's exact test was used instead of the Chi-square test whenever the 2×2 contingency table did not meet the Chi-square assumption, i.e., when the expected count in any cell was below 5.¹²

The operational definitions of the research variables are presented in Table 1.

Ethical Considerations. This study was approved by the [Health Research Ethics Committee of — INSTITUTION NAME TO BE COMPLETED BY AUTHORS —], under approval number [— APPROVAL NUMBER TO BE COMPLETED —], dated [— APPROVAL DATE TO BE COMPLETED —]. Prior to data collection, the purpose and procedures of the study were explained to all prospective respondents, and written or verbal informed consent was obtained from each participant before administration of the questionnaire. Respondent confidentiality and anonymity were maintained throughout data processing and analysis by using numerical respondent codes instead of personal identifying information.

Table 1. Operational definitions of research variables

Variable	Operational Definition	Measuring Instrument	Result Category	Scale
Knowledge level	Respondents' ability to understand the procedures for safe, proper drug disposal	Questionnaire	Good $\geq$ 75% Poor $<$ 75%	Ordinal
Attitude	Respondents' tendency to support proper, standard-compliant drug disposal practice	Questionnaire (Likert)	Positive $\geq$ 75% Negative $<$ 75%	Ordinal
Drug disposal practice	Respondents' practice of destroying medicine in accordance with safe, proper procedures	Questionnaire	Good $\geq$ 75% Poor $<$ 75%	Ordinal

Source: Research data, 2026

RESULTS AND DISCUSSION

This study aimed to evaluate the association between the knowledge and attitude of the community of RW 002, Karang Kemiri Village and their drug disposal practices, involving a total of 100 respondents. Data were collected through a questionnaire covering knowledge level, attitude, and drug disposal practice; the questionnaire was tested for validity and reliability before use, and the collected data were analyzed using Statistical Package for the Social Sciences (SPSS) software and Microsoft Excel.

Validity and Reliability of the Research Instrument

Validity testing was carried out among a separate group of 30 respondents, distinct from the 100 respondents of the main study, to ensure that each questionnaire item accurately measured the intended variable. An item was considered valid if its calculated *r*-value exceeded the *r*-table value of 0.361. Of the nine knowledge items tested, the *r*-values ranged from 0.410 to 0.850, all exceeding the *r*-table value, so all items were declared valid. For the ten attitude items, *r*-values ranged from 0.378 to 0.876, and all items were likewise declared valid. Of the ten practice items, nine items were valid ($r = 0.555\text{--}0.767$); one item produced an *r*-value of 0.317, below the *r*-table value, and was therefore excluded from further analysis. The reliability test produced Cronbach's alpha values of 0.841 for knowledge, 0.875 for attitude, and 0.820 for practice, all of which exceeded the minimum threshold of 0.70, indicating that all three research instruments were reliable (Table 2).

Table 2. Validity and reliability test results

Variable	r-value Range	r-table	Cronbach's Alpha	Status
Knowledge (9 items)	0.410–0.850	0.361	0.841	Valid & reliable
Attitude (10 items)	0.378–0.876	0.361	0.875	Valid & reliable
Practice (10 items)	0.317–0.767 (9 valid, 1 excluded)	0.361	0.820	Valid & reliable

Source: Primary data processed with SPSS, 2026

These results indicate that the questionnaire met standard validity and reliability requirements, supporting the credibility of the knowledge, attitude, and practice measurements used in this study.

Characteristics of Respondents

Table 3. Characteristics of respondents (n = 100)

Characteristic	Category	n	%
Sex	Male	27	27%
	Female	73	73%
Age group	19–25 years	29	29%
	26–40 years	40	40%
	41–60 years	31	31%
Occupation	Farmer	5	5%
	Self-employed	5	5%
	Housewife	36	36%
	Student	22	22%
	Civil servant	17	17%
	Military/Police	4	4%
	Other	11	11%
Education	Elementary school	6	6%

Characteristic	Category	n	%
	Junior high school	11	11%
	Senior high school	35	35%
	Diploma	8	8%
	Bachelor's degree	37	37%
	Other	3	3%

Source: Research data, 2026

Of the 100 respondents, most were female (73%). This distribution may reflect household medicine-management roles reported in previous studies, in which women, particularly housewives, are typically responsible for storing medicine at home, administering it to sick family members, and deciding how to handle damaged, unused, or expired medicine, giving them greater exposure to household drug conditions. A comparable pattern has been reported in a national household drug-management study and in research showing that women play a significant role in decisions concerning the use, storage, and disposal of medicine at home.¹³

Most respondents (40%) were aged 26–40 years, i.e., within the productive adult range, a group generally more involved in household decision-making, including decisions on the use, storage, and disposal of unused or expired medicine, since this life stage is typically associated with more active management of family health. This pattern is consistent with findings that productive-age adults are the most active group in storing and discarding medicine at home and play an important role in medicine-related decision-making, underscoring the importance of targeting health education toward this age group.¹³

By occupation, most respondents were housewives (36%), reflecting their central role in household drug management, from storage and use to the disposal of damaged or expired medicine, which gives them broader knowledge of the household medicine supply than other family members. By education, most respondents held a bachelor's degree (37%), followed by senior-high-school graduates (35%), indicating a generally moderate-to-high education level. Although this study did not statistically test the association between educational attainment and knowledge, attitude, or practice, prior literature suggests that higher educational attainment is associated with an individual's capacity to receive and understand health information, including the proper management and disposal of medicine, such that individuals with higher education tend to better understand the risks of improper disposal and the importance of following correct disposal procedures. This respondent characteristic is therefore consistent with, though not direct evidence for, studies reporting that higher education is associated with better understanding and practice in household drug management, and that education level is related to community behavior in household drug management.¹⁴

Distribution of Knowledge, Attitude, and Practice**Table 4.** Distribution of knowledge level, attitude, and drug disposal practice (n = 100)

Variable	Category	n	%
Knowledge level	Poor	85	85%
	Good	15	15%
Attitude	Negative	57	57%
	Positive	43	43%
Drug disposal practice	Poor	91	91%
	Good	9	9%

Source: Research data, 2026

As shown in Table 4, the majority of respondents had poor knowledge of drug disposal, indicating that most of the community does not yet understand the correct and safe disposal procedure. This gap most plausibly reflects limited exposure to targeted information and education on managing expired medicine at home, rather than a general lack of health awareness; left unaddressed, it increases the risk that medicines will be discarded carelessly, with consequent environmental harm and potential misuse by irresponsible parties.

These findings are consistent with research showing that community information on household drug management, including storage and disposal, still needs to be strengthened through sustained education programs, and with a systematic review indicating that public understanding of safe drug disposal methods generally remains low, highlighting the need for health-promotion measures to improve community knowledge and practice regarding proper drug disposal.¹⁵

Consistent with the knowledge gap described above, most respondents also held a negative attitude toward drug disposal (Table 4), suggesting that low awareness of correct procedures extends beyond factual knowledge to the values and beliefs that motivate action. This negative attitude may stem from limited understanding of the health and environmental consequences of improper disposal, whereas the smaller group with a positive attitude appeared more conscious of the role of proper disposal in preventing environmental damage and medicine misuse.¹⁶ Continued education programs are therefore needed to strengthen a positive community attitude toward proper drug disposal.

This pattern of low knowledge and negative attitude was mirrored in practice, where the large majority of respondents had not yet adopted the recommended drug disposal procedure (Table 4). Rather than an isolated behavioral lapse, this appears to be a downstream consequence of the knowledge and attitude gaps described above, compounded by limited information about managing unused or expired household medicine; in practice, this leads many people to discard medicine together with household waste or into drainage channels without proper destruction¹⁴. This finding is consistent with a systematic review indicating that community drug disposal practices

remain low and are influenced by limited education and the lack of safe disposal facilities, underscoring the continued importance of education to improve safe and correct drug disposal practice .

Relationship Between Knowledge Level and Drug Disposal Practice

Table 5. Relationship between knowledge level and drug disposal practice

Knowledge Level	Practice: Poor n (%)	Practice: Good n (%)	Total	p-value*
Poor	82 (82.0)	3 (3.0)	85 (85.0)	<0.001
Good	9 (9.0)	6 (6.0)	15 (15.0)	
Total	91	9	100	

Source: Research data, 2026

**Fisher's exact test was used because one expected cell count (Good knowledge–Good practice) was below 5; the result was consistent with the Chi-square test ($p < 0.001$).*

Among the 85 respondents with poor knowledge, the majority (82; 82.0%) also showed poor drug disposal practice. Because one expected cell count was also below 5 in this table, the association was confirmed using Fisher's exact test, which showed a significant association between knowledge level and drug disposal practice among the community of RW 002, Karang Kemiri Village ($p < 0.001$), consistent with the Chi-square result. This low level of knowledge indicates that most community members do not yet understand the correct method for disposing of expired, damaged, or unused medicine, which may lead them to discard medicine directly into the trash or drainage system without proper destruction, thereby increasing the risk of environmental pollution and drug misuse.

This finding is in line with research indicating that low community knowledge of household pharmaceutical waste management is associated with improper drug disposal practice, and with a nationwide study showing that communities with better knowledge tend to have better household drug-management practices, including in the storage and disposal of unused medicine, underscoring the need to strengthen drug disposal education through health workers and health-promotion programs so that community knowledge improves and encourages correct disposal practice.¹⁵

Relationship Between Attitude and Drug Disposal Practice

Table 6. Relationship between attitude and drug disposal practice

Attitude	Practice: Poor n (%)	Practice: Good n (%)	Total	p-value*
Negative	56 (56.0)	1 (1.0)	57 (57.0)	0.005*
Positive	35 (35.0)	8 (8.0)	43 (43.0)	
Total	91	9	100	

Source: Research data, 2026

*Fisher's exact test was used instead of the Chi-square test because one expected cell count (Positive attitude–Good practice) was below 5 (expected = 3.87).

Of the 57 respondents with a negative attitude, 56 showed poor drug disposal practice and only one showed good practice; of the 43 respondents with a positive attitude, 35 still showed poor practice and 8 showed good practice. Because one expected cell count was below 5, Fisher's exact test was used instead of the Chi-square test and showed a significant association between attitude and drug disposal practice among the community of RW 002, Karang Kemiri Village ($p = 0.005$). Most respondents with a negative attitude tended to show poor drug disposal practice, while some respondents with a positive attitude still showed poor practice, indicating that practice is not influenced solely by attitude but also by other factors, such as limited information, education, and the availability of medicine take-back programs.

This finding is consistent with research showing that community attitude toward drug use and disposal is associated with household drug-management practice, and that education and increased public awareness are needed to encourage safer drug disposal practice.¹⁷

This study has several limitations that should be considered when interpreting the findings. The cross-sectional design limits the ability to draw causal conclusions regarding the relationship between knowledge, attitude, and drug disposal practice. The purposive sampling technique and the single-village setting also limit the generalizability of the findings to other populations. In addition, data were collected using a self-reported questionnaire, which may be subject to recall or social-desirability bias. Future research using a broader sample and a longitudinal design is recommended to strengthen these findings.

CONCLUSION

This study shows that a significant association exists between knowledge level and drug disposal practice ($p < 0.001$) and between attitude and drug disposal practice ($p = 0.005$) among the community of RW 002, Karang Kemiri Village, with most respondents demonstrating poor knowledge (85%), a negative attitude (57%), and poor drug disposal practice (91%). These findings indicate that knowledge and attitude are important factors associated with drug disposal behavior at the household level and highlight the substantial gap between current community practice and the recommended disposal procedure; given the cross-sectional design, these associations should not be

interpreted as causal. The results are expected to serve as a basis for designing targeted health-education and intervention programs, particularly for women, housewives, and other key household decision-makers, to improve community knowledge and attitude and thereby encourage safer and more compliant drug disposal practices, with potential future application in community pharmaceutical-waste management programs at the village and regional level.

FUNDING

This research received no external funding.

ACKNOWLEDGMENTS

The authors would like to thank the head and residents of RW 002, Karang Kemiri Village, Belitang Sub-district, East Ogan Komering Ulu Regency, for their participation and cooperation during data collection, and Universitas Kader Bangsa Palembang for its institutional support throughout this research.

AUTHOR CONTRIBUTION STATEMENT

AW: Conceptualization, Methodology, Investigation, Data curation, Formal analysis, Writing – original draft; NA: Supervision, Validation, Writing – review and editing; PN: Supervision, Validation, Writing – review and editing; AUP: Supervision, Validation, Writing – review and editing.

CONFLICT OF INTEREST DECLARATION

The authors declare no conflict of interest.

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