RESEARCH ARTICLE

Pharmacy student knowledge level regarding the beyond-use date

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Abstract

Background: In daily practice, misunderstandings often arise regarding the expiration date after opening the package of a drug. Beyond Use Date (BUD) is the time limit for using the drug after it has been formulated or prepared or after the primary packaging has been opened or damaged. Students need to understand BUD because BUD is related to the stability and quality of drug preparations. Without proper knowledge of BUD, the provision of information to patients may be misleading and it may lead to unsafe use of the drug. **Objective**: This study aims to determine the level of knowledge of pharmacy students about beyond use date of drugs. **Methods**: A descriptive survey is used in this observational cross-sectional study. The data collection was conducted in June 2022 at the Pharmacy Study Programme, Faculty of Health Sciences, the University of Muhammadiyah Mataram, Indonesia with a total sample of 163 students. **Results**: This study found that 42.9% (n:70) pharmacy students have a 'good' category of knowledge of BUD, while 53.9% (n: 88) have an 'enough' category of knowledge and 3.1% (n:5) have a 'less' category of knowledge. A total of 11.1% (n:18) of students said BUD did not determine drug use, and 42.9% (n:70) said BUD and ED were not the same. **Conclusion**: The average level of knowledge of pharmacy students in the sampled university about Beyond Use Date Drugs is in the sufficient category.

Introduction

Based on the data from the Ministry of Health of the Republic of Indonesia in 2013, 35.2% of 294,959 households in Indonesia store drugs for self-medication (Kemenkes, 2013). The drugs stored in the household include drugs that are currently being used (32.1%), residual medicine (47.0%), and drugs for stock (42.2%) (Kemenkes, 2013). Residual medicine is medicine left over from a doctor's prescription or left over from previous use that has not been used up (Kemenkes, 2013).

This residual medicine results after a proportion has been used and the symptoms of the disease or the disease itself have healed, so it is a shame if the rest of this medicine has to be thrown away (Priyambodo, 2016).

Prescription residual medicine, in general, should not be stored, because it can be misused, damaged, or become expired (Kemenkes, 2013). People cannot arbitrarily store drugs, especially if the drug needs supervision by health workers during the use, such as prescription drugs and antibiotics (Savira *et al*., 2020). Drug storage in the community, if not followed by knowledge about drug storage according to the information stated on the drug packaging or based on existing references can result in irrational drug use or improper drug storage methods (Puspita & Syahida, 2020).

Before using a drug, one of the things that become a benchmark for whether the drug is still suitable for use or not is the Expiry Date (ED). The ED is the time limit for using the drug after it is produced by a pharmaceutical factory before the packaging is opened (Noviani & Arrang, 2021). In the pharmaceutical world,

the ED of a drug, once opened, is called the Beyond Use Date (BUD). BUD is the time limit for the use of drugs after they have been formulated or prepared or after the primary packaging has been opened or damaged (USP, 2018). The definition of BUD and ED is certainly different because ED describes the time limit for the use of medicinal products after they are produced by pharmaceutical manufacturers while BUD is the time limit after the drugs are opened. BUD can be equal to or shorter than ED. ED is listed by pharmaceutical manufacturers on drug product packaging, while BUD is not always listed. Ideally, BUD and ED are determined based on the results of drug product stability tests and are listed on the packaging (Herawati, 2012).

BUD and ED determine the time limit in which a drug product is still in a stable state. A pharmaceutical preparation can be said to be stable if it still has chemical, physical, microbiological, therapeutic, and toxicological characteristics that do not change from the time it is produced until the period of storage and use. Drug stability is expected to be guaranteed not only at the time of delivery of the drugs to patients by health workers, but until they are stored at home or in in-patient rooms and used by the patients. Therefore, whoever receives the drug must understand the factors that need to be considered to maintain the stability of the drug such as storage temperature, light and humidity when storing the drug (Setyani & Dina, 2019).

Providing information to patients by health workers regarding storage methods and the time limit for using drugs after the packaging is opened is one of the responsibilities of pharmacists which are important to know. Using drugs that have passed their BUD or ED means using drugs whose stability is no longer guaranteed (Christina, 2012).

The term "Beyond Use Date" (BUD) in drug storage is still rarely known due to limited research on BUD (Pertiwi *et al.*, 2021). Kusuma *et al*. (2020) reported that the level of public knowledge related to the Beyond Use Date in Indonesia is still relatively low. This was also confirmed by Cokro *et al*. (2021), who reported that the majority of the respondents examined (97%), did not know about BUD, and all respondents (100%) never received information on BUD from pharmacists. Some of the respondents have the perception that BUD is the same as the expiration date which is usually printed on the factory packaging. Cokro *et al.* (2021) concluded that the perception of the people of North Jakarta regarding BUD could be caused by the low knowledge of BUD, and thus, the role of pharmacists in informing and educating patients and the public about BUD is very necessary.

The act of misinterpreting drug-labelled instructions is a common cause of medication errors, and it affects patients' health outcomes (Bayang, 2013). Labelling for unprepared preparations and torn-off items is not regulated or standardised in eight community health centres in northern Virginia (Wolf *et al*., 2016). Medication error is a type of medical error that often causes harm to the patient's treatment, especially in the use of inappropriate drugs, causing harm to patients (Octavia *et al*., 2021). Medication errors cause more than 7,000 deaths per year in AS (Williams, 2007). Therefore, it is important to educate the public so that knowledge about drug use and good management can be increased.

The public needs to know about medicine to avoid the adverse effects of drugs on health (Octavia *et al*., 2021). Pharmaceutical services in hospitals consist of managing pharmacy supplies and clinical pharmacy services. Clinical Pharmacy Services (CPS) consist of several activities, one of which is the Drug Information Service (DIS) (Kermenkes, 2016). Pharmacists' assistance in providing consultation on drug use can also increase public enthusiasm and knowledge about good drug use (Octavia *et al*., 2022).

Based on the results of research conducted by Coker *et al*. (2022), Indonesian pharmacists were considered to have inadequate BUD knowledge, specifically on crushed tablets and ointment, and this might affect drugs' safety. Pharmacy students, as prospective health professionals, are often asked questions relating to drug use by the public, Therefore, without proper knowledge of BUD, the provision of information to patients may be misleading. This may also lead to unsafe use of the drug. Therefore, students need to understand BUD since it is related to the stability and quality of drug preparations.

Methods

Design

This study was designed with an observational design using a cross-sectional approach. The research was conducted from May to July 2022 at the Faculty of Health Sciences, Muhammadiyah University of Mataram, Indonesia. The respondents in this study were pharmacy students in the Faculty of Health Sciences, Muhammadiyah University of Mataram. The study was carried out using the purposive sampling method. This research was approved by the ethical committee of the Faculty of Medicine, Al-Azhar Islamic University, Mataram Indonesia under the number 40/EC - 04/FK-06/UNIZAR/VII/2022.

Assessment

The level of knowledge of the respondents was measured using a validated questionnaire. Each correct answer was given a value of 1 and the wrong answer was given a value of 0. The results were analysed descriptively using percentage analysis. The assessment criteria used are Good (76% - 100%); Enough (60%-75%), and Less (<60%).

Results

This study sampled 163 respondents consisting of 65 pharmacy vocational students and 98 pharmacy undergraduate students. The demographic data of the respondents can be seen in Table I.

Data on the level of knowledge of respondents can be seen in Table II. The average level of knowledge of pharmacy students is in the sufficient category (75.3%).

Table I: Demographic characteristics of respondents

Characteristics		Number (n=163)	Percentage %
Department	Vocation	65	39.9
	Bachelor	98	60.1
Age	18-20 year	108	66.3
	21-23 year	55	33.7
Class	2019	59	36.2
	2020	64	39.3
	2021	40	24.5
Gender	Male	24	14.7
	Female	139	85.3

Table II: Knowledge level of respondents regarding the beyond-use date of drugs

Knowledge level	Number	Percentage
Less	5	3.1
Enough	88	54.0
Good	70	42.9
Total	**163**	**100.0**

Table III: Respondent's answers to the question item about beyond use date

Statement	Number (%)	
	True	False
The deadline for using the drug before the primary packaging is opened is called the expiration date	138 (84.7%)	25 (15.3%)
Expire date is a benchmark for a drug to stop being used	18 (11.0%)	145 (89.0%)
The time limit for the use of a medicinal product after the primary packaging is opened for dispensing or preparation is known as the beyond-use-date	152 (93.3%)	11 (6.7%)
Eye drops can be used for 30 days after the packaging is opened	122 (74.8%)	41 (25.2%)
Concoction drugs such as ointments, creams, pastes, and gels can be used until the 30th day	144 (88.3%)	19 (11.7%)
Dry syrup can be used for 14 days after reconstituted	106 (65.0%)	57 (35.0%)
Expire date and beyond-use-date are the same terms in drug storage	70 (42.9%)	93 (57.1%)

Discussion

Based on Table I, it was observed that the respondents in this study comprised more students in the undergraduate pharmacy programme category (60.1%) than students from the vocational programme category (39.9%). This is because the number of undergraduate pharmacy programme students is greater than that of the vocational programme. Based on age, more respondents fell in the 18-20 years (n=108) category when compared to respondents in the 21-23 years (n=55) category. The "age" factor can affect a student's ability and way of reasoning (Kusuma *et al.*, 2020). The capacity to acquire knowledge is believed to increase as students advance in age (Kusuma *et al.*, 2020).

Based on Table I, there were more female respondents than male respondents, of which female respondents were 85.3% and male respondents 14.7%. The level of willingness and positive responses of the female respondents to participate as research subjects appeared to be higher than that of the male respondents, which might have potentially determined the increased number of female respondents when compared to the male respondents (Puspita & Syahida, 2020).

Based on Table II, it was observed that the level of knowledge of respondents about BUD in the "Good" category was 42.9%, while in the "Enough" and "Less" categories were 54.0% and 3.1% respectively. The average level of knowledge of pharmacy students was in the "Enough" category (75.3%); The level of knowledge of respondents about BUD was most in the "Enough" category, and this is because the respondents in this study were dominated by middle-level students,

which means that these students might have been taught the subject of BUD. The respondent's level of knowledge about BUD in the good category is dominated by students in the pharmacy undergraduate study programme while respondents in the less category were dominated by first-year students.

Based on Table III, in the question item about the limit on drugs stopped for use, only 11.0% (n=18) of the respondents answered correctly. In the question item which examines the knowledge about the relationship between BUD and ED, only 42.9% (n= 70) of the respondents answered correctly; which means that there are still many respondents who do not know the difference between BUD and ED. This is similar to the research conducted by Pertiwi *et al.* (2021) which stated that pharmacy students at Mataram University knew the definitions of BUD and ED, but some students were unable to distinguish the terms between BUD and ED. This is because the expiration time of the drug before and after the primary packaging is opened is sometimes considered the same (Pertiwi, 2021).

Of all the respondents in this study, only 42.9% (n=70) answered correctly in determining the BUD for liquid preparations. Liquid preparations that do not contain preservatives may only be used within 14 days after opening provided that the preparations are stored in a refrigerator while preparations containing preservatives can be used up to 35 days after opening (USP, 2019).

Conclusion

The level of knowledge of pharmacy students about drug Beyond Use Date is 42.9% (Good); 54.0% (Enough) and 3.1% (Less). The average level of knowledge of pharmacy students at the Faculty of Health Sciences, Muhammadiyah University of Mataram regarding Beyond Use Date Drugs is in the Enough category.

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