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MALAYSIAN BEHAVIOUR TOWARDS PROPER DISPOSAL OF
UNUSED MEDICATIONS

Foon Phooi Yut (a), Yuvaraj Ganesan (b)*, Jasmine Yeap Ai Leen (c), Hasnah Haron (d)
*Corresponding author

(a) Graduate School of Business, Universiti Sains Malaysia, Penang, Malaysia, yuvaraj@usm.my

(b) Graduate School of Business, Universiti Sains Malaysia, Penang, Malaysia

(c) School of Management, Universiti Sains Malaysia, Penang, Malaysia

(d) Faculty of Industrial Management, Universiti Malaysia Pahang, Pahang, Malaysia

Abstract

Based on the statistic, Ministry of Health (MOH) Malaysia had disposed a total of nearly RM2 million unused or expired medications through the MOH's drug take back system known as "Return Your Medicines" program in the year 2014 and 2015. This kind of program important as improper disposal of unused medications leads to medication waste entered our environment, which will cause huge threat to public health, environment and economy as well. Past studies in Malaysia and oversea showed poor awareness and practice among public about the proper disposal medications. By using the theory of planned behaviour (TPB), this study investigate the factors influencing public's intention to proper disposal of unused medications in Malaysia population. This study aims to assess socio-demographic factors and the TPB constructs (attitudes, subjective norms, perceived behavioural control, intentions, and situation factors). It will also examine the moderating effect of education level in the relationship between attitude and intention. This is cross-sectional study that using primary data which will collect from public in Malaysia via structured questionnaire. The data will be analyse using Statistical Package for the Social Sciences (SPSS) and Smart Partial Least Square software. This research will benefit in term of enhance in understanding the factors influence proper disposal are crucial to help government and related authorities to design an intervention or implement a more effective program to raise the awareness and change the behaviour among Malaysian

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1. Introduction

Based on recent statistics the Malaysian Ministry of Health (MOH) disposed a total of nearly RM2 million expired or unused medications in 2014 and 2015. This is mostly contributed by the MOH's PPU (Program Pemulangan Ubat) programme or drug take back system known as "Return Your Medicines" programme. The expired medications include some of the emergency medications such as anti-venom and anti-malaria medications (Brenda, 2016; MPS, 2017; Rahim, 2016)

Most common return medications are medications used to treat diabetes, hypertension, hypercholesterolemia and gastritis. The reasons of returning these medications include death of patient, change of treatment, discontinuation of treatment and non-compliance to medications. Besides, some patients receive the same medications supply due to multiple follow-up appointments at different facilities. Repeat filling of prescriptions without assessing the amount at hand also contributes to the return of unused medications (Brenda, 2016; Rahim, 2016)

PPU or Return Your Medicines Programme was introduced in 2010. It is a drug take back system aims for safe disposal of unused, excess or expired medications kept at patients' or public's homes. The collection points of the unused, excess or expired medications are pharmacy departments at MOH hospitals and health clinics. Introduction of PPU programme also supports the green strategy introduced by the National Policy on the Environment (DASN) 2002. DASN has been established for continuous economic, social and cultural progress and enhance quality of life of Malaysians through sustainable development (MoH, 2016). Although this programme is implemented since 2010, but there is still low awareness and poor practice in disposing unused medications among Malaysian.

Many studies showed the presence of medication waste in aquatic environment. There are 100 different medications have been detected in the aquatic environment. They are usually found in sewage treatment works (STW) effluents (Aherne, English, & Marks, 1985; Batt, Kostich, & Lazorchak, 2008; Vanderford & Snyder, 2006). This may indicate that medication waste is not completely removed during wastewater treatment. The medication waste detected include analgesics, beta-blockers, selective serotonin reuptake inhibitors (SSRIs), fibrates, anti-epileptics, and steroids (Ruhoy & Daughton, 2007).

There are three sources of medication waste which enter or pollute environment. They are effluents discharged from manufacturers, improper disposal of unused or expired medications, and via excretion from the patients. However the environmental impact from the manufacturers was deemed to be minor due to the high cost in medications productions. Medication waste can enter the water cycle or aquatic environment as a result of inappropriate disposal via washbasin or toilet. Improper medications disposal can cause negative environmental impact. The presence of medications and their respective metabolites in the aquatic environment has become a source for rising concern in many countries (Fatokun, Chang, Ng, Nair, & Balakrishnan, 2011; Kümmerer, 2010).

Benotti et al. (2009) found medication waste in waste water and drinking water. However, there is study found that the levels of the contamination of medication waste is ultra-trace levels. The impact on human health is still uncertain and no acute impact on ecosystems seen (Kümmerer, 2010). Yet, long term impacts on ecosystems caused by some medication waste cannot be ruled out. It could have delayed environmental hazards (Boxall, 2004). Slack, Gronow, and Voulvoulis (2005) suggested medicine environmental contamination contribute to development of antibiotic resistance in the environment, or

exposure of populations to irritant or mutagenic anticancer medications. There is possible link between endocrine disrupting compounds and falling fertility too. It may contribute to the feminisation of male fish, sluggish activity or reduced appetite (Kidd et al., 2007; Lyons, 2014). Many wastewater and drinking water treatment plants were not designed specifically to completely remove these medications or chemical residue from the waste water (Azad et al., 2016).

Besides, based on the PPU guideline by Pharmaceutical Service Programme, the returned medications from patients cannot be reused as recommended by World Health Organization due to the fact that the qualities of the medications are uncertain. This concern raised by the possibility of improper storage of the medications by patients at home. Large amount of return medications can lead to direct cost to society. In addition, the leftover medications possess safety risk for children, animals and some elderly people.

2. Problem Statement

There is a large variation of how an individual disposes of unused medications and how many leftover medications are returned to pharmacies. The differences in the patterns of medications returned to pharmacies reflect attitudes in society as well as actions taken by pharmacists and depend on the particular country's policy (Fatokun et al., 2011). Improper disposal of unused and expired medications may lead to both environmental and public health hazards. Although it is unclear the extent to which these medication wastes have on the environment, it is important to limit the amount of medication waste that is inappropriately disposed. Potential future harm to human could result from this environmental pollution.

Studies in the UK found that only 22% of unused medications are returned to a pharmacy (Bound & Voulvoulis, 2005) and 23% reported in a USA study (Seehusen & Edwards, 2006). Extra medications at homes leads to the issue of appropriate disposal and has potential implications for accidental childhood ingestions (Beirens, Van Beeck, Dekker, Brug, & Raat, 2006; Franklin & Rodgers, 2008). The unused medications are most likely to be disposed as solid waste in a landfill or flushed into toilet to become a component of liquid sewage (Azad et al., 2012). Study in USA found that 54% of people threw unwanted drugs as household waste and 35% disposed through flushing down the toilet or threw into sink (Kuspis & Krenzelo, 1996). Meanwhile, study in UK showed 63% of respondents discard their unused drugs in trash in, 11% threw into the sink or toilet and 22% returned them to a pharmacy (Bound & Voulvoulis, 2005). Another study in New Zealand found 13 to 24% of drugs are returned to a pharmacy and over 55% disposed in toilet or sink (Azad et al., 2012).

Pharmaceutical industry in Malaysia is developing rapidly and has amounts of US\$ 652.8 million in 2007 (Bee, 2009). Al-Naggar and Alareefi (2010) found it is common that many unused medications and tablets prescribed are left at home. So, these leftover unused medications eventually will be discarded. If it is discarded improperly, it will lead to environmental pollution and increase in health care cost (Brody, 2017).

In Malaysia, the extent of the problem of unused or expired medicines at home and public disposal practices are largely unknown. The return of unused and unwanted medications to the pharmacy is only a fraction of the true amount wasted. MOH Malaysia has established the PPU guideline for proper disposal of unused medications. MOH also introduced Patient's Own Medicines campaign to reduce wastage of

extra patient's medicines in 2016. There are also campaigns such as 'Know Your Medicines Campaign' to promote rational use of drugs conducted since 2007.

Awareness programme and campaigns of rational drug use have been promoted in Malaysia for almost ten years. However, many study results show a relatively low awareness and inappropriate practice in disposing the medications. Study conducted by (Lim, 2016) found less than 50% of respondents aware of safe medication disposal and there is need to create public awareness about issues on safe medication disposal. Another study showed 2% of the respondents returned the drugs through PPU programme while more than 93% respondents do not aware of this PPU programme in Malaysia. 83% of the respondents disposed as normal general waste (Azad, et al., 2012).

The MOH campaigns and policies were introduced for a period of time, yet the knowledge, awareness practice among the public is still low. Public's intention and behavior determines the final disposal of the unused medication and subsequently the potential impact caused by these medication wastes. Factors causing this conditions needed to be identified to implement more effective awareness campaigns to tackle this problem. It will be a valuable step to prevent environmental pollution and save cost in preserving our environment as well as health care cost (Nipa, Ahmed, Shahariar, Rahman, & Haider, 2017).

The aim of this study is to find out the factors influencing public's intention to proper disposal of unused medications. Theory of planned behavior (TPB) is used to investigate the factors influencing this intention. TPB provides a theoretical framework that used to systematically identify the factors influencing proper disposal of unused medications. Currently, no known study is found to investigate public's intention in properly disposing unused medications from the perspective of TPB. In addition, situation factors is investigated in this study to improve the predictive validity of TPB.

3. Research Questions

The following research questions serve as the guide to the present study.

- i. What is the relationship between environmental knowledge and attitude?
- ii. What is the relationship between attitude and intention?
- iii. What is the relationship between social norm and personal norm on subjective norm?
- iv. What is the relationship between subjective norm and intention?
- v. What is the relationship between perceived behavioural control and intention?
- vi. What is the relationship between situation factors and intention?
- vii. Does education level have moderating effect in the relationship between attitude and intention?

4. Purpose of the Study

The purpose of the study is to examining the factors influencing Malaysian intention to proper disposal of unused medications and investigative whether the education level able to moderate the relationship between attitude and intention. Furthermore, this study contributes in three perspectives, namely theoretical, practical and social perspective.

4.1. Theoretical contribution

Theoretically, this study has extended the TPB through the addition of variables that affect the two core component of the theory namely subjective norm and intention. It contributes to enrich the knowledge about the intention of properly disposed unused medication. The addition of personal norm and social norm as precursors to subjective norm. It shows what individual thinks other would like him or her to do. Situation factor is added to TPB model which believes will influence intention to properly dispose medications. This situation factor will assess the situation or barriers such as limited time and inconvenience in engaging in properly dispose of unused medications. Besides, the inclusion of moderator, education and profession, in the study framework provide clearer understanding about the way attitude influences intention on properly disposal of unused medications. Public generally believe health care professional has better knowledge and ready to provide accurate and timely information regarding health care information. Health care information in this case refer to information in properly dispose unused medications. Examining education and profession in influencing the intention is valuable. This research will provide a model that contributes to the understanding of important factors that affect the public's intention in properly disposing their medications.

4.2. Practical contribution

In terms of practical contributions, the findings of this study will enable the local government to better understand the intention of properly disposal of unused medications among Malaysian. This study has also provided a reference model for other states in Malaysia to educate and influence public's intention in properly dispose their unused medications. The knowledge, awareness and practices of proper disposal of unused medications are in unsatisfactory level. Currently no known study conducted in examining the factors in motivating and discouraging people to engage in disposing unused medications properly. Many studies suggested to raise awareness regarding properly dispose of unused medications are crucial in protecting our environment. Thus, the idea is to get them to first be aware of all the environmental concerns happening around them and the benefits of doing their part by properly disposing unused medications so that their attitude towards properly disposal of unused medications will change for the better. This will lead to higher intentions of in engaging in activities of properly dispose their unused medications and subsequently start to return the medications to related authority. Government and related authorities may employ the result from this study to emphasize on the factors most influencing the public's intention when promoting and encouraging the public to participate in proper disposal of unused medications.

4.3. Social contribution

Successful medication returns programme or drug take back system will minimize the negative impact to the environment. This environmental improvement will reduce the pollution of landfill and also water system. This promote public's health and well-being indirectly. Medications have been used to treat and prevent disease. Non-compliance to medication treatment and excess supply are factors contributed to excess unused medications at home. According to Brody (2017), non-compliance to medications causing death and hospitalization. The total health care cost incurred in American health care system is between \$100 billion and \$289 billion a year. In addition, the subsequent handling of this unused medications

becomes a concern. Excretion from human via urination or bathing also contributes to environmental pollution by unchanged active pharmaceutical ingredients (Daughton & Ruhoy, 2009). Improper disposal of unused medications eventually leads to contamination of surface waters and landfills. So, proper handling of unused medications is important in preserving our environment. Many studies show poor knowledge, awareness and practice among Malaysian as well as in other countries (Nipa et al., 2017). Most of the public will just throw their unused medications as general waste in trash bin, flush the unused medications down the toilet or sink, burn and others which leads to contamination of landfill and water. Proper education to public is important to enhance awareness and knowledge. By understanding the factors affecting the intention in engaging proper medications disposal, government or related authority can effectively in conveying the message and educating the public about proper disposal of unused medications. They can influence the public's intention and subsequently their behaviour in proper disposal of unused medications. Besides, they also can improve the available policies and practice of return medication programme in Malaysia. Proper disposal of medications not only prevent environmental pollution but also save health care and environmental cost. In terms of excess supply and non-compliance problem, medications check, and counselling should be done by the professional to reduce wastage and end up causing environmental problem. This action will save health care cost by reducing the excess supply and admission of hospitals due to complications of non-compliance problems (Brody, 2017). According to Kumar et al. (2015), the health care cost including medications in Malaysia is in increasing trend. Wastage in medications will lead to increase in healthcare cost. In addition, government may need to pay more to preserve environment due to pollution. Objective of DASN also is said to be achieved in terms of economic and social if the implementation of proper disposal of medication programme successful

5. Research Methods

This study is going to be conducted using quantitative approach and utilise cross sectional study that describe the relationship between the influential factors and the intention to engage in proper disposal of unused medications at one point in time. Furthermore, this study is correlational study which is tried to determine if there are relationship among the variables used in this study. The unit of analysis in this study is individual level. The population of the study is Malaysian and will using convenience sampling method to collect primary data for the study. A structured questionnaire containing 4 sections will be utilised to collect data. Smart PLS will be use as statistical total to analysis the data and make the conclusion about the research objectives. The variables of study were adapted from the past literature as show in table 1.

Table 01. The variables in this study

Variables	Variables	Adapted from
Independent	Environmental Knowledge	Zhang, Huang, Yin, and Gong (2015)
	Attitude	Zhang, et al. (2015)
	Personal Norm	Tan, Ramayah, Yeap, and Ooi (2017)
	Social Norm	Tan, et al. (2017)
	Subjective Norm	Zhang, et al. (2015)
	Perceived Behavioral Control	Zhang, et al. (2015)
	Situation Factor	Zhang, et al. (2015)
Dependent	Intention	Zhang, et al. (2015)
Moderating	Education Level	Self-Construct

6. Findings

We expect environment knowledge to have a positive effect on attitude, with social norms and personal norms having a significant effect on subjective norm. Furthermore, we also anticipate that the intention to properly dispose of unused medication is positively affected by TPM factors (attitudes, subjective norms, perceived behavioural control, and situation). In addition, we expect education level to play the moderating role in the relationship between attitude and intention.

7. Conclusion

Disposal of unused medications has been a concern in many countries. Improper disposal of unused medications is not only causing negative impacts on the environment, but also incur cost in preserving the environment. It may pose risk to public health and subsequently increase health care cost. The statistic showed that government via Ministry of Health (MOH) had disposed a total of nearly RM2 million expired or unused medications. Although, many programs have done by the MOH but the public is unaware about the program and the participation by public is unsatisfying. This study is timely as the literature showed that there is lack of study on the factors influencing the intention properly disposal unused medications. Therefore, the aim of this study is to find out the factors that affect the intention of Malaysian in properly disposing of unused medications by utilised the theory of planned behaviour (TPM). This study not only enhanced the knowledge of scholars but help the relevant authorities to strategic their plan of actions to improve the properly disposal medication by Malaysians.

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