ACADEMIC HOSPITAL JOURNAL

Volume 5, No. 2, September 2023

ISSN 2615-6253 (ONLINE)
ISSN 2615-6245 (PRINT)

Sociodemographic Associations with Knowledge of Storage and Expiration Time of Medicines in the Community of Bantul

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Submitted: December 2023 Publish: December 2023

Abstract

Background: Storing medicines is a crucial thing to do because storing medicines will affect the stability and effectiveness of the stored medicines. Drug storage is closely related to the expiration time of the drug. **Objectives**: The aim of this study was to determine the relationship between sociodemographic and the level of public knowledge about drug storage and drug expiration.

Materials and Method: This study employed a cross-sectional survey study method. The sample was the residents of Bantul Regency taken using convenience sampling, in the data collection period September-November 2023, with a total of 104 respondents. The questionnaire included sociodemographic data, storage domain and drug expiration time, distributed on Google form. Data were analysed descriptively and using the Chi-square statistical test with $p<0.05$.

Results: The research results showed that 61 (58.7%) respondents had a good level of knowledge of drug storage, 43 (41.3%) and 82 (78.8%) respondents had a good level of knowledge of drug expiration. There is a relationship between gender ($p=0.032$) and occupation ($p=0.041$) with the level of knowledge of drug storage and there is a relationship between income ($p=0.025$) and the level of knowledge of drug expiration. **Conclusion:** Effective and targeted education is needed to the community regarding drug storage and drug expiration time.

Keywords: *Bantul regency, drug expiration, drug store, health literacy, knowledge*.

1. Introduction

The act of storing medicine is a natural and common thing to do by the community after using medicine, usually people store medicine in the nearest place when they take medicine or in a medicine storage area that they have provided themselves. In fact, drug storage is very important and crucial to the quality and stability of drugs.

Based on the results of the Basic Health Research in 2013 by the Ministry of Health of the Republic of Indonesia stated that 35.2% of the community stored drugs and of the stored drugs, 82% were over-the-counter drugs, 27.8% were antibiotics, 15.7% were traditional medicines, 35.7% were hard drugs, and 6.4% were unidentified drugs (1). However, based on research by Meidia Savira et al (2020) showed that 42.9% of respondents did not read the drug storage conditions on the packaging, and 42.9% of respondents stored drugs in conditions that were accessible to children. Based on this data, there are still many people who do not know about good drug storage, so it is necessary to have appropriate education and interventions to increase public knowledge related to drug storage and drug expiration time (2).

Drug storage is closely related to expiration time, drug preparations have an expiration time when used or known as the *Expired Date* is the time limit for the use of drugs after being produced by pharmaceutical factories, before the packaging is opened. *Expired Date* is the time when the drug is no longer suitable for use based on the quality, efficacy, and safety of the drug (3). Often people think that the expiration time of drugs before and after the packaging is opened is the same thing, even though both have significant differences.

In terms of pharmacy, the determination of drug expiration time before and after the main packaging is opened has a different meaning. After the drug is first opened, it does not refer to the *expiration time* (*Expired Date*), but to the *Beyond Use Date* or commonly called BUD, which is the time limit for the use of a medicinal product after the main packaging is opened, BUD can have the same time as the *Expired Date* or it can be different.

If in daily activities the term *Expired Date is* already known or familiar to the wider community, but the term *Beyond Use Date is* often rarely heard or even never heard among the public. Based on research conducted by Kusuma et al (2020), it shows that the understanding of the Kecepit village community regarding *Beyond Use Date is* still lacking. It cannot be denied that people are more familiar with the term *Expired Date* than *Beyond Use Date*, this is because medicines that are often consumed by the public usually only include the *Expired Date* and rarely write the *Beyond Use Date* (4).

Knowledge about drug storage and expiry time is very important for the community because it is closely related to the quality and potential efficacy of the drug. Storage of drugs in inappropriate places or conditions will also affect the stability of the drug, which in turn will affect the therapeutic effectiveness of the drug. It is also important for the public to know about the expiry date of medicines as it can have a negative impact. Drugs that have passed their expiry date are prone to decreased potency and chemical changes. Consumption of expired drugs can also cause adverse health effects such as poisoning (5).

2. Materials and Method

Research Design

This research design is quantitative using *cross-sectional* study. This research was conducted using a survey and sought information collected in the form of primary data related to the level of knowledge of drug storage and drug expiration time in Bantul Regency. This research was conducted from October 2023 to November 2023 online for the general public of Bantul Regency.

Data Collection

The method of data collection was by distributing questionnaires online through Google Form, the link was then disseminated through social media with a brief introduction to the research and a consent form. Only people who agreed to fill out the form and were eligible were allowed to complete the questionnaire.

The population in this study was the people of Bantul Regency aged ≥18 years who performed medicine storage activities. The Ethics

Committee of FKKMK Universitas Gadjah Mada (KE/FK/1678/EC/2023) approved this research. The sampling method used was purposive sampling. Determination of the sample size was carried out using the following sample formula:

$$n = (Z_{(1-a)})^2 P (1 - P))/d^2$$

The sample size uses the Lameshow formula with a proportion value of the dependent and independent variables of 50% and an absolute precision of 10% (6). So the sample size was calculated as 96 and rounded up to 100 respondents as the final sample size.

Data were collected using a questionnaire and the instrument was compiled based on previously published research articles. Then the instrument was carried out reliability testing on 30 respondents outside the research respondents, based on the results of the reliability test showed that the questionnaire was reliable as evidenced by the Cronbach Alpha value of 0.739 so that it met the requirements (>0.6). Then the validity of the instrument is carried out with content validity evaluated by expert judgement discussion with the supervisor, the questionnaire consists of four parts as follows:

The first section consists of an introduction that contains the respondent's willingness to participate in the study and fill in the captcha, the second section is the respondent's identity containing name, address, age, education, occupation, and income. Then in the third section is a statement about public knowledge of drug storage and the fourth section is a statement about public knowledge of drug expiration time.

Data Analysis

Data was analysed using SPSS software, firstly the data was transferred into IBM SPSS. Then descriptive statistics such as mean, median, min, max, and standard deviation were used to reveal various parameters. Normality test using Kolmogorov-Smirnov, relationship testing for both variables using Chi-square test, decision making in Chi-square test using cross tabulation in SPSS programme with significance level $p<0.05$.

3. Result

Table I. Sociodemographic Characteristics of Respondents

Sociodemographics and Characteristics of Respondents	Total (N) = 104	Percentage (%)
Age		
18-25 years (early adolescence-adulthood)	32	30,8
26-45 years (adult)	27	26,0
46-59 years (early elderly)	40	38,5
60-74 years (elderly)	5	4,81
Gender		
Male	36	34,6
Women	68	65,4
Education		
Not completed primary school	2	1,9
Primary School	2	1,9
Junior High School	1	1,0
Senior High School	31	29,8
D3, S1 / College / further education	68	65,4
Jobs		
Not working	10	9,6
Student	20	19,2
Civil Servant	6	5,78
Private	37	35,6
Retired	6	5,8
More	25	24,0
Revenue		
<1,200,000 IDR	33	31,7
1,200,000-3,000,000 IDR	36	34,6

3,001,000-5,000,000 IDR	19	18,3
5,001,000-10,000,000 IDR	11	10,6
>10,000,000 IDR	5	4,8

The characteristics of the patients as shown in Table I, based on age in this study the most were in the age group 46-59 years as many as 38.5% of the total 104 respondents and female sex 65.4% of respondents. The last education of most respondents had the last education D3, S1 / further education. Respondents in this study mostly work as private employees 35.6% with the majority earning IDR 1,200,000 - IDR 3,000,000 by 31.7%.

Table II. Categories of Knowledge Level of Medicine Storage and Expiration Time

No.	Domain	Category	Number (N)	Percentage (%)
1.	Medicine Storage Knowledge Level	Good	61	58,7
		Less	43	41,3
2.	Medicine Expiration Time Knowledge Level	Good	82	78,8
		Less	22	21,2

The results of testing the level of knowledge of drug storage and drug expiration time in the community of Bantul Regency, out of a total of 104 respondents, 61 (58.7%) respondents had a good level of knowledge of drug storage and 43 (41.3%) had a poor level of knowledge. As for the level of knowledge of drug expiration time, 82 (78.8%) respondents had a good level of knowledge and 22 (21.2%) respondents had a poor level of knowledge.

Table III. Distribution of Respondents' Answers Based on Statement Items on Drug Storage and Drug Expiration Time

No.	Questionnaire Statement	N(%)	
		Exactly	Inappropriate
Medicine Storage Knowledge			
1.	Tablets and capsules can be stored where children can reach them.	89 (85,6)	15 (14,4)
2.	Tablets and capsules can be stored in any place in the house (Bathroom, Bedroom, Kitchen, Dining Table).	96 (92,3)	8 (7,7)
3.	Tablet medication is best stored in the refrigerator as the temperature is relatively constant	70 (67,3)	34 (32,7)
4.	Medicines should be kept in the original packaging and with the complete etiquette.	99 (95,2)	5 (4,8)
5.	A medicine box is the best place to store tablets and capsules.	94 (90,4)	10 (9,6)
6.	Store the tablets in a place protected from sunlight.	103 (99,0)	1 (1,0)
7.	All types of medicinal preparations can be stored refrigerated (2-8°C).	65 (62,5)	39 (37,5)
8.	The medicine is stored in a clean and well-sealed container	104 (100)	0 (0,0)
9.	The method of drug storage for all types of medicinal preparations is the same	80 (76,9)	24 (23,1)
10.	The storage temperature of tablet medicine does not need to be considered because the medicine remains stable in a wide range of temperatures	77 (74)	27 (26,0)

11.	Medicine in the form of suppositories and ovules can be stored at room temperature	30 (28,8)	74 (71,2)
12.	Medicines in the form of syrups and solutions should be kept refrigerated	42 (40,4)	62 (59,6)
13.	Eye drops should not be stored for more than 30 days if the pack has been opened.	71 (68,3)	33 (31,7)
14.	Unopened insulin packs should be stored in a refrigerator at 2-8° C, but should not be frozen.	64 (61,5)	30 (38,5)
15.	Eye ointment medicine can be stored in a humid place	59 (56,7)	45 (43,3)
Medicine Expiry Time Knowledge			
1.	*Expiration Date* is the time limit for using the medicine after it is produced by the pharmaceutical manufacturer, before the packaging is opened.	93 (89,4)	11 (10,6)
2.	*Beyond Use Date* is the time limit for using a medicinal product after the main packaging has been opened.	88 (84,6)	16 (15,4)
3.	If the main packaging has not been opened, the medicine can be stored for as long as possible	81 (77,9)	23 (22,1)
4.	*Beyond Use Date* and *Expired Date* are the same thing	82 (78,8)	22 (21,2)
5.	Medicine can still be stored even if it has changed colour, taste and texture	99 (95,2)	5 (4,8)
6.	Drug storage duration does not depend on the type of preparation	64 (61,5)	40 (38,5)
7.	*The Expiry Date is* always listed on the medicine packaging	101 (97,1)	3 (2,9)
8	*Expiry date* on all types of drug preparations is the same	94 (90,4)	10 (9,6)
9.	*Beyond Use Date* on all types of drug preparations is the same	79 (76,0)	25 (24,0)
10.	Using medicine past the *Expiry Date* and *Beyond Use Date* will reduce the safety and effectiveness of the medicine.	100 (96,2)	4 (3,8)

Based on Table III, the distribution of respondents' answers for each item of the drug storage statement is presented, the highest respondent knowledge about drug storage is in statement question number eight, namely "The medicine is stored in a clean and well-sealed container" with a total of 104 (100%) respondents answering correctly and 0 (0.0%) respondents answering incorrectly. Meanwhile, the lowest respondent knowledge was in statement number eleven, namely "Drugs in the form of suppositories and ovules can be stored at room temperature" with 30 (28.8%) respondents answering the statement correctly and 74 (71.2%) respondents answering the statement incorrectly.

Based on Table III, it is presented that the highest knowledge of respondents about drug expiration time is in statement question number seven, namely "*Expired Date is* always listed on the drug packaging" with a total of 101 (97.1%) respondents answering correctly and 3 (2.9%) respondents answering incorrectly. Meanwhile, the lowest respondent knowledge was in statement item number six, namely "The length of drug storage does not depend on the type of preparation" with a total of 64 (61.5%) respondents answering the statement correctly and a total of 40 (38.5%) respondents answering the statement incorrectly.

Table IV. Sociodemographic Associations with Knowledge Level of Drug Storage and Drug Expiration Time

No.	Sociodemographic Characteristics		Medicine Storage Knowledge Level	Medicine Expiration Time Knowledge Level
			P-value	
1	Age	≤ 45 Years > 45 Years	0,295	0,222
2	Gender	Male Women	0,032*	0,846
3	Last Education	Diploma/Bachelor's degree Non-diploma/non-graduate	0,376	0,485
4	Jobs	Work Not Working	0,041*	0,068
5	Revenue	High Low-medium	0,843	0,025*

*Significant at p<0.05

Based on the *Chi-square* test shown in (Table IV), age has no relationship with the level of knowledge of drug storage and drug expiration time. From the test results it was also found that gender has a significant relationship with the level of knowledge of drug storage, but has no relationship with the level of understanding of drug expiration time. Furthermore, according to the test results, occupation has a relationship with the level of knowledge of drug storage but has no relationship with the level of knowledge of drug expiration time. Then for the last factor, namely income, which is related to the level of drug storage knowledge, but not related to the level of drug expiration time knowledge.

4. Discussion

The characteristics of the patients as shown in Table I, based on age in this study the most were in the age group 46-59 years as many as 38.5% of the total 104 respondents and female sex 65.4% of respondents. The last education of most respondents had the last education D3, S1 / further education. Respondents in this study mostly work as private employees 35.6% with the majority earning IDR 1,200,000 - IDR 3,000,000 by 31.7%. This result is due to the distribution of questionnaires aimed at the people of Bantul Regency which is included in the Yogyakarta Special Region which has a UMP (Provincial Minimum Wage) of IDR 1,981,782.39 (7). Age is an influential factor in drug storage practices because with increasing age the risk of disease or the risk of weakening the body's immune system becomes higher, this is due to naturally declining physical conditions commonly known as the aging process (8). In research related to community knowledge and understanding related on how to get drugs, use, store, and dispose of medicines properly, the highest is in the age range of 46-59 years because people in that age range carry out a lot of drug storage activities (9).

Other results also mentioned that women have more time at home as housewives than men who have to work. In addition, women also have a level of concern that is more than men, women are also more concerned about their health conditions so that women carry out more drug storage activities (10). Classification of level knowledge of drug storage and drug expiration is based on expert judgment, which is an expert in pharmaceutical management and social pharmacy. The results of testing the level of knowledge of drug storage and drug expiration time in the community of Bantul Regency, out of a total of 104 respondents, 61 (58.7%) respondents had a good level of knowledge of drug storage and 43 (41.3%) had a poor level of knowledge. As for the level of knowledge of drug expiration

time, 82 (78.8%) respondents had a good level of knowledge and 22 (21.2%) respondents had a poor level of knowledge. These results indicate that the level of knowledge of the people of Bantul Regency about drug storage and drug expiration time is mostly classified as good. This is different from the results of research conducted by Sari et al (2021) on the level of knowledge of drug storage at home in the Banjarbaru community, South Kalimantan, which found that people with a low level of knowledge were 39.2%, 44.5% were sufficient, and 16.1% had a high level of knowledge. Another study on the level of public knowledge of drug expiration in Sukaragam Village stated that a total of 31.9% of the community belonged to a high level of knowledge, 48.4% belonged to a moderate level of knowledge, and a total of 19.8% belonged to the less category (Table II).

Based on Table III, the distribution of respondents' answers for each item of the drug storage statement is presented, the highest respondent knowledge about drug storage is in statement question number eight, namely "The medicine is stored in a clean and well-sealed container" with a total of 104 (100%) respondents answering correctly and 0 (0.0%) respondents answering incorrectly. Based on these results, it can be seen that the community has a good understanding of drugs that must be stored in clean and well-sealed containers, according to the Ministry of Health (2021) drug storage must be in its original place with clean and well-sealed containers. Meanwhile, the lowest respondent knowledge was in statement number eleven, namely "Drugs in the form of suppositories and ovules can be stored at room temperature" with 30 (28.8%) respondents answering the statement correctly and 74 (71.2%) respondents answering the statement incorrectly. Storage of drugs in special preparations also requires special storage, such as ovules and suppositories which require special storage, namely by storing preparations in a refrigerator at a temperature of (2-8 ° C) (11).

Based on Table III, it is presented that the highest knowledge of respondents about drug expiration time is in statement question number seven, namely "Expired Date is always listed on the drug packaging" with a total of 101 (97.1%) respondents answering correctly and 3 (2.9%) respondents answering incorrectly. Based on these results, the community already understands that the expiration date or Expired Date is always listed on the drug packaging, according to Sari et al (2021) said that the Expired Date is always listed on the drug packaging, this is done so that people can more easily avoid using medicines that have passed their lifespan, this helps prevent potential health risks that can arise from using expired drugs. Meanwhile, the lowest respondent knowledge was in statement item number six, namely "The length of drug storage does not depend on the type of preparation" with a total of 64 (61.5%) respondents answering the statement correctly and a total of 40 (38.5%) respondents answering the statement incorrectly, Proper drug storage is highly dependent on the type of drug preparation, each type of drug has specific characteristics, including active ingredients, formulations, and conditions that affect stability, such as solid preparations with liquid preparations having different storage conditions and storage lengths (12).

Based on the *Chi-square* test shown in (Table IV), age has no relationship with the level of knowledge of drug storage and drug expiration time. this is due to the different conditions of respondents where age is a factor that is easily influenced by other things, besides that there are technological advances so that people can access information and do not depend on how old they are (13). From the test results it was also found that gender has a significant relationship with the level of knowledge of drug storage, but has no relationship with the level of understanding of drug expiration time. The different results between the level of knowledge of drug storage and drug expiry time are influenced by several things including unequal sample distribution, unbalanced distribution of samples from one gender group to another, it can be seen that women dominate it, variability in sample size between groups can affect Chi-Square results, statement and response characteristics factors when viewed in terms of statements, in drug storage statements are more clear and related to daily experience, this can affect the response rate and accuracy of answers. Then education also

found no relationship to the level of knowledge of drug storage or drug expiration time, this is in line with research conducted by Dhirisma (2022) where the results of the *Chi-Square* test showed that there was no significant relationship between education and knowledge level (14). Furthermore, according to the test results, occupation has a relationship with the level of knowledge of drug storage but has no relationship with the level of knowledge of drug expiration time. These results can be influenced by several factors including the characteristics of the information provided in a particular job field that provides information or special training on drug storage. Then for the last factor, namely income, which is related to the level of drug storage knowledge, but not related to the level of drug expiration time knowledge. these results are influenced by several things including, knowledge priorities in the context of income, respondents with low-medium opinions pay more attention to drug expiration time knowledge related to efficiency and cost savings, while those with high incomes pay more attention to drug storage knowledge (15).

The limitations of this study are that the data collection was carried out online so that it could cause obstacles in filling out the questionnaire, the questions were closed questions so that there was no freedom in expressing the respondents' opinions, and the limited number of samples which resulted in not being able to generalise the level of knowledge of the people of Bantul Regency.

5. Conclusion

The level of knowledge in Bantul Regency is influenced by various factors such as age, gender, education, occupation, and income. The majority of respondents had a good level of knowledge about drug storage and drug expiry time. There is a relationship between gender and occupation with the level of knowledge of drug storage ($p<0.05$), there is a relationship between income and the level of knowledge of drug expiration time ($p<0.05$). Effective and targeted education is needed to the community regarding drug storage and drug expiration time.

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