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Welcome Letter for Malaysian Journal of Pharmacy new Editorial Board

Chan Siok Yee[1] and Long Chiau Ming[2]

Malaysian Journal of Pharmacy (MJP) since its launch in 2001, upholds the essence of knowledge and experience dissemination of regional pharmaceutical related research and sciences. With Dr Yew Su Fong as the founding Editor in Chief, a few journal issues were published and in year 2008 the torch was passed on to the successor, Professor Dr Mohd Baidi Bahari. Under the helm of Prof Baidi, valuable research findings by respective hospitals in Malaysia were published, some disseminated in the form of conference proceeding and abstract. Gradually, *MJP* has become a keystone to showcase the research findings of fellow pharmacists especially in the hospital setting which provide publications that are both informative and impactful, highlighting matters that of high value to the profession. In recent years, the journal's management and structure grow and improve, along with its appointment of the journal's immediate past Editor in Chief, Associate Professor Dr Asrul Asrul Akmal Shafie that strengthened the workflow of the journal.

In term of operation, the way forward for *MJP* is to keep abreast with the latest trend and technology advancement. Web-based automated submission system, digital object identifier (DOI), citation tracking are the crucial features to be implemented to encourage article submission to MJP. Given a chance to lead *MJP*, we would like to take a moment to introduce the revamped structure of our editorial board. The newly assembled board comprises of registered pharmacist from different disciplines of pharmacy whom either a well cited researcher or highly experienced practising pharmacist. To name a few, Professor Habibah A Wahab, Dean of School of Pharmaceutical Sciences of Universiti Sains Malaysia (USM), Professor Mohd Cairul Iqbal Mohd Amin, Deputy Director of Ministry of Higher of Education, Professor Wong Ting Wui and Associate Professor Dr Asrul Asrul Akmal Shafie who are among the high cited researchers in their research field. Advisors are included in the structure of our editorial board who are entrusted to advise the Board on strategic planning and progress of the journal. Advisors include Emeritus Professor Yuen Kah Hay and Emeritus, Professor Dr Paraidathathu Thomas, former Editor in Chief Professor Dr Mohd Baidi Bahari, international renown researcher Dr Sheng Qi and Associate Professor Alberto Berardi. This local and international advisory team is in the interest of transparency, good governance and render the decision-making process to independent scrutiny. Besides, the Board serves on the principle of autonomy and impartiality, to ensure the article published in this *MJP* is of high quality and non-bias. As far as the journal is concerned, the editorial board of *MJP* have the right to reject manuscript that is deemed not appropriate or unqualified without influence, fear, or favour.

MJP is a peer-reviewed publication with an aim to publish content covers all aspects of pharmacist in Malaysia and beyond. It solicits manuscripts across different areas as long as it brings benefit to the growth of pharmacy profession as a whole. The scope of the journal includes research performed clinically, community, lab-based, social administrative based, Pharmacy Education as well as industrial related. Relevant contents from academicians, pharmacy student (final year projects), pharmaceutical industrial research, as well as the mandatory research by provisionally registered pharmacy (PRP) are also welcome. Special Issue may also be considered for current hot topic. We envisage that *MJP* will serve as a platform to educate, motivate and help the author as well as readers to better serve as a pharmacist.

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Short communication

The Need of Patient Education to Improve Medication Adherence Among Hypertensive Patients

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ABSTRACT

Essential medicines have become indispensable to maintain and to improve our lives and health. Latest literature again reiterated that inappropriate use of medicine is a global phenomenon in both developed and developing countries still prevail. Poor adherence is associated with negative clinical outcome of the disease. It is important to note that about 50% of treatment failures are due to poor medication adherence and this results in substantial morbidity and mortality. Patient's belief and perception have been reported to influence medication adherence. Low rate of adherence was found strongly associated with patient's belief across the studies with chronic diseases with hypertension, coronary heart disease, diabetes, asthma and renal disease. Exploring the health beliefs of patients is vital to improve adherence and thereby blood pressure among the patients with hypertension. Lack of knowledge about usage of medication and various misleading perceptions of hypertension management have resulted inappropriate use of medication especially medication adherence among community-dwelling patients with hypertension. Literatures classified non-adherence into primary and secondary. Primary non-adherence refers to medication is purposefully never filled or taken; Secondary non-adherence is defined as medication is not taken properly or continued as prescribed and further classified into intentionally and unintentionally. Patient education aims to train patient in the skill and self-management of their chronic disease by adapting to the treatment or lifestyle changes. Despite improving in patients' skill and self-care by providing information about the treatment, patient education could enhance their empowerment and medication adherence. Patient education is a basic right of the patients and healthcare members have responsible to provide such information. However, the authenticity of the available information is yet to be verified. Therefore, healthcare professional could play a vital role here to educate their patients about the appropriate information.

INTRODUCTION

Essential medicines are defined as those medicines that satisfy the priority health care needs of the population in a country [1]. Essential medicines have become indispensable to maintain and to improve our lives and health [2]. Additionally, essential medicines play a significant role in therapeutic assets of medical treatment options. Yet, medicines still are unaffordable, unavailable, unsafe and inappropriate used among many people around the globe [3, 4]. World Health organisation (WHO) has defined Quality Use of Medicine (QUM) as *"Patients receive medications appropriate to their clinical needs, in doses that meet their own individual requirement, for an adequate period of time, and at the lowest cost to them and their community"*[5]. Australian National Medicines Policies has defined QUM as *"selecting management and suitable medicine wisely, and using medicines safely and effectively"*[6].

WHO has estimated that more than half of all medicines are prescribed, dispensed or sold inappropriately in worldwide [7]. Moreover, 50% of the patients did not take medicine in appropriate manner [7] and this leads to the various complications of not well-managed chronic diseases. Latest literature again reiterated that inappropriate use of medicine is a global phenomenon in both developed and developing countries still prevail [8]. Common problems of inappropriate use of medicine have emerged, including the use of too many medicines per patient with the similar function (polypharmacy), inappropriate use of antibiotic, inappropriate self-medication especially prescription-only medicine, inappropriate use of injection when the regime can be substituted with oral

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formulation and failure to prescribe according to guidelines [9]. In addition, people tend to forget the details given by doctor and pharmacist, not able to buy prescribed medicine at pharmacy due to financial problem, take initiative to stop consuming prescribed medicine, or taken the wrong dosage [10]. Patients were found to have greater tendency to store large quantities of medications in urban households with large percentages of the medication was being wasted [11].

Medicine Adherence Underpinned by Patient's Perception

WHO defines adherence as *"the extent to which a person's behaviour – taking medications, following a diet and/ or executing lifestyle changes, corresponds with agreed recommendations from a health care provider"*[12]. Worldwide, approximately $177 billion was spent in direct and indirect health care cost annual due to poor adherence [13]. Medication adherence is one of the important aspects of the QUM. Poor adherence is associated with negative clinical outcome of the disease [14]. It is important to note that about 50% of treatment failures are due to poor medication adherence and this results in substantial morbidity and mortality [15, 16]. Patient's belief and perception have been reported to influence medication adherence [17-19]. Low rate of adherence was found strongly associated with patient's belief across the studies with chronic diseases with hypertension [20], coronary heart disease [21], diabetes [22], asthma [23] and renal disease [24]. Exploring the health beliefs of patients is vital to improve adherence and thereby blood pressure (BP) among the patients with hypertension [20]. Literature demonstrated that patient's beliefs about medicines yielded a significant predictor to medication adherence compare to social demographic factors [21]. To maximise treatment outcomes, a number of rigorous reviews were focused on the modifying factors, such as patient's beliefs, rather than non-modifying demographic variables [21, 25]. Many patients with hypertension did not adhere to antihypertensive medication because they had misperception towards hypertension or they were unconfident with their antihypertensive medication such as concern of potential adverse effects [26-28]. In overseas, lack of knowledge about usage of medication and various misleading perceptions of hypertension management have resulted inappropriate use of medication especially medication adherence among community-dwelling patients with hypertension [28-30].

Possible reasons of non-adherence includes perceptual factors such as beliefs, attitudes and preference [21, 31]. Studies have shown that medication adherence was greatly influenced by patients' health belief towards hypertension [14]. Patient's beliefs play an important role in predicting medication adherence [22, 32]. Patient's judgement in the need of medication (necessity belief) relatively to their concern of adverse effect influences their motivation to start and continue with medication [33].

It must be noted that literature demonstrated that low medication adherence was observed among patients with chronic diseases [34]. A wide variation of non-adherence rate (i.e. 7%-67%) has been reported among the patients with cardiovascular diseases [35]. Medication adherence among patients with hypertension was reported ranged from 50% to 70% [36]. It is evident that many patients with hypertension have obstacles to adhere to their medication regimens [4]. Approximately half of them were found to be non-adherent and leading to suboptimal clinical benefits [16, 37]. In Malaysia, only 35% of patients with hypertension have controlled BP level with antihypertensive medications [38]. A recent local study revealed that the reasons of poor medication adherence among patients with hypertension were due to misconception about side effect of antihypertensive medication and lack of knowledge towards hypertension management [31].

Differentiating the Type of Medication Non-adherence

Literatures classified non-adherence into primary and secondary. Of note, when medication is purposefully never filled or taken; or a new prescription is not filled by patient, it is called as primary non-adherence [36, 39]. While, secondary non-adherence is defined as medication is not taken properly or continued as prescribed [36]. Secondary non-adherence is classified into intentionally and unintentionally. Intentional non-adherence refers to patient's decision to stop medication on their own, either insufficient information about benefits or side effect of medication [40]. On the other hand, unintentional non-adherence occurs when patient is prevented from taking medication under unplanned circumstances, for instances, forgetfulness, does not understand instruction of use for the medication, language barriers or physical barrier to comply medication [41]. Taking a scrutiny into the medication adherence break down components; 12% of cardiovascular patients did not fill up prescription (primary non-adherence); 12% of the primary non-adherence was found by not started medication; while 29% of cardiovascular patients did not take prescribed medication for long term (secondary non-adherence), and only 47% of cardiovascular patients adhered to prescribed medication [42]. Another study revealed that the adherence rate was dropped to only 35% during the first year of treatment among the patients with hypertension [43].

Way Forward: The Need for Continued Patient Education to Mitigate Medication Non-Adherence and Wastage

Patient education is defined as *"A systematic experience in which a combination or a variety of methods are used. These might include the provision of information and advice and behaviour modification techniques, which influence the way the patient experiences his illness and/or his knowledge and health behaviour, aimed at improving or maintaining or learning to cope with a condition, usually a chronic one"*[44]. The concept of patient education is to train patient in the skill and self-management of their chronic disease by adapting to the treatment or lifestyle changes [45]. Despite improving in patients' skill and self-care by providing information about the treatment, patient education could enhance their empowerment

and medication adherence [46]. In addition, patient education could reduce the medical expenses in terms of long term care for both patients and society [45]. Patient education plays an important role in therapeutic plan by improving patients' self-management skills [47] and to enhance patient-centred perspective [48].

Patient education can be divided into clinical patient education (learning and teaching process are carried out at clinical setting) and community health education (education program emphasises on prevention, wellness and healthcare awareness among the community level)[49]. With the expert knowledge and proper training, health promoters generally have credibility to conduct patient education program. However, expertise alone does not make a good health educator. Three principles must be adopted in patient educational programme: (i) patients' belief and understanding of the aims of education program must be delivered and evaluated through some learning tools [50-52], (ii) established relationship between patients and healthcare providers [53, 54], and (iii) attention must be given to low self-esteem and non-vocal patients to change their health-related behaviors [55].

Preparation of patient education is important. Health educator needs to think through the objectives of the session, the way of conducting and the involvement of participants [56]. Jensen and Simvska reported that the optimal learning outcome could be achieved throughout active participation during learning process [57]. Whilst Ewles and Simnett added that learning methods should be variated in different ways i.e. books, leaflets, handout, poster, flip-chart, PowerPoint slides and others [56]. Health care provider could play an important role to educate patients in order to enable them to further understand their conditions and the given therapy [58]. Evidence demonstrated that patients want health information but some of them have difficulty in understanding and remember the information delivered by the health educator [59].

A recent local study revealed that a total of 20,799 excessive pills were returned by patients with hypertension at a single Malaysian government hospital, with a total cost of (Malaysian Ringgit) MYR 4,362.28 (equal to USD 1037) was wasted during the 8 months of study period with an average wastage of MYR 42.35 (equal to USD 10) per patient; changing medication by the doctor and death of patients were the most common reasons accounted for the wastage [60]. Lack of knowledge about usage of medication and various misleading perceptions of hypertension management have resulted inappropriate use of medication especially medication adherence among community-dwelling patients with hypertension [29, 30]. Within this context, a pharmacist whom traditional roles focus on medication dispensing and procurement have been serving well as a healthcare educator. Being an expert of medicines, a pharmacist is dedicated to provide medicine counselling to patients, taking into consideration their prescription, non-prescription, self-prescribed, herbal medications as well as the drug interaction[61].

CONCLUSIONS

Patient education is a basic right of the patients and healthcare members have responsible to provide such information. Healthcare providers could provide pertinent yet enough information to the patients and thus avoiding the development of confusion. Patients might obtain information from other sources, such as social media, friends, neighbour and family members. However, the authenticity of the available information is yet to be verified. Therefore, healthcare professional could play a vital role here to educate their patients about the appropriate information [62].

The evolving of patient education and the emerging of the new developments are expected from the healthcare professional. Currently healthcare professional have more access and training opportunity in patient education technique, such as counselling and motivational interview [63]. However, many healthcare professionals confronted challenging when educating patient because of limited time was allocated to cover all health topics [64]. Therefore, the development of patient education interventions is impeding with the direction of replacing a part of consultation time with providing tools for self-monitoring by patient themselves at outside of healthcare setting.

CONFLICT OF INTEREST

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MALAYSIAN Journal *of* Pharmacy

Original Research Article

Gamified Online Quizzes: Pharmacy Student Perceptions of Learning in an Undergraduate Medicinal Chemistry Course

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ABSTRACT

Introduction: In the context of pharmacy education worldwide and in Malaysia, the use of digital technologies to promote higher level thinking and discussions is seen as preparing the millennials as pharmacists in the 21st century. Together with leveraging on millennials' penchant for mobile technology, gamified online quizzes as an assessment tool that help promote active and collaborative learning in a Medicinal Chemistry course have been used. **Objectives:** This study investigates students' perception of the impact of gamified online quizzes on their learning in a Medicinal Chemistry course. **Method:** This study employs mix method research comprising descriptive analysis, content analysis from informal chats and researchers' observation to gather the findings for the study. Three gamified online quizzes using Quizizz, were implemented outside classroom time, in place of traditional quizzes. Multiple attempts were allowed within a stipulated time. As interventions, post-quiz discussions were conducted during class time. Students completed an end-of-the-course survey. **Results:** Out of 63 respondents, more than 96% felt that the gamified online quizzes enhanced their learning as they learned from the instant feedback, their mistakes and post-quiz discussions. Overall student performance based on the percentage and accuracy of answering the quiz improved with time. Student qualitative comments on the survey, the course social media (closed group) and informal chats supported the findings from the descriptive data analysis of the study. **Conclusions:** From students' perception, the gamified online quizzes were found to be enjoyable and effective in enhancing active, peer learning in an undergraduate medicinal chemistry course outside class time. For instructors, the online quiz served as an efficient tool for formative assessment in a large classroom setting, and could replace traditional classroom quizzes.

INTRODUCTION

The use of online and in-classroom digital games and game-based approaches to promote student engagement via active and collaborative learning has gained prominence (1–3). It is of particular relevance during this challenging Covid-19 times when most face-to-face teaching and learning activities moved to online learning–prompting educators to seek approaches that facilitate and increase students' online engagement (4,5).

Game-based learning provides learners: (a) the environment to take risks, (b) the chance to make mistakes and learn from these mistakes in a low-stake but competitive environment, (c) the opportunities to keep trying and (d) the avenue to be rewarded for successful attempts. These are similar to how people learn to master certain skills or acquire new knowledge in life.

Besides that, game-based learning employs elements such as point systems, scoreboards, winners and eye-catching avatars coupled with exciting music and colourful, user-friendly interfaces that keep learners motivated and engaged in a non-

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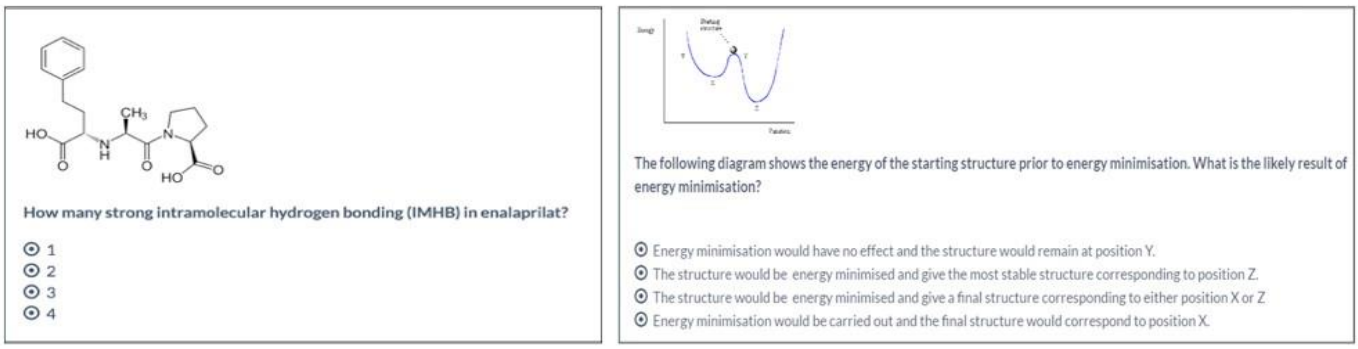

Figure 1: Question samples using a molecular structure and a diagram

game context (6,7), for instance in learning abstract concepts or dry subjects (8–11).

In the context of pharmacy education worldwide and in Malaysia, the use of digital technologies to promote higher level thinking and discussion is seen as preparing the millennials as pharmacists in the 21st century–where skilful communication, collaboration and critical thinking are essential in various pharmacy practices (8,12–21).

Gamified web-based quizzes e.g. Kahoot, Quizizz and Socrative, are increasingly being used as a pedagogical strategy to conduct classroom teaching and assessment (7). Despite doubts of its pedagogical effectiveness (22,23), their appeals to young students lie in engaging and motivating learners in game-based, digital learning experiences (18,24).

In previous years, students taking the Principles of Medicinal Chemistry course at the School of Pharmaceutical Sciences, Universiti Sains Malaysia (USM) were assessed in a number of in-class assignments and pop-quizzes. These formed the formative assessment part of the course. Anecdotally, this subject was found difficult amongst many students. To help their learning on the subject, students requested for regular pop-quizzes. In doing so, however, the instructors found that creating questions, marking such formative assessments and providing constructive feedback were time-consuming, particularly for a large class.

Therefore, this study is aimed to seek for a form of formative assessment that would help instructors to securely conduct the assessment, allows efficient grading, analyse student responses and deliver learning analytics. Additionally, this study aimed to evaluate a digital tool that leverages on digital natives' penchant for mobile technology.

The popularity of various game-based instructions for active learning in pharmacy classroom settings has been reported previously (12,16,19,21,25–28); however, its use outside of class time remains relatively unexplored in traditional higher education setting. The use of gamified online quiz by effectively utilising the notional student learning time (SLT) could serve as a novel way towards effective learning. This preliminary study evaluates pharmacy students' perceptions of learning using a gamified online quiz approach (ie. using Quizizz) with a view of replacing traditional in-class quizzes.

METHOD

The Principles of Medicinal Chemistry course is a 2-unit course for second year pharmacy students at Universiti Sains Malaysia. It consists of topics on drug design and development that includes structure-activity relationship (SAR), quantitative SAR (QSAR), drug modelling and pharmacokinetics. The course is taught by two instructors to a large group of 116 students. Three unsupervised online quizzes were offered during the semesters, i.e. students were assessed in Week 7, 11 and 14. Each quiz was conducted about 3 weeks apart. Students completed these quizzes as a part of continuous assessment (10%) in this course. The online quiz consisted of 20-30 multiple-choice, randomised questions and answers with progressive difficulties, which would evaluate students' six cognitive levels based on the Bloom's Taxonomy, i.e. knowledge, comprehension, application, analysis, synthesis and evaluation. Using images and diagrams, instructors were able to construct more challenging questions by prompting students to critically examine the visuals (e.g. drug-protein interactions, SAR, molecular modelling in Figure 1), thus testing students' critical thinking and understanding in medicinal chemistry.

The quizzes were implemented based on students' preferences that were collected using Google Form. Students were made aware of the quizzes through the Facebook closed group of the medicinal chemistry course. Students were alerted to six rules for online quizzes–one such rule requires students to use assigned name codes to keep their anonymity secured in the cyber world and later, for grading purposes (Table 1).

Simple technical support for students (e.g. game pin, access, name repeat) was provided by the instructors in the evenings of

Questions	Class Level			109LING*	11CHAN	28GOH	49LOW*	48LOH
	# Correct	# Incorrect	# Unattempted					
The concept of a single name for a unique active pharmaceutical for global use is abbreviated as	106	7	45	INN	INN	INN	INN	INN
How many good HBA in enalaprilat?	55	51	52	5	6	6	4	5
How many strong intramolecular hydrogen bonding (IMHB) in enalaprilat?	54	54	50	2	2	2	2	2
Which of the following statements on a carrier prodrug is incorrect?	41	71	46	Ester prodrugs of ampicillin increase the absorption to	Ester prodrugs of ampicillin increase the absorption to	Ester prodrugs of ampicillin increase the absorption to	The linkage between the active drug and the carrier must be	The linkage between the active drug and the carrier must be
Which of the following statements regarding drug biotransformations is false?	24	82	52	In Phase II, common endogenous groups are linked	Drug metabolism has 3 phases- Phase I, II and III. Phase III does	In Phase II, common endogenous groups are linked	In Phase II, common endogenous groups are linked	In Phase II, common endogenous groups are linked
Bioavailability of theophylline generally means	85	30	43	the fraction of an administered drug that reaches the blood	the fraction of an administered drug that reaches the blood	the fraction of an administered drug that reaches the blood	the fraction of an administered drug that reaches the blood	the fraction of an administered drug that reaches the blood
The pharmacotherapeutic stem "-alol" stands for	53	61	44	alpha + beta blockers	alpha + beta blockers	selective beta-2 blockers	selective beta-2 blockers	beta blockers

Figure 2: Colour-coded analytics categorised by questions and students facilitated post-quiz discussions.

the quiz, between 8-10 pm. Instructors were also present online to monitor the running of the online quiz. Student performance reports were downloaded every 15-20 minutes, and at the conclusion of the online quiz. The reports are colour-coded as shown in Figure 2.

Table 1: Six rules of online quiz

6 Rules of Online Quiz
1. Please make sure you are connected to a stable wi-fi, uni-fi or cable internet. The quiz is web-based. You may use mobile devices or laptops.
2. Please use the assigned code names. ANY names different from the assigned code names will be removed. No marks given.
3. DO NOT SHARE the quiz code or quiz questions with anyone or your juniors/seniors.
4. You may repeat the quiz as multiple times–within the allocated time.
5. Your quiz marks will be based on your best performance.
6. The content of the quiz is copyrighted under the instructor. No screenshot or any audio-visual recording is allowed without prior permission.

* The assigned code name will be crucial during the grading process.

This makes it visually easy for instructors to quickly check and plan for student feedback. Post-quiz discussions based on the Quizizz reports were held during the next available lecture hour. The reports were also used for grading purposes.

Criteria and considerations in designing a gamified online quiz

a) Which gamified online quiz would be suitable for a large class?

As mentioned earlier, there are several free, gamified online student response systems available e.g. Kahoot, Socrative and Quizizz. For this initial study, the criteria used for selecting the online quiz are: 1) it is a free digital tool, and remains free for a large number of students (over 100); 2) student- and instructor-friendly (e.g. low learning curve); 3) has built-in elements of gamification; 4) able to generate analytics; 5) set a deadline for students; 6) stable, responsive and reliable during real-time uses for a large-sized class and 7) able to be used on laptops and mobile devices. Based on these criteria, Quizizz was selected as the gamified online tool as a part of the continuous assessment.

b) How many attempts for an online quiz? How long should it be?

At the outset of this online quiz, the instructors had little idea what constitutes a realistic setting for students, in terms of quiz duration and number of attempts. Unlike the traditional pen-and-paper quiz, the instructors were mindful of the time learners need to familiarise themselves with a new technology. Allowing for extra time reduces anxiety in students, a key factor in facilitating learning (28). Allowing for extra time also provides students time to rectify technical issues (e.g. internet access, browser) possibly encountered, often at the start, and during the online quiz.

Furthermore, the main purpose of offering the gamified online quiz is to help students to learn from their mistakes and that of their peers. Taking these factors into considerations, the first online quiz was opened for 120 minutes. Students could repeat taking the quiz as many times as they wish–within that period. At the end of the 2-hour period, the online dashboard showed a staggering 834 players with an overall 79% accuracy. Considering that there were 116 students registered for the quiz, each student probably attempted close to 7.2 times. The top 10% players took, on average, 1 minute and 25 seconds to answer each quiz question and rose to the top of the scorecard with 100% accuracy. Due to the huge number of attempts, the first instructor discovered that the overall analytics on student performance could not be processed and downloaded from Quizizz website.

The second quiz was administered about 3 weeks later by the second instructor. Initially, the instructor planned for a traditional in-class quiz; but upon overwhelmingly positive student feedback for the first quiz and requests for a second online quiz, the second quiz was also held using Quizizz. The instructors had a discussion to rectify and improve the first setting. Based on our discussion, students were allowed a maximum of three attempts within a 60-minute period. With

Table 2: A survey on students' perception of learning based on the gamified online quiz.

Survey	Number that agreed or strongly agreed	Percentage
Q1. The online quiz makes learning more fun than the traditional, in-class quizzes.	56	96.6
Q2. Unlike traditional quiz, I can take the quiz repeatedly. These have enhanced my learning in the course.	56	96.6
Q3. Unlike traditional quiz, the online quizzes were held after class - in the evenings between 8-10 pm. These have enhanced my learning in the course.	47	95.6
Q4. Unlike traditional quiz, the online quiz allows a fixed amount of time (often 5 - 30 seconds) for a question. This has enhanced my learning in the course.	23	56.1
Q5. Unlike traditional quiz, the online quiz is based on speed and accuracy of your answers. This has enhanced my learning in the course.	29	70.7
Q6. Unlike traditional quiz, the online quiz displays the scoreboard of you and your classmates. This has enhanced my learning in the course.	22	68.7
Q7. Unlike traditional quiz, the online quiz displays memes and funny quotes. This causes distractions for my learning.	14	29.8
Q8. Unlike traditional quiz, the online quiz offers flexibility. It can be taken anytime, anywhere as long as there is internet. This does not help my learning at all.	21	39.6
Q9. Unlike traditional quiz, the online quiz is entirely based MCQs, and therefore is so easy.	17	43.6
Q10. In the online quiz, a variety of questions of different difficulties (easy, medium and hard) were posted. These have enhanced my learning in the course.	54	98.2
Q11. The online quiz makes learning more effective than the traditional, in-class quizzes.	55	96.5
Q12. The post-online quiz discussion held by lecturer(s). This activity has enhanced my learning in the course.	58	98.3
Q13. Taking the online quiz has made it easy for me to remember concepts, principles about medicinal chemistry.	55	98.2
Q14. I prefer the traditional 1 hour quiz in class. Online quiz does not work for me.	5	7.9

the duration and number of attempts capped, the second instructor managed to download the final report.

For the third quiz, students requested to increase the number of attempts. Since the purpose of offering the online quiz is "assessment for learning" rather than "assessment of learning", the first instructor allowed more repeats than the previous quiz. Assessment for learning refers to formative assessments that are focused on providing feedback for improvements in students' learning, whereas assessment of learning refers to summative evaluations at the end of a course (29). Therefore, in the third quiz, the maximum number of attempts were capped at 5 times for a 60-minute quiz.

Data Collection

After the final quiz, the students were asked to complete an online questionnaire on a voluntary basis–no rewards were offered for completing the survey. They were asked to provide only their first name and gender. The purpose of the student survey was to gauge the student perceptions on learning via gamified online quizzes. The questionnaire had a section of 14 questions to find out to what extent gamification features, types of questions, flexibility, post-quiz discussions influenced their learning (see Table 2).

The survey used a five-point Likert scale for each item (1=strongly disagree, 2= disagree, 3=neutral, 4=agree, and 5=strongly agree). At the end of the questionnaire, there were blank spaces for students to write further comments and suggest improvements. Informal chats together with students' feedback on the course Facebook group were taken into account in this study. The data from students' comments, suggestions and informal chats were analysed and used to support the descriptive data from the survey.

RESULTS

Out of 116 students, 63 students responded to the survey. Forty-four respondents (69.8%) were female students and 19 (30.2%) were male. The results in Table 2 showed that over 95% thought the online quizzes were more fun, enhanced their learning and were more effective than the traditional in-class quiz. Interestingly, 95.9% of respondents believed that online

quizzes in the evenings helped to enhance their learning, effectively uses the notional student learning time (SLT). About 98% indicated that taking the online quizzes made it easy for them to remember concepts and principles in medicinal chemistry. Similarly, 98.3% felt that their learning was further enhanced when post-quiz discussions were held. Because the online quizzes were conducted in the evenings, the limited daytime lecture slots were not compromised; instead they were used for post-quiz discussions. Somewhat 39.6% agreed or strongly agreed that the 'anytime, anywhere' flexibility of taking the online quiz did not help their learning.

The web-based quiz used in this course, Quizizz, employs game elements e.g. points, live ranking and scoreboard, memes and funny quotes to inject fun and motivate students by rewarding them based on the speed and accuracy of their answers. Two-thirds of the respondents disagreed that memes and funny quotes cause distractions. When queried about the gamification features, specifically on the duration set per questions, varying between 5-30 seconds, about 56.1% of respondents felt that the fixed duration contributed towards enhancing their learning; whereas 70.7% thought speed and accuracy did help their learning. Additionally, 68.7% of the respondents indicated that having the scoreboard helped their learning.

Studies have shown that game mechanics e.g. scoreboards, rewards and rankings encourage engagement in learners and provide social comparisons, thus may influence students' motivation and performance (30). Regarding having the quiz in multiple choice questions (MCQ), 43.6% felt it was easy, but the majority thought that having a variety of questions of different difficulties (easy, medium and hard) helped to enhance learning in the course. Overall, the majority of students prefer gamified online quizzes to traditional in-class quiz.

DISCUSSION

The value of game-based quiz for learning has been well-investigated recently in higher education settings (2,31–33). Traditional in-class quizzes, closed or open-book, have been routinely used as a summative assessment. Instructors may or may not discuss the quiz questions. On the other hand, an open-book quiz seems to reduce anxiety, puts less weight on memorisation, encourages deeper engagement with the course materials and is more realistic as it mimics the real-life working environment (33). Taking a step further, when learning, formative assessment and game elements are combined, it could potentially enhance student engagement in the course, encouraging learning without threatening esteem (30,34). To this end, many interactive response systems or similar have been shown to promote active learning and peer instruction in lectures (32,35–38).

The survey results of student perceptions are further supported by voluntary written student feedback using the same survey and on the closed Facebook group of the course. Table 3 lists the total number of positive comments (10 comments) which outnumbered the negative aspects (1 comment).

Among the positive comments, many mentioned "having fun during gamified online quizzes"; discussing and learning from their friends; felt that they could remember better; get quick feedback and learn from their mistakes. Gamified quiz reframes failure as an essential part of the learning process, thus, promoting resilience in learners (23). Some students also suggested this online quiz be implemented in other courses, while expressing concerns for not having enough time to learn and improve their scores in a 1-hour quiz.

Table 3: Comments from students from the survey and Facebook

Positive comments of the gamified online quizzes were

- New way of learning was exciting!
- I wish every quiz is conducted this way.
- This approach makes me remember better.
- This is my first time in life having fun while answering quizzes.
- Good as in online quiz is done with flexibility and can be discussed with friends.
- We can learn in a fun and relaxing way via online quizzes. Do it for all subjects.
- I really love this online quiz! Especially when we can learn from our mistakes and correct them on the spot. I'm looking forward to the next quiz!
- I really have fun doing this quiz! This helps me remember better–l love the avatars.
- This quiz was very fun doing in a group. Really learnt a lot from our own mistakes. Thanks for this fun and worthy online quiz! Looking forward to the next online quiz!
- Online quiz is much better than traditional quiz. I tend to learn from my mistakes. Unlike traditional ones, we have the chance to attempt more than once and therefore, learning from our mistakes.

Negative comments of the gamified online quizzes were

- Just a suggestion regarding the duration of quiz, I think it should be extended to 1.5-2 hours so that students have more time to think and choose the right answer to each question.

Informal interviews with students

To gain an insight into how the students took the gamified online quizzes, informal interviews were conducted with several students. The students revealed that they worked in groups. The group size increased from small (3-4 students) to large (9-10 students) as the quiz progressed. They further revealed that before the start of the quiz, they had all the study materials (books, lecture notes, mobile phones and tablets–at hand) ready. When the quiz began, they would attempt the questions as individuals. If they were unable to answer the questions, they paused and checked with their group mates,

read the materials and scanned the internet for answers. Since time is the essence, if they still could not find an answer they tend to continue without submitting an answer. Such response is allowed in Quizizz. These were most apparent in the first half hour of the quiz as reported by the analytics.

As the quiz progressed, the first instructor learned that the instant feedback was helpful to student in checking their conceptions. Once the correct or wrong answers were noted down, discussions ensued with them continuing to learn from their own mistakes and others. The anecdotes support the notion that gamified quiz promotes informal, peer learning outside classroom during the notional SLT.

Post-quiz discussions

Post-quiz discussions are an effective form of intervention; these were made during lecture hours. The discussions were based on the analytics generated by Quizizz, which provides a downloadable colour-coded Excel table displaying answers in green (correct) and red (wrong) as shown in Figure 2.

The report helps instructors to quickly pick the questions that needed further clarification and corrections during the post-discussions. The analytics can also be used as starting points for deeper discussions during the lecture hours. Informal chats with students revealed that this form of intervention is rarely conducted in the traditional quiz and large classroom settings, where formative assessment tend to be overlooked (39,40). It is, therefore, no surprise that 98% of respondents felt the post-quiz discussions enhanced their learning (survey item 12).

Limitations of the study

The online quiz has its limitations; it invites the possibility of cheating, particularly the identity of the participants. Cheating can be minimised by assigning unique student names. Nonetheless, it could have been answered by the same student using 2-3 assigned names, or even by a random person. Having supervised online quizzes could have prevented cheating. Under another course at the School, a similar online quiz using Elearn@USM, the university's Moodle-based learning management system, had been administered at a computer lab in the School. Since the capacity of the computer lab is limited to about 50-60 students, the online quiz had to be conducted in two consecutive sessions. When one group of students was taking the quiz, the other group was being quarantined until the first group finished. Even though cheating was prevented in this case, conducting such quiz placed greater burden on staffing, facilities and timetabling.

Another limitation for such online quiz is stable internet connectivity, which is stated as one of the rules in the Table 1. Students are able to access stable Wi-Fi or cable internet provided by the university, on-campus or at student accommodation; though, at times overloaded servers may affect the internet connectivity. In one instance, a student reported that she was unable to log into the online quiz using her laptop browsers. She had to switch to her phone using own data plan to attempt the quiz. She finished her third attempt past the deadline. Allowance for time provides a space for any technical difficulties and helps increase student familiarity with technology. This incident highlights the importance of time, which should be included as a part of the design of an online quiz or any assessment using a digital tool and platform.

CONCLUSION

The objective of this initial study was to find out the students' perceptions on the employment of gamified online quizzes in a medicinal chemistry course as an alternative to traditional pen-and-paper quiz. Overall students' perceptions towards the employment of online quizzes were extremely positive. For instructors, it provides an efficient way to conduct formative assessments throughout the course.

Additionally, the gamified quiz environment promotes informal, active and collaborative learning outside lecture hours. Students strongly indicated that receiving instant feedback, learning from mistakes and post-quiz discussions are three key factors that enhanced their learning. They also recommended the adoption of the gamified online quiz in other courses in the pharmacy curriculum and could serve as an alternative to traditional quiz. A comparison between gamified and non-gamified online quizzes would be explored in the future.

Confronted with multiple lockdowns and remote teaching during the Covid-19 pandemic, adoption of alternative forms of assessment in higher education settings using digital tools and platforms are inevitable and on-going. With careful planning, design and selection of digital tools, gamified online quizzes can promote and sustain active and collaborative learning for deeper engagement and social resilience in 21st century pharmacy education.

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CONFLICT OF INTEREST

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Original Research Article

Folk Songs for Health Education: A Qualitative Exploratory Study among Public and Pharmacy Enforcement Officers

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ABSTRACT

Dikir Farmasi (DF) is a new effort to expand and intensify the dissemination of information about the regulation of the legitimate use of drugs and cosmetics. This study was aimed to explore the opinions of Pharmacy Enforcement Division staff and the general public regarding the quality and impact of DF program as a health promotion tool in Malaysia. A qualitative study using semi-structured interviews and focus group discussions (FGDs) were conducted at the Pharmacy Enforcement Department and three health clinics located at the city of Kota Bharu, Malaysia. The interviews were audio recorded, translated and transcribed. Thematic analysis was performed to identify the themes and sub-themes of the transcripts. Ethical approval was obtained from Ministry of Health Malaysia. All respondents provided a written consent for participation. Nine pharmacy officers and 23 general public participated in this study. Five main themes emerged from the information gathered and analyzed: 1) language; 2) design; 3) content and delivery 4) costs and benefits and 5) prospect of DF. Certain weaknesses of DF have been raised and the health authorities could utilize this information for an improvement. Significant effort must be made to improve the publicity and dissemination of DF to ensure that it reaches the target population. Certain weaknesses of DF have been raised and the health authorities could utilize this information for an improvement. Significant effort must be made to improve the publicity and dissemination of DF to ensure that it reaches the target population.

INTRODUCTION

Health promotion is defined as "*the process of enabling people to increase control over, and to improve, their health"*.[1] Communicative acts, namely health communication, are deemed as intervention efforts which are instrumental to change public health promotion behaviors.[2]

Health messages nowadays are often conveyed in a complex manner via electronic multi-media. People with low health literacy particularly face difficulties in comprehending these messages as they often lack of essential health-related background knowledge hindering them from understanding important information. [3, 4] This is aggravated by the fact that these people can be chronically ill and less engaged in health preventive services.[5, 6] To convey heath messages effectively, strategic health communication techniques are imperative. One such techniques is entertainment education (EE).[7, 8]

EE embeds pro-social messages into entertainment programs to influence public attitudes, awareness and behaviors. [9] EE offers appealing stories where messages are imparted through prominent characters delivering interesting plots of which is not usually found in the traditional persuasive models.[10]

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In Malaysia, the Pharmacy Enforcement Department of Kelantan has taken initiatives to promote health education via a traditional musical form *dikir barat*, an innovative EE approach by introducing Dikir Farmasi (DF) as a means to promote health awareness to the public.[11] DF is a new effort to expand and intensify the dissemination of information about the regulation of the legitimate use of drugs and cosmetics. The juxtaposition of elements of entertainment with an educational message facilitates pharmacy related messages to be communicated in a livelier manner. The DF project has been created to reach out to the Kelantanese people whom deem *dikir barat* as a popular local art, commonly performed during festive and wedding celebrations.[12] In the early 90s, *dikir barat* was an edutainment. [8] It was is utilized as a vehicle for social commentary, to stimulate discussion on current issues and scenarios.[11, 13, 14]

DF combines the elements of *dikir barat* (a type of traditional folk song rhythm) and traditional sketches from the state of Kelantan, Malaysia.[15] The DF music album, entitled "Let's use registered medicine" was produced in June 2011, consisting of four sketches, namely 1) "Processing of illegal drugs", 2) "Introduction to the service of the enforcement unit", 3) "Registration of medication", and 4) "Illegal cosmetics", as well as three dikir songs, namely 1) "Understanding the service of pharmaceutical services"; 2)"Know your medication", and 3) "Drug information".(9) The animation drama sketches and the lyrics of songs were produced by the enforcement officers from the Protection and Consumer Awareness Unit. DF has been disseminated in the form of theatre performance, exhibition, social and printed media as well as through the internet (YouTube) and , official Ministry of Health website.[12, 16, 17], Google-Play.[15, 18, 19]The VCDs and CDs have been distributed to every health facilities department, to taxi drivers, bus conductors, hyper-malls, as well as to other government agencies within the state of Kelantan.

To the authors' best knowledge, no documented literature has been reported about the impacts of the DF public educational campaign. This present study explores the opinions of Pharmacy Enforcement Division staff and the general public in Kelantan state of Malaysia. It elucidates the effectiveness and shortfalls of DF as health promotional tool and gather thoughts and suggestions for improving the program.

METHOD

Study design

Qualitative study utilizing semi-structured interviews and focus groups discussions (FGD).

Inclusion criteria:

i) Pharmacy enforcement officers at Kelantan Pharmacy Enforcement Department.
ii) The general public:
- Kelantanese
- 18 years old or above
- With previous exposure to the DF programs

The exclusion criteria are those not able to understand standard Malay and Kelantanese Malay languages and individuals who refuse giving informed consent.

Setting

Three health clinics in Kota Bharu, Kelantan were selected due to high daily frequency of patients' visit and diverse patients' statistics in terms of gender, age and area of residence.

Sampling

Using the convenience sampling method, the public participants were identified and approached to join the study by a field researcher at the health clinics. The participants were recruited until no new themes emerged from the interviews.

Study procedure

Nine pharmacy officers were included. 40 public individuals were invited, 25 were interested to participate. However, 2 out of 25 failed to participate due to busy routine. Participants were briefed about the aim of study, researcher who did not represent any governmental agency and affiliate with DF program, their right to express and to withdraw from study with no penalty, goody bag containing a T-shirt and a souvenir as complementary gifts. The study receives Ethical approval from the Medical Research and Ethics Committee, Ministry of Health Malaysia (NMRR-15-1041-23897). All volunteers had to provide an written informed consent form before participating in this study.

Data Collection

Interviews of pharmacy officers were conducted individually in a private room at the Kelantan Pharmacy Enforcement Department. Focus group discussions and semi-structured interviews were conducted with general public. Focus group participants were divided into three groups; two groups of adults and one group of high-school students (7-9 per group).

The semi-structured interviews were conducted based on a prewritten interview guide, a schematic presentation of questions or topics. The semi-structured interview guide were developed through two rounds of panel discussion involving pharmacy lecturer, personnel that involved in DF and two education lecturers that had watched DF videos. The same interview guide was used for both officers and the general public. All the interviews and FGDs were carried out in separate rooms. Each semi-structured interview lasted 40-60 minutes. Interviewees were encouraged to express additional views at end of the interview.

Table 1: Demographic information of the pharmacy officers

ID	Age	Gender	Education	Monthly household income (US Dollar)
PO-1	29	Female	Bachelor of pharmacy	1400-1700
PO-2	30	Female	Bachelor of pharmacy	1400-1700
PO-3	31	Male	Bachelor of pharmacy	1400-1700
PO-4	32	Female	Bachelor of pharmacy	1400-1700
PO-5	30	Male	Bachelor of pharmacy	1400-1700
PO-6	36	Female	Master of pharmacy	1400-1700
PO-7	37	Female	Bachelor of pharmacy	1400-1700
PO-8	35	Male	Bachelor of pharmacy	1400-1700
PO-9	36	Male	Bachelor of pharmacy	1400-1700

Interviewers' Background

The interviews were conducted by researchers with PhD and have more than 5 years clinical and research experience. They have been trained to conduct semi-structured interviews, qualitative research and thematic analysis. The research team comprised of health administration and law enforcement officers, academician and researchers.

Data processing and analysis

All interviews and FGDs were audio recorded. The information was translated into English by two experienced translators. A third researcher (SB) was appointed to compare the audio-recorded interviews and FGDs information against the transcribed written copies. No field notes were taken.

Thematic content analysis was used to identify patterns or regularities within the data. [16, 17] Two researchers individually free coded the verbatim transcripts line by line. All sentences with the same code were reviewed to ensure consistency of interpretation and to confirm additional coding levels are needed. Homogeneity and heterogeneity between the codes were assessed and had them grouped into a hierarchical tree structure. The interviews of pharmacy officers were coded separately by another researcher. Similarly, the FGDs and the interviews of general public were coded separately by two other researchers. All coded data was then reviewed independently to determine inter-rater agreement. All disagreements were discussed until a consensus was reached. New codes were created, to capture the meaning of groups of initial codes. This process resulted in a tree structure with several layers.

Representative participant quotes have been provided and the study results have been reported following the Consolidated Criteria for Reporting Qualitative Research (COREQ) checklist.[20] (see supplementary file).

RESULTS

After interviewing nine pharmacy officers (3 men; 6 women, with a mean age of 30.3 years) from the Kelantan Pharmacy Enforcement Department, and 23 participants ((15 males; 8 females, with a mean age of 30.61 years) from the general public, two researchers reached a consensus that saturation had been met. Five main themes were identified: 1) language ; 2) design ; 3) content and delivery ; 4) costs and benefits and 5) prospects of DF. Table 1 and 2 outlined the demographic information of the pharmacy officers and the general public participants, respectively.

1. Language of DF

1.1. Understandability

DF is a health-information medium where information included should be direct and the language employed uncomplicated. For verification, respondents were asked if they faced difficulties in understanding the DF contents. All respondents, including the students, did not face problem in understanding the language since they are Kelantanese or residents of Kelantan. Respondents expressed that the DF information could not be instantly grabbed at the first exposure.

1.2. Language as a barrier for non-Kelantanese

Both pharmacy officers and the general public expressed concern about the ability of non-Kelantanese to understand the Kelantanese dialect. The respondents were however not keen to use standard Malay language claiming that if DF is expressed in non-Kelantanese dialect, DF will lose its charm. The use of Malay subtitles was recommended instead.

2. DF Design

2.1. Cultural significance

DF is culturally significant because the components used, dikir barat and the sketches, are parts of Kelantanese cultural arts. However, one of the respondents indicated that DF as entertainment is not a new idea other than by means of modern audiovisual aids instead of traditional flyers.

2.2. The Dikir barat (songs) versus the sketches

Both the pharmacy officers and the general public preferred sketches over dikir as i) the sketches can be understood by all

age groups and by non-Kelantanese. ii) the visual effects of sketches felicitate learning.

2.3: Distracting nature of entertaining elements of DF

Unlike pure entertainment, EE actively seek to change the audience's knowledge, attitude and behavior.21According to the pharmacy officers and general public, the entertaining aspects of DF hindered the delivery of educational messages.

3. DF content

3.1: Length

Officers and certain public respondents highlighted that frivolous elements such as unnecessary jokes or prelude scenes should be minimized to reduce duration of DF videos.

3.2: Additional content

Pharmacy legislations such as fines and punishment for conviction of offences should be included in DF to alert people from violating pharmacy-related laws.

The roles of Pharmacy Enforcement Division should be featured to promote public awareness and public-government communication on issues such as medicine registration.

3.3 Take-home message

A mass media campaign cannot be effective unless the target audience is exposed to, attends to, and comprehends its message.22Through DF, the importance of medication registration and administration methods were take-home messages for the respondents.

4. Content and delivery

4.1: Poor dissemination and publicity

DF has been in existence since 2009, but its implementation was not as effective in accordance to officers and general public.

"No one has talked to me directly about matters regarding this DF. (PO-6)"

"Ermm…I'm not sure…because nobody has come to me and say they know about DF. I never had such an encounter. I don't know.(PO-3)"

"The dissemination is not widespread yet. It focuses more on the urban areas and does not cover the rural areas. (R-16)"

Certain officers lamented that pharmacists lack awareness about DF, so were some of them prior joining Pharmacy Enforcement Office. The pharmacists in the public and private sectors should be exposed to DF to enable them to translate the benefits of DF to general public.

4.2: Communication mediums

Respondents also highlighted internet connectivity and accessibility were barriers for general public to receive information of DF.

"The sketches have been available on YouTube® since 2011 but they have only had 2000 views even though thousands of Kelantanese are reported to have access to the internet. (R-2)"

Respondents expressed the need to have DF broadcasted through multiple communication mediums, such as social media, television, radio, billboards, and TV screen in supermarket and pharmacies.

4.3: The need for collaboration

Calls for collaboration between DF team and other parties, such as the National Antidrug Agency and the District or State Education Department, were expressed. This is to equip school teachers with the more information on DF and to encourage DF live performances in schools and universities.

4.4: Other recommendations

More promotional tours and educational events engaging young children should be conducted. Celebrity endorsements were suggested by respondents.

"This campaign should also start as early as in kindergarten because children are easier to educate than adults. (R-4)"

"The selection of performers is also important, for instance Sabri Yunus. His fans will follow whatever he's doing. The same goes for Halim Yazid. If other performers replace him then the audience may not be interested to follow. (R-4)"

5. Costs and benefits

5.1: Resources consumed

Certain officers expressed concern about the cost effectiveness of DF. They doubted if the CDs distributed would be played. When applicable, one-to-one explanation and the use of apps were recommended. Officers had also expressed the concern regarding the time and manpower that DF consumed, especially for live performances requiring them to travel interstates:

"the exhibitions really take too much of their time, and they also have other jobs at their own stations...It's affecting their actual job. (PO-8)"

Table 2: Demographic information of the participants from general public

ID	Age	Gender	Occupation	Education	Monthly household income (USD)	Living area (Rural/urban)	Current medical conditions	Medicine received from	Number of medicines currently taking	Information source on DF
R-1	30	Male	Government sector	Tertiary	240-480	Rural	NA	Government	NA	Internet
R-2	19	Female	Student	Secondary	NA	Urban	Allergy	Private pharmacy	1 (yellow cream)	NA
R-3	25	Male	Student	Tertiary	NA	Urban	NA	Government health clinic	NA	Family/Friends
R-4	32	Male	Self-employed	Secondary	240	Urban	Asthma	Pharmacy	1	Road banner/billboard
R-5	30	Male	Private sector	Secondary	240	Rural	None	NA	1 (for cough)	Family/ friends Advertisement, internet, brochure, banners
R-6	20	Male	Student	Tertiary	NA	Rural	Allergic rhinitis	Government clinic	0	Internet
R-7	25	Male	Self-employed	Secondary	480-720	Urban	None	Government clinic	NA	Internet
R-8	27	Male	Self-employed	Tertiary	240-480	Urban	None	NA	NA	Family/Friends
R-9	30	Male	Government sector	Tertiary	240-480	Rural	NA	Government clinic	NA	Internet
R-10	35	Female	Government sector	Tertiary	480-720	Rural	None	Government hospital	0	Road tour
R-11	18	Female	Student	Secondary	NA	Urban	Short-sightedness	Private hospital	2	Internet
R-12	41	Male	Self-employed	Secondary	480-720	Rural	None	Government clinic /private pharmacy	1 (Vitamin C)	NA
R-13	48	Female	Housewife	Secondary	240-480	Urban	None	Government /private clinic	0	Family/friends
R-14	19	Female	Student	Secondary	480-720	Urban	None	Hospital/Clinic	0	Teacher
R-15	37	Female	Self-employed	Tertiary	1300	Urban	None	Hospital	0	Exhibitions
R-16	35	Male	Retired	NA	240-480	Urban	None	None	0	Joint-performance with DikirFarmasi
R-17	18	Female	NA	Secondary	NA	Urban	Asthma	NA	NA	Teacher
R-18	43	Male	Self-employed	Secondary	1300	Urban	None	Government clinic	0	Family/friends
R-19	37	Male	Government	Secondary	720-900	Rural	Chronic back pain	Government hospital	3	Advertisement, Internet, Brochure
R-20	40	Male	Government	NA	1300	Urban	None	Government hospital/Pharmacy	0	Advertisement, Internet, Brochure
R-21	23	Male	Private	Tertiary	240	Rural	None	None	0	Family/friends
R-22	38	Male	Government	NA	480-720	Urban	None	None	NA	Advertisement, Internet, Brochure, banners, Family/friends/
R-23	19	Female	NA	Secondary	NA	Urban	Anemia	Government clinic	0	Internet

"if I have to do performance, have to join the performance, a lot of my time is being spent on training.. (PO-7)"

5.2: Behavioral change

DF motivated general public to practise the health knowledge in their daily lives and to promoted behavioral change. However, some respondents admitted failure in doing so.

"The information is very helpful but compliance to the information is difficult, especially among adults. (R-4)"

"Dikir Farmasi is nice to listen to but to practice is the difficult part because I find it interesting to listen to but I don't practice the knowledge. (R-5)"

Some of the respondents, however, reported behavior change after exposure to DF:

"Before this I used to kept medication recklessly.... and didn't know that medications can be contaminated. After listening to the CD I will discard the medications. (R-7)"

"Before this I used to buy medicines sold at the night market. I've become more alert and check for registration of medicines after being exposed to DF. (R-1)"

6. DF Future

6.1: Adaptability of DF over time

There were disagreements among the general public if DF should adopt dikir or modern music.

"The suggestion to include K-Pop elements in dikir can be considered, but not to the point that the dikir loses its identity. (R-4)"

In toto, the officers were given authority to fully promote DF. Respondents highlighted that further assessment on the impact and acceptance of DF among public needed to be conducted. Pessimistic comments to replace DF with new ideas were recorded, although the options of replacements were not formulated:

"….ermmm…if I myself, ermm…I will discontinue it, the dikir. Because I myself, am not a huge fan of DF. Maybe…think of other ideas….So far I cannot come up with other ideas. (PO-7)"

6.2: Impact and cost-effectiveness

There is no known evidence investigating the impact versus cost effectiveness of the DF. No research reports the appropriateness and public acceptance level of DF.

DISCUSSION

The aim of the study was to explore perspectives of nine Pharmacy Enforcement Officers and reveal public perception on DF. The findings of the study revealed that there is a trend in the field of health emphasizing on health promotion rather than disease treatments.[20, 21] Health promotion incorporates appropriate self-management of medicine. Effective health promotion program requires to equip the public with relevant knowledge via health communications using advanced technologies.[20, 21] Officers need to be inculcated with appropriate health information for effective delivery to general public.

As reflected from the interviews, the Pharmacy Enforcement Officers interviewed are apparently not able to appreciate the value of DF as a tool in health-promotion. Therefore, it is recommended that the concept of health-promotion and how DF relates to it be discussed with the officers in helping them to appreciate the value and benefits of DF. It is worth mentioning that DF is available in both online and off-line and a recent study indicated that both methods were found equally effective for delivering pharmacy education.[22]

Proper planning and evaluation of outcomes are important to ensure the success of DF. Here we recommend the Precede-Proceed Model.[23]The Precede-Proceed Model has been utilized in multiple preventive health promotion programs in Australia including early health risk detection initiatives. Its success has been validated through several rigorously evaluated clinical and field trials.[23]Basically, the model's premise is on rigorous population assessment prior to development of health intervention (*Precede*), and post-intervention evaluation (*Proceed*) to measure the effectiveness of the program. The study's findings point to some weaknesses of DF since the contents had not been subjected to the *Precede* evaluation. DF is deemed to be too lengthy and the entertainment elements are distracting. For example, the officers lamented that DF activities are time-consuming and disrupting to their other duties. To overcome this issue, we recommend that a special portfolio be assigned to officers whose scope of tasks are mainly focused on DF. This officer may be given the responsibility of conducting the relevant research to assess the impact of DF. The appointed officer should act as the head of all DF programs and attend all DF activities to ensure smooth implementation. The majority of respondents have generally pessimistic views on DF. Personal opinions do not necessarily reflect the objective reality as personal views are dependent on the accuracy of the individual's assessment. Contrary to what people tend to believe, personal views are often flawed due to biases that can prevent the people from arriving at accurate judgments or decisions.[24] These biases may be attributed to the lack of information required to achieve accurate self-assessment. However, obtaining accurate information is not always an easy and straightforward task.[25] Effective communication strategy is lacking in health education. The implementation of

strategy should adopt theoretical framework that can adapt to cultural differences.[26-29]

This study also explored public's perception about DF. The respondents lack exposure to DF despite the DF has been promoted in supermarket chains, private buses and taxis, 287 health facilities throughout Kelantan, the Ministry of Defence, the Election Commission of Kelantan, the Department of Information, the Universiti Malaysia Kelantan and Universiti Teknologi MARA Kelantan.[11]

Another main concern of the respondents was that information conveyed by DF may not translate into actual behavioral change. The mass media are intensively employed in public health with vast sums spent annually for the production and distribution of booklets, pamphlets, exhibits, newspaper articles, and radio and television programs in the hope that three effects might occur: the learning of correct health information, the changing of health attitudes, and ultimately the change of behavior. Changing behavior is the ultimate and highest priority in any public health campaign, but most of the mass media will change knowledge and awareness more easily than behavior. [30]

In a meta-analysis, Shen et al. analyzed the results of 22 studies and concluded that EE messages had a significant small effect on persuasion (r = .12) with a slightly stronger effect on health knowledge that on attitudes, intention, and behaviors. This suggests that EE can be more effective in communication health-related information, especially in educating people about a variety of health issues than changing attitudes and behaviors.[10]

Strengths and limitations of this study

To the best of our knowledge, no documented literature has investigated the conduct and organization of DF program (i.e. health promotion delivered in a pharmacy). In this study, a total of nine pharmacy enforcement officers from Kelantan Pharmacy Enforcement Department and twenty three general public participants from three different health clinics in Kota Bharu, Kelantan presented multiple perspective regarding the quality and impact of DF. Two data collection methods (semi-structured interviews and focus group discussions (FGDs)) were used to generate data.

In term of weakness of the study, the respondents had only been interviewed once. Since DF is still being implemented, its progress still needs to be followed and the respondents should be interviewed again after a specified timeframe to observe for changes in their opinions. In addition, the team leader of DF has not been interviewed. The opinions of the team leader will be valuable in order to have balanced views. The second part of our study consisted of interviews of 23 general public. While their opinions gave us very valuable insights into different aspect of DF, they cannot represent and speak for the whole population in Kelatan, Malaysia and other rural residents of Malaysia. Moreover, there is a chance that reporting bias exists since the interviews were conducted face-to-face which may have put some pressure on the respondents. Future studies may include pharmacists from other settings such as hospital pharmacists or academician pharmacists since they are also involved in health education and their opinions can contribute to the betterment of DF.

CONCLUSION

DF represented an innovative health promotion platform for the Kelantan Pharmacy Enforcement Division. It intensifies the dissemination degree of knowledge and information related to drugs and cosmetics regulations to the public. In general, the public has positive views on DF. This is reflected in their favorable and optimistic comments on DF. However, certain weaknesses have been raised; significant effort must be made to improve the publicity and dissemination of DF to ensure that it reaches the target population and it is used to its optimum potential. The elements of entertainment and comedy provided extra value to education in an interesting and informal way. However, more research needs to be done in order to analyze the actual impacts of DF and to evaluate its effectiveness versus its cost. It is hoped that DF can benefit from this study and more innovations in health education are to be implemented in future.

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CONFLICT OF INTERST

The authors declare no conflict of interest.

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Original Research Article

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Utilization Pattern of Lipid Modifying Agents in An Outpatient Pharmacy Department of a Private Hospital in Malaysia

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ABSTRACT

Introduction: Lipid-modifying drugs have been used to treat dyslipidemia as well as for the primary and secondary prevention of CVDs and stroke. **Objectives:** This study aims to describe the drug utilization pattern of lipid-modifying drugs in a private hospital. **Method:** A retrospective study was carried out in outpatient of the selected hospital. Patients were selected based on inclusion and exclusion criteria by using convenience sampling. Data were collected through KCIS by retrieving patients' registration number. Defined daily dose (DDD) was calculated and compared to World Health Organization DDD. Medicine prices were also analysed. **Results:** A total of 180 patients' record were analysed, 70% of them were male; 40.6% of the patients were from the age range of 50 to 59 years old; ethnicity breakdown was Malay (69.4%), Indian (18.3%) and Chinese (12.2%). Among all lipid-modifying drugs, utilization of statins was the highest as statins are the preferred line in the treatment of dyslipidemia. Innovator brands were more preferred where most of the lipid-modifying drugs used in the selected hospital are innovator brand drugs. In terms of cost, lipid-modifying drugs contributes to about 27% of the total cost of prescription in average. **Conclusion:** The utilization of all lipid-modifying drugs in the selected hospital was lower as compared to WHO DDD. As compared to combination therapy, monotherapy with atorvastatin was generally preferred in the selected hospital. The utilization of atorvastatin was found to be the highest in the OPD of the selected hospital.

INTRODUCTION

Dyslipidemia is a medical condition referring to an abnormal lipid level in the blood. Elevated levels of LDL cholesterol in blood are associated with Cardiovascular Diseases (CVDs), cerebral stroke and renal failure or even death [1]. CVDs are principal cause of death globally as well as in Malaysia [10]. According to National Health & Morbidity Survey 2015, Malaysian has a high risk of CVDs, an estimation of 73% of total death is due to non-communicable diseases (NCDs). These NCDs include overweight or obesity, diabetes mellitus, hypertension as well as hypercholesterolemia. The prevalence of hypercholesterolemia in Malaysia has increased from 32.6% in the year 2011 to 47.7% in the year 2015 indicating poor dyslipidemia management [2].

Lipid-modifying Agents (LMAs) are used for primary & secondary prevention of CVDs [13]. The total expenditure of LMAs has been increased by 56.6% from RM 210 million in the year 2009 to RM 329 million in the year 2010. This inflation was greatly contributed by the private sector (64.8%) [12].

Increment of cost per year in LMAs is directly proportional to prevalence of CVS patient. This is a clear implication on the need of drug utilization review (DUR) to identify the appropriateness in the usage of LMAs. DUR is defined as an authorized, structured, ongoing review of prescribing,

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Table 1: Demographic profiles of selected patients

Category		Frequency (n=180)	Percent (%)
Gender			
	Male	126	70.0
	Female	54	30.0
Age (years)			
	Below 20	0	0.0
	20 – 29	1	0.6
	30 – 39	4	2.2
	40 – 49	36	20.0
	50 – 59	73	40.6
	60 and above	66	36.7
Ethnicity			
	Malay	125	69.4
	Chinese	22	12.2
	Indian	33	18.3

dispensing and use of medication with the goals of promoting optimal medication therapy and ensuring drug therapy meets standard [3].

In this research, drug utilization of LMAs in a private healthcare centre was conducted in a private hospital in Negeri Sembilan, with the intention to describe if the Defined Daily Doses (DDDs) of LMAs are prescribed and utilized accordingly based on the WHO DDD criteria in private hospitals. DDD is defined as an assumed average maintenance dose/day for a drug used for its main indication in adults [10]. This study will be able to provide information on the compliance of WHO DDD in the private hospital and cost of lipid-modifying drugs can be calculated in order to reduce the usage of high-end drug. This may eventually facilitates the development of hospital drug formularies.

The objectives of this study include to describe the drug utilization pattern and analyse by comparing WHO DDD criteria of LMAs prescribed in the OPD of private healthcare centre. Secondly, to identify the highly utilized LMA prescribed in the OPD of private healthcare centre and to calculate the cost of LMA per prescription.

METHODOLOGY

A retrospective, observational, quantitative study on the utilization of lipid-modifying agents was conducted in the outpatient department of private hospital, Malaysia. A list of item movement for each lipid-modifying drug in the selected private hospital with the transaction date between 1st January 2017 till 31st December 2017 was first generated together with patients' name, Medical Record Number (MRN), transaction date, quantity dispensed as well as prescriber's name by using the Hospital Information Technology System (HITS).

The prescription was chosen using convenience sampling method. List of MRN generated were used to retrieve patient's prescription via KPJ Clinical Information System (KCIS). Selection of patient according to eligibility criteria. The inclusion criteria include newly registered (in year 2017) and existing patients (follow up from past years) prescribed LMAs, patients of either sex age 18 years old and above while prescription with incomplete data were excluded from studies. Patient's medical data was not collected as it was not accessible in the private hospital.

Data retrieved were collected using data collection form through KCIS include patient's demographic, like age, gender and race as well as prescription details such as name and brand of prescribed medicine, frequency, dose and duration of the medicine prescribed as well as prescriber details like prescriber category and education background for each patient were recorded. Costs of lipid-modifying drugs and total cost per prescription were calculated based on the price reference list provided by the pharmacist.

Demographic information and prescribing record of each patient were analysed descriptively and statistically by using the Statistical Package for Social Science (SPSS) program version 22.0 which were expressed in mean and standard deviation. The DDD was computed based formula derived from Manitoba Centre for Health Policy. The ethical issues and informed consent have been approved by Research Ethics Committee of KPJ University College, Nilai, Malaysia. This approval has been obtained before conducting the study.

Table 2: Drug utilization based on DDD

Lipid-modifying Drug	WHO DDD (DDD)	Total DDD (DDD)	Rates per residents per day (DDD per 1,000 residents per day)	Rates per user per day (DDD per user per day)
Simvastatin 20mg	30	820	0.07	1.71
Atorvastatin 20mg	20	2,655	0.24	1.84
Atorvastatin 40mg	20	820	0.07	2.10
Atorvastatin 80mg	20	4,360	0.39	5.38
Rosuvastatin 10mg	10	1,030	0.09	2.27
Rosuvastatin 20mg	10	1,940	0.17	4.04
Fenofibrate 145mg	200	837.38	0.07	1.34
Ezetimibe/Simvastatin 10/20mg	-	1,065	0.10	1.87
Ezetimibe/Simvastatin 10/40mg	-	930	0.08	1.82

RESULT AND DISCUSSION

In this study, demographic characteristic, dyslipidemia can be seen higher in men (70%) than in women (30%). This result is consistent with several findings from China and American-based studies [4,5]. This could be attributed to the unhealthy lifestyle such as alcohol drinking and cigarette smoking in men, while on the other hand, women are generally more health conscious [11].

Dyslipidemia can be seen increasing by age, peaking in the age group of 50 to 59 years (40.6%), but slightly reducing in age group of more than 60 years (36.7%). Similarly, in other studies from China, America and Africa, the prevalence of dyslipidemia increases with age [4, 5, 6, 14]. In terms of ethcinity, dyslipidemia is most prevalent in Malay (69.4%), followed by Indian (18.3%) and Chinese (12.2%).

The average number of drugs per prescription was 5.54 drugs per prescription. Previous study reported by WHO suggested that for a patient without chronic diseases such as hyperlipidemia, hypertension, about two to three drugs per prescription is ideal to ensure proper adherence [10]. However, this study reported higher number of drugs per prescription. This may increase risk of drug interaction. Other study suggested that personal patients' request or demand could lead to over-prescribing of multi-vitamins or medications for minor ailments [15]. Medication counselling and bedside counselling are also implemented to ensure patients have proper understanding of each medication prescribed in order to enhance medication adherence.

In terms of drug utilization of statin, this study revealed that the most frequently prescribed statin was atorvastatin (64.7%) and the least was simvastatin (11.8%), remaining was rosuvastatin (23.5%). A study supported that atorvastatin was the safest statin in association with renal function [7] while another study also reported that atorvastatin is more cost-effective as compared to rosuvastatin as the additional efficacy of rosuvastatin does not support the extra cost [8].

The utilization rates per residents per day and the rates per user per day were lower compared to the WHO DDD. This low drug utilization rate is due to the low sample size obtained, which ultimately affects the result of utilization rates. This low level of utilization obtained cannot be used to reflect the overall usage of lipid-modifying drugs in OPD of the selected hospital.

The average cost of lipid-modifying drugs per prescription contributes to about 27% of the total cost of prescription. The LMA used are mostly innovator brand drugs with a high price per unit. Generic brands of atorvastatin at a cheaper price were least preferred. The high cost of lipid-modifying drugs directly contributes to the rise in total cost of prescription, which may burden the patients financially especially those with low or moderate income will eventually leads to poorer medication adherence. Majority of the patients with dyslipidemia also has at least one comorbidity of either CVDs such as hypertension, myocardial infarction, coronary artery disease and/or diabetes. The higher the number of comorbidities, the higher the number of prescription drugs, which in turn increases the cost of prescription [9]. With a significant increase in cost, patients especially those with low or moderate income will eventually leads to poorer medication adherence where they either stop

filling their prescription or reduce the frequency of taking the medication, which ultimately worsen health outcomes.

Study Limitation and Further Study

One limitation in this study is convenience sampling method used with a low sample size, which affects the utilization rate measured and that the result obtained shall not be used to generalize or represent the overall utilization. However this study serves as a pilot study to aid in further studies on drug utilization. Another limitation is the restricted access to patients' medical to obtain important information such as diagnosis, comorbidity, laboratory results like lipid profile, lifestyle and family histories which could be an aid in calculating Framingham Point Scores in order to identify the appropriateness of lipid-modifying drug prescribing. Further studies can be done using all patients' data to reflect on the actual utilization of lipid-modifying drugs. The appropriateness on prescribing of lipid-modifying drugs can be identified if complete access to patients' medical notes is permitted. Since the average number of drugs per prescription in the selected hospital is close to 6 drugs, medication adherence can be evaluated to ensure patients are taking medication correctly.

CONCLUSIONS

The drug utilization of LMAs in OPD of private healthcare centre is lower as compared to WHO DDD which may be due to low number of samples collected and may not be used to reflect the overall utilization. Monotherapy with Atorvastatin is generally preferred in private healthcare centre. Innovator brands were more preferred where most of the LMAs using in private healthcare centre are innovator drugs. The higher price per unit of innovator drugs increases the cost of LMA where physician may consider switching from innovator brands to generic drugs for a more cost-saving approach. The average number of drugs per prescription was found to be high at 5.54, this increases the risk of drug-drug interactions and in turn increases patients' health risks. Pharmacists are recommended to actively participate in prevention of drug-drug interactions by involving in medication reconciliation to reduce inappropriate and unnecessary drug prescribing.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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