

AN EVALUATION OF PRACTICES, PERCEPTIONS AND UNDERSTANDING ABOUT USE OF ACETAMINOPHEN (PARACETAMOL) AMONG MALAYSIAN CONSUMERS: A QUALITATIVE STUDY

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An assessment on the use of acetaminophen (paracetamol) among consumers would provide guidance for implementing strategies to overcome the misuse of acetaminophen-containing products. This study aims to evaluate Malaysian consumers' practices, perceptions and understanding regarding the use of acetaminophen. A semi-structured qualitative study utilising face-to-face interviews was conducted among 14 consumers aged 24 to 82 years old who live in Pulau Pinang, Malaysia. Transcripts of all the interviews were generated from audio tapes and were analysed for the issues and themes emerging from the text; the transcripts were independently coded and verified by experts. The consumers had a positive attitude towards the popularity, safety and efficacy of acetaminophen. The consumers predominantly used acetaminophen for pain and fever. Some consumers tended to increase the frequency and dosage of acetaminophen consumption if their condition persisted. Consumers had difficulty recognising the generic acetaminophen-containing products available in the market. Health literacy investigations have found that consumers have a lack of knowledge regarding the correct dosing regimen for acetaminophen in adults and children. The consumers were not aware of the precautions and toxicities of acetaminophen. To increase awareness of acetaminophen poisoning in Malaysia, the consumers suggested that educational tools regarding the proper use of acetaminophen are needed from the Ministry of Health and policy-makers. The information gained from this study emphasises the importance of educational interventions to educate the public on the proper use of acetaminophen in Malaysia.

Keywords: Acetaminophen, Paracetamol, Practices, Perceptions, Understanding

INTRODUCTION

Acetaminophen (or paracetamol) is a common constituent of over-the-counter analgesics and non-prescription drugs used to reduce fever and relieve common pain. The recommended dosage of acetaminophen for adults is 500 mg to 1,000 mg every 4 to 6 hours, up to a total daily dose of 4,000 mg; the recommended dosage for children is 15 mg/kg every 4 to 6 hours, up to a total daily dose of 2,400 mg (National Prescribing Service Limited [NPS] 2003). An acute single ingestion of acetaminophen greater than 10 g or 200 mg/kg (whichever is lower) in adults or 200 mg/kg in children is considered hepatotoxic (Dart *et al.* 2006). Additionally, acetaminophen toxicity could occur after

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repeated ingestion of supra-therapeutic doses over a period of more than 8 hours (Daly *et al.* 2004; Craig *et al.* 2012). These events might lead to symptoms such as confusion, loss of appetite, stomach pain, nausea, or vomiting. Liver injury becomes evident when levels of aspartate aminotransferase and alanine aminotransferase begin to increase within 24 to 48 hours. This liver injury might eventually lead to death (Schjødt *et al.* 1997; Dart *et al.* 2006). Currently, N-acetylcysteine (NAC) is the antidote for acetaminophen poisoning. Early initiation of NAC therapy is essential because the treatment is most effective for patients who are admitted to the hospital within 8 to 10 hours of acetaminophen ingestion (Alsop 2013).

Acetaminophen poisoning is a common phenomenon around the globe. In the United Kingdom, acetaminophen poisoning accounted for 48% of hospital admission related to drug poisoning and leads to 100 to 200 deaths yearly (Hawkins, Edwards and Dargan 2007). A study conducted at a general hospital in Northern Malaysia found that acetaminophen poisoning accounted for approximately 29.0% of all drug poisoning incidents; 60.0% of the cases were suicide attempts, and 33.3% of the cases involved accidental ingestions. The majority (73.3%) of the acetaminophen poisoning cases involved patients between 16–30 years of age, and 38.0% of the cases involved ingestion of a dose of more than 10 g (Mohd Zain, Fathelrahman and Ab Rahman 2006).

A survey study conducted among 266 adolescents and young adults in the United States of America demonstrated that lack of health literacy is the main reason for the poor understanding and potential inappropriate use of acetaminophen-containing products. In this study, the respondents with limited health literacy were more likely to misunderstand information in the acetaminophen product label (Shone *et al.* 2011). Moreover, self-medication without consultation with healthcare providers could increase the risk of misuse and over-consumption of non-prescription medicines, including acetaminophen (Almasdy and Sharif 2011). A previous study on self-medication practices among female students in Malaysia revealed that the incidence of accidental drug poisoning was 8.3% (Ali, Ibrahim and Palaian 2010). To overcome this problem, proper labelling, educational interventions, and public health activities might help promote the proper use of acetaminophen (Shone *et al.* 2011).

Educational tools to promote the proper use of acetaminophen are limited in Malaysia. An understanding of consumers' practices, perceptions, and understanding regarding the use of acetaminophen is important to the overall planning of educational interventions. This study would provide baseline data to develop an educational tool on the proper use of acetaminophen. The study findings would help a government agency in designing educational programmes for consumers regarding the proper use of acetaminophen, which would enhance the quality of acetaminophen use to achieve optimum health outcomes for the public.

METHODS

Qualitative semi-structured interviews were conducted in the State of Pulau Pinang, Malaysia from 1 May 2013 to 31 June 2013. The interviews were conducted with a convenience sample of consumers who visited the Health Clinic of Universiti Sains Malaysia (USM), Outpatient Clinic of Advance Medical and Dental Institute, USM and two selected community pharmacies. The inclusion criteria for the consumers were any adult patients who attended a clinic visit. The consumers were required to be literate in Malay, English or Chinese. The sampling was continued until the saturation level was reached or when there was no more new information gathered from the interviews. This method was in accordance with the methodology for determining the sample size for qualitative interviews (Mason 2010).

The interviews consisted of open-ended questions in which the consumers could freely express their opinions and comments in response to questions. Each interview lasted approximately 30 minutes, and consent was obtained from consumers before the interview started. The interviews were conducted in the patients' waiting area. The interview questions were initially developed in the English language using information from a literature review. The questions were tested for face and content validity by three experts in pharmacy practice research. The experts consisted of registered pharmacists who worked as academic staff in the School of Pharmaceutical Sciences, USM. The questions were subsequently translated to Malay and Chinese using forward-backward translation procedure. During the interview, the questions (see Table 1) were read out loud by the researcher (the first author) in the consumers' preferred language. Then, the consumers gave their opinions and comments according to each question with visual aids such as acetaminophen product labels or packages as well as acetaminophen in tablet, syrup, and suppository forms. The interview was audio recorded. The consumers received a gift (a pen) upon completion of the interview.

Table 1: Interview questions.

No.	Questions
Part 1: An evaluation on Malaysian consumers' practices of acetaminophen*	
1.	Have you ever taken Panadol? What type of Panadol do you use?
2.	Where do you obtain Panadol? What is the quantity of your purchase?
3.	Under what conditions do you take Panadol?
4.	What is the dosage for the tablets that you take? How many tablets do you take each time? How frequent do you take it per day? How often do you use it?
5.	If your conditions/symptoms persist after taking Panadol, what would you do?
6.	Do you read the instructions of the package before you consume? Do you receive any medical advice regarding Panadol consumption when you purchase it? What kind of medical advice do you receive?
7.	How do you feel regarding the effectiveness of the Panadol that you have been taking? Should this Panadol be recommended to family or friends?
8.	Where do you get reference information about Panadol for self-medication? Why do you use that source?
9.	Do you take any prescribed medicines? If yes, do you consume Panadol together with the prescribed medicines?
Part 2: An evaluation on Malaysian consumers' perceptions of acetaminophen*	
1.	From your point of view, do you think Panadol is popular among the Malaysians?
2.	They are increasing demands for Panadol in the market. How do you feel about the safety and efficacy of these Panadol products?
3.	Do you think Panadol sold in Malaysia are tested and approved by the Ministry of Health?
4.	Do you think educational effort is needed to educate public on use of Panadol?
5.	How could the labels on the Panadol be improved? (by showing few examples of product labels)
Part 3: An evaluation on Malaysian consumers' knowledge of acetaminophen*	
1.	What is Panadol used for?

(continued on next page)

Table 1: (continued)

No.	Questions
2.	Is Panadol a brand name or an active ingredient in a medicine? Do you know the content of Panadol?
3.	Can you differentiate among these Panadol [®] products? (by showing few examples of Panadol [®] products in different formulations, for instance, Panadol [®] Actifast, Panadol [®] Soluble and Panadol [®] Cold & Flu)
4.	Can you differentiate among these Paracetamol products (generic products) with different brand name? (by showing few examples of generic paracetamol products)
5.	Do you know the maximum dosage of Panadol tablet per intake in adult? Do you know the maximum dosage of tablet per day in adult? (by Showing Panadol [®] 500 mg & 650 mg tablet)
6.	Do you know the dosage of syrup Panadol 125 mg/5 mL per intake in children in aged between 1–3 and 4–6 years old? (by showing the syrup Panadol [®] 125 mg/5 mL)
7.	Do you know the dosage of syrup Panadol 250 mg/5 mL per intake in children aged between 6, 7–9 and 10–12 years old? (by showing the syrup Panadol [®] 250 mg/5 mL)
8.	Under what conditions Panadol should be consumed with caution?
9.	What are the effects of Panadol over-consumption?
10.	What are the signs of Panadol over-consumption? What course of action would you take if you recognize signs of Panadol over-consumption?
Part 4: Conclusion*	
1.	As a conclusion, do you have any additional comments about the usage of Panadol in Malaysia?

Note: *The name of the originator brand "Panadol" was used throughout the interview as the participants were not familiar with the term "acetaminophen" or "paracetamol". They only familiar with the term "Panadol".

The interview focused on consumers' practices, perceptions, and understanding of acetaminophen. Additionally, their knowledge regarding the indication, dosage, and toxicity of acetaminophen were assessed. The name of the originator brand, "Panadol", was used throughout the interview because the participants were not familiar with the terms "acetaminophen" or "paracetamol"; they were only familiar with the term "Panadol". Therefore, the use of the term "Panadol" in this study did not refer to a specific brand and referred to acetaminophen. The consumers were also provided with acetaminophen product labels and were asked to give opinions on how to improve these labels. Additionally, the consumers were provided with 17 acetaminophen product package props and were asked to distinguish between the acetaminophen brand name (originator) products (a total of 7 products) and generic products (a total of 10 products).

The data provided by the consumers were transcribed verbatim and analysed for prominent themes, major issues, differences, and unique individual responses. The themes were developed from the raw data after the interviews. The thematic analysis was manually performed by the first author without using any research tools. During the initial phase of the thematic analysis, reading and re-reading were performed on the transcribed material to develop a list of items with a reoccurring pattern. These items were subsequently coded to allow the researcher to make comparisons between the interviewees' responses and to search for themes. The codes were combined to form themes, which are phrases that identified the meaning of the data. The identified themes were verified through discussion among the first author and two academicians from the School of Pharmaceutical Sciences, USM, who are experts in the field of qualitative research. Coding was given to each consumer (Con01 to Con14). The study was granted

ethics approval from the Universiti Sains Malaysia-Hospital Lam Wah Ee Ethics Committee (ethics approval number: USM-HLWE/IEC/2012(0017)).

RESULTS

Characteristics of Participants

Fourteen consumers aged 24 to 82 years were interviewed. In terms of educational background, six of the consumers had received secondary education, and two of the consumers had completed a diploma's degree. Five consumers were university students, and the remaining consumer did not have any formal education. Five interviews were conducted at the two selected community pharmacies, five interviews were conducted at Health Clinics of USM and the remaining interviews were conducted at the Outpatient Clinic of Advanced Medical and Dental Institute of USM. The consumers' demographic characteristics are summarised in Table 2.

Table 2: Demographics and characteristics of the responding consumers.

Characteristic	Frequency
Age group, years	
18–25	3
26–40	7
41–60	1
Above 60	3
Gender	
Male	3
Female	11
Ethnicity	
Malay	3
Chinese	11
Education background	
No formal education	1
Secondary school	6
Diploma	2
Bachelor's degree student	4
Post-graduate degree student	1
Employment status	
Unemployed	4
Student	4
Self-employed	1
Private sector	5
Household status	
Live alone	2
Live with family	12
Health status	
Fair	7
Good	6
Very good	1
Alcoholic (Do you drink alcohol?)	
Yes	1
No	13

The thematic content analysis of the interviews identified four major themes, including the trend of acetaminophen use, appropriateness of acetaminophen use, factors contributing to appropriateness of acetaminophen use, and strategies to improve the quality use of acetaminophen. The descriptions of each theme with illustrative excerpts from the consumers' transcripts are included below.

Theme 1: Trend of Acetaminophen Use

The consumers were asked about the popularity, types, place of purchase, and quantity of acetaminophen used. All of the 14 consumers had taken acetaminophen, and the majority of consumers noted that acetaminophen was popular among Malaysians:

"Yes, Panadol is popular and good since many people take it." (Con03)

"So far ok, many people buy it." (Con10)

"Everyone knows and take it." (Con13)

"Panadol is very usual in Malaysia because every house will buy and take it." (Con14)

All of the consumers were found to have consumed various acetaminophen products other than the originator brand Panadol[®]. Some of the consumers were familiar with Uphamol[®] (a generic brand) and KK paracetamol ("KK" is an 500 mg acetaminophen tablet obtained from the Malaysian government hospitals or clinics):

"Yes, I take Panadol[®] 500 mg, Panadol[®] Soluble and Panadol[®] Actifast." (Con03)

"Yes, I take Panadol[®], Uphamol[®] and Panadol[®] Soluble." (Con09)

"Yes, I take Panadol[®] Actifast, Panadol[®] Soluble and KK." (Con11)

The majority of the consumers obtained acetaminophen from the pharmacy in a quantity of 10 tablets in one strip:

"I buy one strip from the pharmacy and Chinese medicine shop." (Con02)

"I buy it from the pharmacy, sometimes one strip and sometimes two strips." (Con04)

"I get one strip from the pharmacy and government hospital." (Con08)

"I buy it from the mini market and pharmacy, usually one strip only." (Con13)

"I usually buy one strip from the sundry shop and pharmacy." (Con14)

Theme 2: Appropriateness of Acetaminophen Use

The consumers typically took acetaminophen for common pain and fever:

"I used it during headache and fever." (Con03)

"Err...I used (acetaminophen) for fever, headache, mild toothache, not for cold and flu." (Con04)

"I used it as pain killers, for example, for headache, toothache, menstrual pain, and fever." (Con05)

"I used (acetaminophen) to treat diseases like headache, fever, and menstrual pain." (Con09)

"I used Panadol for severe headache and fever." (Con12)

A few consumers used acetaminophen for abdominal pain, gastric pain, and dizziness:

"I used Panadol for fever, headache, and dizziness. But, not for dental pain, should have other medicines (dental pain should be treated by other medicine)." (Con01)

"I used it for menstrual pain, headache, abdominal pain, gastric pain, and toothache." (Con11)

The consumers were able to recognise and follow the proper recommended dose of 500 mg acetaminophen tablets in adults, which is one to two tablets every six to eight hours, and the total daily dose should not exceed eight tablets:

“I take one tablets thrice times per day when I feel sick.” (Con01)

“I take two tablets every eight hours and used it every month during period pain.” (Con11)

A consumer reported using a 500 mg acetaminophen tablet as the condition arises, and she was very satisfied with its effectiveness:

“I will recover after take one tablet of KK paracetamol.” (Con08)

The respondents predominantly failed to recognise and follow the proper recommended dose of 650 mg acetaminophen tablet in adults, which is one to one and a half tablets every six to eight hours, and the total daily dose should not exceed six tablets:

“I take two tablets thrice times when necessary.” (Con05)

“I take two tablets once time per day when headache.” (Con10)

“I am not sure about the dosage.” (Con12)

The respondents without children were generally not aware of the paediatric dosage of acetaminophen:

“I really don't know. I only knew myself take two tablets only.” (Con03)

“No, because no children in my house.” (Con06)

“I don't know, no children in the house.” (Con13)

A mother was found to know about the dosage of acetaminophen for her children's age group:

“I give my children aged 12 years old approximately 15 mL thrice times per day (for acetaminophen suspension 250 mg per 5 mL).” (Con02)

The respondents show various behaviours when their conditions or symptoms persisted after taking acetaminophen. Apart from consulting their doctor, some would increase the frequency or dosage of acetaminophen consumption:

“I will take it more frequently.” (Con02)

“I will double the dose, previously take one tablet, now, take one more tablet.” (Con13)

“I will double the dose by taking another two tablets.” (Con14)

One respondent ignored the conditions or symptoms:

“I usually ignore the conditions.” (Con08)

Theme 3: Factors Contributing to the Appropriateness of Acetaminophen Use

A few consumers would read the instructions on the package before consuming acetaminophen, whereas other consumers did not report this practice:

“I get information from the product label because this source is very reliable and accurate.” (Con04)

“I bought Panadol myself. I read instruction on the package for the first time and then follow the previous dosage.” (Con10)

“No, I just take it (acetaminophen) directly (without reading the instructions on the product label).” (Con01)

“I am too lazy to read the instruction.” (Con14)

Some of the respondents received medical advice regarding acetaminophen from their healthcare professionals, family, and friends:

"I just follow instruction of my mother. If my mother says two tablets, I will take two tablets only." (Con03)

"Yes, hospital pharmacists tell me on the indication, dosage, and frequency of Panadol." (Con07)

"From doctor and pharmacist, they tell me about effects of Panadol overdose, don't exceed maximum daily dose, dose, and frequency per day." (Con09)

"From my mother because she is a doctor, she told me to take two tablets every six hours." (Con11)

"My friend just tell me about not over than two tablets per intake." (Con12)

Some of the respondents were cautious about consuming acetaminophen together with their prescribed medicines:

"Yes, I took antihypertensive and hypercholesterolemia drugs. But, I didn't take Panadol with my prescribed medicines." (Con07)

"Yes, I took antihypertensive, anti-diabetic, and hypercholesterolemia drugs. But, I didn't take Panadol with prescribed medicines. I only take it when headache." (Con08)

A few consumers knew that acetaminophen should be consumed with caution when they were taking alcohol or other types of medicines:

"I think Panadol should be consumed with caution when we are taking alcohol and when we are taking other types of drugs, for example, pain killers." (Con01)

"When you are taking alcohol and when you are taking other medicines like antihypertensive drugs and diabetes drugs." (Con04)

A consumer felt that acetaminophen should be consumed cautiously by those who have kidney and liver diseases:

"People with diseases such as kidney failure and liver injury." (Con05)

One consumer correctly recognised liver damage and spontaneous abortion during pregnancy as effects of acetaminophen over-consumption. Another consumer correctly stated that an acetaminophen overdose could cause liver and kidney damage:

"Liver injury and may cause spontaneous abortion, not caused renal damage." (Con06)

"I think kidney damage. But, I really don't know." (Con02)

"It (acetaminophen over-consumption) will cause liver damage and kidney damage." (Con14)

Only a few consumers correctly recognised that changes in mental status, vomiting, and loss of appetite are signs of acetaminophen over-consumption:

"It will cause redness and not feeling well." (Con01)

"It will cause diarrhoea." (Con02)

"Dizziness, change in mental status, erm...loss of appetite and maybe vomit also." (Con06)

"It caused dizziness, diarrhoea, and vomit." (Con09)

"I don't know (about the signs of acetaminophen over-consumption), because I take it (acetaminophen) on the safe way." (Con11)

Acetaminophen products available in the market were perceived as very safe and effective by the consumers. The consumers were noted to have recommended the products amongst each other:

“It is very safe and effective drug and my mother recommended (acetaminophen) to me.” (Con03)

“Yes, it is very effective and I recommended (acetaminophen) to my family sometimes.” (Con02)

“Its effectiveness is ok. But, my family will know (about acetaminophen) even I am not recommend it.” (Con06)

“Yes, it is very effective and I will recommend it to my children.” (Con07)

“It is effective and I will recommend it to my family when they feel headache.” (Con14)

One consumer highlighted that acetaminophen contains a dangerous drug and she would not recommend it to her family:

“It is quite effective. But, I will not recommend it to my family because I usually heard that Panadol contains dangerous drug to reduce feeling of pain and it is a powerful pain killers.” (Con12)

Another consumer felt that pain killers are more effective than acetaminophen:

“Yes, it (acetaminophen) is safe and effective. But, I got try other medicine (try to used other medicine for pain management), for example Ponstan[®] (mefenamic acid). I felt Ponstan[®] more effective than Panadol.” (Con02)

Most of the consumers believed that all acetaminophen products sold in Malaysia were tested and approved by the Ministry of Health. A few consumers noted that acetaminophen products that have gained approval from the Ministry of Health Malaysia would be labelled with a hologram on the packages:

“Sure, if not (tested and approved), how these products (can be sold) in the market and also it will cause people death if not approved by the government.” (Con03)

“Sure, if not (tested and approved), why our government hospital give us (acetaminophen) to take it.” (Con08)

“Yes, if not approve, they (pharmacists) can't sell (acetaminophen) in pharmacy.” (Con09)

“Yes, the sale of Panadol is everywhere. It should be approved and then marketed.” (Con12)

“Sure, because they (acetaminophen products) got hologram approved by the government.” (Con02)

“It (acetaminophen products) should be approved by government because these products got hologram.” (Con04)

To gain more insight into the issue of confusion with the use of different brands of acetaminophen, the consumers were asked whether they could recognise the originator and generic products available in the market (by showing them 7 and 10 originator and generic product package props, respectively). Some respondents correctly recognised these acetaminophen brand (originator) products:

“I just put it (refer to Panadol[®] Soluble) in water, it is used for flu.” (Con01)

“It (refer to Panadol[®] 500 mg) is used during headache and fever. It (refer to Panadol[®] Extend) is used for muscle pain and backache.” (Con04)

“It (refer to Panadol[®] Actifast) act faster compared others and it used for headache.” (Con05)

"It (refer to Panadol[®] Menstrual) is used for menstrual pain. It (refer to Panadol[®] Cold & Flu) can't put in counter, need to prescribe by pharmacist." (Con09)

Consumers might become confused by different brands of acetaminophen, and only two generic products could be recognised:

"I always take KK and it stamp word KK on each tablet as well (the word "KK" is stamped on each acetaminophen tablet), I take it from hospital." (Con11)

"It is from Chemical Company of Malaysia Berhad (CCM) company which is blue in colour with dosage of 650 mg per tablet (refer to Uphamol[®] 650 mg)." (Con02)

Theme 4: Strategies to Improve the Quality Use of Acetaminophen

Some of the consumers agreed that good consumer education regarding acetaminophen might help to improve the future use of acetaminophen:

"Educational effort (is) needed (to improve the use of acetaminophen), professionals such as pharmacist can teach public on the dosage and frequency of Panadol and also under what condition should it be taken with caution." (Con01)

"Yes, need to educate public (about the use of acetaminophen) through seminar in schools." (Con05)

"Yes, (educational intervention should be conducted through) seminar or talk in public (places), for example, shopping complex." (Con09)

"In Malaysia, there is misuse of Panadol and also misunderstanding of Panadol risks. Although, Panadol has tested in laboratory, many people scare to consume Panadol as well. Here, need to educate public about the signs and effects of Panadol over-consumption. I think can give booklet to public, talk or seminar, and also drug exhibition, tell public on how to differentiate between brand and generic products." (Con11)

"Yes, level of health in Malaysia was poor and Malaysians were not emphasised on their health. Need to educate public (about the use of acetaminophen) through advertisement in television and newspaper which included maximum dosage per day, signs and effects of Panadol over-consumption, and also knowledge on the alternatives (generic products) of Panadol. If organise drug exhibition or talk, I believe that only public who care about their health will go." (Con12)

Some of the consumers supported educational interventions emphasising the signs and effects of acetaminophen poisoning as well as emphasising the dosage of acetaminophen in children:

"Malaysians were not misuse of Panadol. It is very safe drug, only need to educate public on the side effects of Panadol." (Con13)

"No need (there is no requirement for educational intervention), everyone knew it (acetaminophen) and it is old brand already (the brand of Panadol had been available in market since long time ago). Only little educational efforts is needed about the effects and signs of Panadol over-consumption." (Con02)

"No need (there is no requirement for educational intervention). But, if really need (educational intervention) just emphasise on children (the use of acetaminophen in children). Even if elder people go and buy it (acetaminophen) in sundry shop, they will also get information about the dosage from that sundry shop." (Con06)

One consumer did not support educational intervention to improve the proper use of acetaminophen. The consumer perceived that acetaminophen over-consumption did not cause any side-effects and thought there is no requirement for educational intervention:

"No need (there is no requirement for educational intervention), because I feel that it (acetaminophen) is good and don't have any effects (side-effects) and signs if Panadol over-consumption." (Con07)

Various suggestions on how to improve the label of the product packaging were highlighted by the consumers:

"Bigger words and highlight the word (highlight the important information) are needed." (Con01)

"I felt that need to add in Chinese language, because some elderly peoples (Chinese) don't know Malay and English." (Con04)

"Bigger words needed and (need to add in) precautions such as keep out of reach by children." (Con05)

"Bigger words needed, but, I even not read the label." (Con07)

"Label is ok, just add on "no more than two tablets per intake". This is because most people will take more than two tablets per intake which is more effective. But, it will cause drug poisoning. So, maximum dose per intake and per day are needed in the label." (Con11)

"Bigger words needed and also included side effects of Panadol." (Con13)

"Words not clear (the wordings in the label are not clear), bigger words needed, because elderly people can't see." (Con14)

Some of the consumers did not agree on the need to improve acetaminophen package labels:

"I think not need to improve the label, because I even not read (the label) and just get the information (about acetaminophen) from my family." (Con03)

"Here, the labels already complete and got expiry date, not need to add anything." (Con08)

DISCUSSION

This study revealed that Malaysian consumers viewed acetaminophen as a popular over-the-counter medicine. An Australian study, in which acetaminophen was used for common pain and fever, showed similar observations (Trajanovska *et al.* 2010). These results are in accordance with the research results from other countries (Boardman *et al.* 2004; Onohwosafe and Olaseha 2004). A survey in the United Kingdom reported that headache was most commonly treated by acetaminophen by consumers (Boardman *et al.* 2004). In Nigeria, the majority of secondary school students preferred to use acetaminophen products because of its efficacy, availability, and affordability (Onohwosafe and Olaseha 2004). Another African study found that acetaminophen was the most commonly used medicine among university students (Lucas *et al.* 2007). University students in Thailand utilised acetaminophen as the first line of treatment for menstrual pain (Tangchai, Titapant and Boriboonhirunsarn 2004). In Palestine, the majority of consumers were likely to keep acetaminophen in their house (Sweileh 2009).

Inappropriate self-medication of acetaminophen for stomach pain, gastric pain, and dizziness were noted among the consumers in this study. A study in Denmark also revealed misunderstanding regarding the use of acetaminophen by parents to improve appetite, health, and sleep as well as to prevent febrile seizures in their children (Jensen *et al.* 2010). This study found an inappropriate practice among consumers, whereby the consumers would double the acetaminophen dose or take the medication more frequently if their conditions persisted. This practice might result in exposure to accidental or staggered overdose, which is defined as taking two or more high doses of acetaminophen

in an interval of more than 8 hours until the total daily dosage exceeded 4 g (Craig *et al.* 2012). Previous evidence demonstrated that patients with repeated supra-therapeutic ingestion of acetaminophen were at risk of developing liver damage (Alhelail *et al.* 2011). These improper uses of acetaminophen might result from a lack of knowledge regarding acetaminophen among consumers and a lack of consultation with healthcare professionals when practicing self-medication (Dawood, Ibrahim and Palaian 2010).

In Malaysia, there are more than 50 acetaminophen (paracetamol) products marketed by various drug companies (Ministry of Health Malaysia [MOH] 2014). Consumers in this study were most familiar with the originator brand (Panadol[®]), and they had difficulty identifying generic products. Studies in the United States found that poor knowledge was the main factor that caused difficulty among consumers to differentiate acetaminophen-containing products (Fosnocht, Taylor and Caravati 2008; Shone *et al.* 2011). The consequences of difficulty in distinguishing acetaminophen-containing products would increase the chances of poly-pharmacy and acetaminophen over-consumption, which might lead to delays in the diagnosis of acetaminophen poisoning and initiation of the NAC antidote (Hewett, Shields and Waring 2013). To overcome this problem, health providers are responsible for educating consumers on how to identify the content of acetaminophen products.

There is no control on the quantity of acetaminophen that could be sold in Malaysia, which is in contrast to the policy implemented by several countries on the sales of acetaminophen to decrease suicide rates and serious self-poisoning by acetaminophen. The quantities of acetaminophen tablets that could be bought by the consumers per transaction are 6 g, 8 g, and 10 g in Ireland (Donohoe, Walsh and Tracey 2006), France (Chan 2000) and Germany (Bateman 2009), respectively. In the United Kingdom, the total acetaminophen sale per transaction is limited to 16 g in community pharmacies and 8 g in non-pharmacy settings (Bateman 2009). The consumers in this study predominantly obtained acetaminophen from pharmacies in a quantity of 10 tablets. There is a need to control the quantity of acetaminophen that could be sold per transaction in Malaysia to avoid multiple packs of acetaminophen being easily obtained by consumers. Limiting the amount of acetaminophen that could be purchased could reduce the risk of acetaminophen poisoning among Malaysian consumers.

The consumers in this study lacked knowledge regarding the dosage of acetaminophen, particularly the 650 mg tablet and the syrup formulation. Studies in the United States found similar trends; less than 50% of the consumers knew the correct total daily dose of acetaminophen (Fosnocht, Taylor and Caravati 2008; Hornsby *et al.* 2010). Studies in Brazil, Canada, and Saudi Arabia reported that more than half of parents and caregivers gave the incorrect dose of acetaminophen to their children (Goldman and Scolnik 2004; Alves *et al.* 2007; Alomar, Alenazi and Alruwaili 2011). In this study, the lack of knowledge regarding paediatric acetaminophen syrup dosing among the consumers might be because only one consumer had children. Those who do not have children may not be alert about the dosage of the paediatric syrup. The lack of knowledge regarding acetaminophen dosage would place the consumer at risk of sub-therapeutic doses and of overdoses.

Poor understanding regarding the toxicities of acetaminophen was observed among the interviewed consumers. A similar trend was found in Australia; less than half of the parents knew that acetaminophen overdose could cause injury to the liver, stomach, and kidney and lead to poisoning (Walsh, Edwards and Fraser 2007). Another study reported that 43.3% of American consumers knew that acetaminophen over-consumption could cause hepatotoxicity (Stumpf *et al.* 2007). This observation is in contrast to findings from the United Kingdom, where consumers revealed greater knowledge regarding the signs of acetaminophen toxicities, which include liver damage (80.0%), confusion (70.0%), and death (88.3%) (Simkin *et al.* 2012). The greater knowledge among the United

Kingdom consumers might be explained by the warnings of the dangers of acetaminophen overdose printed on the product package (Simkin *et al.* 2012). The Malaysian government could consider applying this strategy to enhance consumers' alertness regarding acetaminophen overdose. The results from this study suggest that consumers' knowledge regarding the signs and symptoms of acetaminophen overdose need to be enhanced via educational interventions to ensure a prompt response by consumers to any toxicity that they might experience.

In this study, the consumers suggested that healthcare professionals should be more proactive in educating consumers on acetaminophen toxicities and the dosage of acetaminophen in children. Additionally, the consumers suggested that public health programmes regarding the appropriate use of acetaminophen should be organised for consumers. A previous study also showed that education emphasising the proper recommended dosage, toxicities of acetaminophen and recognition of acetaminophen-containing products are needed among consumers in the United States (Stumpf *et al.* 2007). Another survey found that education regarding fever is important for parents who were likely to treat their children with too frequent doses of acetaminophen (Cohee *et al.* 2010). The present study findings suggested that the Malaysian government should promptly organise various educational programmes to improve the knowledge of acetaminophen among consumers. Moreover, educational tools, such as brochures, videos and web apps, should be designed and distributed to educate the public on the issues around appropriate acetaminophen dosages and toxicities.

Within the context of self-medication, acetaminophen product package labels are essential sources of drug information for consumers. A few consumers in this study did not read the package instructions before consuming acetaminophen. This finding suggested that the product package labels for certain acetaminophen products might not be attractive enough for the consumers to read. Some of the product labels might not be informative based on the fact that there were suggestions from the consumers to add in additional information such as the maximum dosage per intake per day and the side effects of acetaminophen. Furthermore, there were suggestions from the consumers to increase the font size of the wording in the label because the text is difficult to read. An American study suggested that instructions and warnings attached to the blister package could help to prevent the information from being thrown away by the consumers (Weiss 2009). A more recent study stated that 74.4% of American consumers were not aware of the new warning label of liver damage while taking over-the-counter acetaminophen products (Goyal *et al.* 2012). In Nigeria, a study showed that the majority of caregivers did not read instructions of the package because they preferred to rely on their past experiences to decide the dosage of acetaminophen (Obu *et al.* 2012). The consumers' ignorance towards product labels might put them at risk of acetaminophen poisoning. Therefore, Malaysian drug companies should design an attractive, simple, and user friendly product leaflet with text in multiple languages to encourage consumers to refer to the package label before consuming the product. Additionally, healthcare professionals are responsible for informing consumers regarding the information on the label when prescribing and dispensing acetaminophen.

Limitations

This study demonstrates the limitation of qualitative research in that the generalisability of the findings is limited. The convenient sampling in this study only managed to recruit one consumer who was known to have children. A purposive sampling would be more appropriate to recruit consumers with children to assess their knowledge about paediatric dosages of acetaminophen. The recruitment of the consumers in this study did not involve consumers from shopping malls or supermarkets, from which the consumers might

purchase acetaminophen. This recruitment further limited the generalisability of the study findings. However, the study provides insight into the lack of understanding regarding acetaminophen-containing products, dosing, and toxicities among Malaysian consumers. A follow-up nationwide quantitative survey should be conducted to explore whether poor knowledge of acetaminophen use is common among Malaysian consumers.

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CONCLUSION

The interviewed Malaysian consumers generally had a positive attitude regarding the popularity, safety, and efficacy of acetaminophen. The consumers were confused by the various products containing acetaminophen and the proper recommended dosage of 650 mg acetaminophen tablets and syrup formulations. Some of the consumers had little knowledge of the signs and effects of acetaminophen over-consumption. The insights gained from the consumers in this study could be useful to the Ministry of Health in Malaysia and to policy makers in designing proper educational interventions and in improving the product label to increase consumer awareness of acetaminophen. The provision of information and educational intervention might help Malaysian consumers to develop a better understanding of acetaminophen.

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