Cough severity and quality of life assessment in acute cough treatment by the community pharmacists: a pilot study from Penang, Malaysia

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ABSTRACT - Purpose: Community pharmacists in Malaysia are among the choices for patients' minor ailments consultations. However, little is known about the impact of acute cough treatment by the pharmacists. This study aimed to evaluate the community pharmacists' acute cough management practices. The patients' cough severity and quality of life were assessed. Methods: This was a prospective observational study conducted in eight community pharmacies. Adult patients presented with acute cough were included. The patients were evaluated on their cough severity and quality of life using Cough Visual Analog Scale (VAS) and Leicester Cough Questionnaire-acute (LCQ-acute) respectively on baseline and day 5. Results: A total of 53 patients with mean age of 42.00±15.83 years were recruited. Majority of patients were non-smokers (92.5%) and presented with phlegm (88.7%). Some patients had associated symptoms of sore throat (52.8%) and runny nose (41.5%). Bromhexine & dextromethorphan syrup (11.2%) and diphenhydramine & ammonium chloride syrup (7.8%) were most frequently used for the treatment. Most of the products selected were from conventional medicines (84.5%) while a minority were natural products (11.2%) and health supplements (4.3%). The treatment durations were mostly 5.00 days (67.9%). The median total cost per patient was RM 15.50 (USD 3.57). The patients showed significant reduction in cough VAS score from median 65.00 mm at baseline to 25.00 mm after 5 days. Besides, the LCQ-acute score improved significantly from baseline (median 12.09) to day 5 (median 17.83). Conclusions: Significant improvement in cough severity and quality of life were seen in patients seeking acute cough treatment.

Keywords - Acute cough, cough severity, quality of life, community pharmacist, non-prescription medicines

I. INTRODUCTION

Acute cough occurring less than 2 weeks duration is one of the most common symptoms that prompts patients to approach the primary care service for community pharmacists' consultations [1, 2]. Viral upper respiratory tract infections such as common colds are the frequent causes of acute cough [1, 3]. Acute cough is also often manifested in a self-limiting infection of the lower respiratory airways known as acute bronchitis. Patients with acute bronchitis often have symptoms such as muscle aches, headaches, tiredness, wheezing and hoarseness [4]. Even though acute cough is a self-limiting condition, frequent coughing can be a disturbing symptom which affects the quality of life and causes other complications that encourage patients to seek for treatment [5].

Patients with acute cough can have significant impacts on their physical and psychosocial health [6]. According to the National Centre for Health Statistics, 20 million work days are lost each year in US due to acute cough [7]. The patients' cough-related quality of life affected by acute cough can be assessed using an instrument called Leicester Cough Questionnaire-acute (LCQ-acute) [8, 9]. The LCQ-acute has received recognition from the European Medicines Agency (EMA) as a quality of life assessment instrument [10]. As a validated instrument to assess patients' cough-related quality of life, LCQ-acute is also very responsive in evaluating the antitussive therapy effects [8]. Besides, there is an easy-to-use instrument for cough severity assessment called as Cough Visual Analog Scale (VAS). The cough VAS score is a valid and widely recognized tool to evaluate the improvement in cough severity [8, 11]. However, the relationship between the cough VAS score and the assessment of quality of life is less prominent. Thus, cough VAS score is not suitable to substitute health-related tools such as LCQ for the evaluation of cough-related quality of life impacts [8].

There are various options for the treatment of acute cough. The common cough therapy includes active ingredients such as dextromethorphan, ambroxol, codeine, acetylcysteine and guaifenesin [2, 12]. Acute cough is mainly managed by using non-prescription medicines. However, in the United Kingdom, over-the-counter (OTC) medicines are mostly used based on traditional practices rather than clinical evidences due to the lack of clinical trials.[1] Besides non-prescription medicines, herbal preparations and plant derived products are commonly utilized in Europe and Asia for acute cough treatment [10]. In Malaysia, the community pharmacists have variety choices of medicinal products for cough treatment which are categorized under Class C Poisons, non-scheduled poisons (OTC products), natural products and health supplements. Both Class C poisons and non-scheduled poisons which categorized as non-prescription medicines in Malaysia are often used by the community pharmacists to manage minor ailments [13]. Besides coping with the underlying course of acute cough, effective symptoms control using medicinal products can aid to improve patients' quality of life.

In Malaysian setting, community pharmacists are one of the choices for patients to consult for their minor ailments. However, little is known about the impact of cough remedies provided by the community pharmacists towards the patients' cough severity and quality of life. Therefore, this study aimed to evaluate the community pharmacists' practices in the management of acute cough. Additionally, this study also assessed the effects of treatment on cough severity and quality of life for patients receiving medicinal products from the community pharmacists. The cost of treatment from the medicinal products chosen for acute cough management were also assessed. The study findings are valuable in providing baseline data for the further improvement in the Malaysian community pharmacists' practices with regards to minor ailments management.

II.   MATERIALS AND METHODS

This was a prospective observational study conducted in eight conveniently selected community pharmacies in Penang state, Malaysia. Data collection were conducted from August 2016 to February 2019. This study has obtained ethics approval from the Medical Research and Ethics Committee, Ministry of Health Malaysia on 18th March 2016. [approval number: NMRR-15-2195-28442 (IIR)].

The inclusion criteria were patients aged 18 years old and above with acute cough. Acute cough is defined as a cough with an onset within two weeks. Patients with associated symptoms such as rhinorrhea, sneezing, fever, myalgia, malaise, headache and sore throat at least 24 hours before the study (considered as having upper respiratory tract infections) [8] were also included in this study. Patients who were currently taking any cough medicine were excluded. Pregnant or breastfeeding patients and smokers were excluded as well. This study also excluded patients with history of lung diseases (asthma or obstructive airway disease) and moderate to severe kidney diseases. Those with concurrent gastrointestinal symptoms such as nausea, vomiting or epigastric pain were also excluded.

The community pharmacists were free to choose any conventional cough medicines, natural products or health supplements according to the patients' conditions. Conventional cough medicines are divided into Class C Poisons and non-scheduled poisons (OTC products). The dispensing of Class C Poisons without a prescription can only be performed by a registered Malaysian pharmacist in a licensed pharmacy premise according to the Malaysian Poison Act 1952 [14]. Meanwhile, products that do not contain active ingredients listed in the First Schedule under Poison Act 1952 and categorized under health supplements or natural products are known as non-scheduled poisons (OTC products) [15]. Traditional medicines, finished herbal products, herbal remedies and homeopathic medicines are subdivided under natural products [15]. Health supplements are products that complement a diet and to sustain and enhance the human health [15]. The community pharmacists would refer the patients to the physicians after assessing that the patients were not suitable for self-medication.

After assessing the patients' cough conditions, the community pharmacists opted the suitable cough medicinal products and gave instructions on their use. Subsequently, the patients made payment for their treatments at the cashiers. After the payment transaction was made, the patients were approached by the research staff for their willingness and written consent to participate in this study. The research staff was previously appointed and given short training by the principal investigator of this study to collect data from the patients. Convenient sampling was used in the patient recruitment. The baseline data including age, gender, ethnicity, education level and clinical presentations of the disease were collected from the patients using a self-designed data collection form. The patients were evaluated for the cough severity by using cough VAS at day 1 (baseline before treatment started) and day 5 of treatment. Cough VAS is a 100 mm scale on which patients can indicate the severity of cough with 0 mm representing no cough and 100 mm as the worst cough [16]. The reduction in the cough VAS score will indicate the improvement in the cough severity.

The patients were also evaluated for quality of life using self-administered LCQ-acute questionnaire on day 1 and day 5. LCQ-acute is a 19-items questionnaire with three domains of physical, psychological and social to assess the cough-related quality of life. The physical LCQ-acute score was assessed based on a total of eight questions (Q1, Q2, Q3, Q9, Q10, Q11, Q14 and Q15) in the questionnaire. The psychological LCQ-acute score was assessed based on a total of seven questions (Q4, Q5, Q6, Q12, Q13, Q16 and Q17) while the social LCQ-

acute score was assessed based on a total of four questions (Q7, Q8, Q18 and Q19). The LCQ-acute total score is range from 3 to 21 whereas each domain score is range from 1 to 7. The higher the LCQ-acute score, the better the quality of life [8]. The permission to use the LCQ-acute and cough VAS score have been obtained from the authors of the tools. The patients were contacted by the research staff on day 5 to complete the data collection forms for the evaluation of cough VAS and LCQ-acute score. In the case of any possible adverse reaction occurred, or the patients' symptoms became worse during the research period, referral to medical doctors was performed.

A previous study showed that the number of subjects required for a parallel group to demonstrate a change of total score of 2 for LCQ-acute and 17 mm in cough VAS score from visit 1 to visit 2 (change from baseline) with the power of 80% were 50 and 22 per group respectively [11]. The magnitude changes of 2 and 17 mm indicated significant changes in quality of life and cough severity respectively for the patients. As this study involved the use of both LCQ-acute and cough VAS as the assessment tools, the sample size of approximately 50 was sufficient to detect significant changes in the quality of life and cough severity of the patients for this pilot study.

All raw data was entered to the Statistical Package for the Social Sciences, SPSS® program version 24.0 software. The data was not normally distributed after being tested by Shapiro-Wilk test. Thus, median and interquartile range (IQR) were used to present the data. The changes in cough VAS score and LCQ-acute score at baseline and day 5 of treatment were analysed by using Wilcoxon signed-rank test. The differences in the changes of LCQ-acute and cough VAS score between the conventional, natural products or health supplements groups were analysed by using Kruskal-Wallis test while for the number of items groupings were analysed using the Mann-Whitney U test. Statistical significance was set at a two-tailed p value of < 0.05.

III. RESULTS AND DISCUSSION

A total of 53 patients were initially recruited in this study from eight community pharmacies. Upon completion of the study, 51 and 52 patients completed the cough VAS and LCQ-acute assessment respectively. The mean age for the patients was 42.00 years (SD 15.83). Most of the patients were female (69.8%). The patients mostly had secondary educational level (39.6%) and majority (92.5%) were non-smokers. Considering the clinical presentation of the acute cough, most of the patients (88.7%) presented with phlegm. Slightly more than half of the patients (57.4%) had coloured sputum and 29.8% of patients reported the sputum for being sticky. In terms of phlegm quantity, more than half of the consumers (68.0%) had at least normal to greater quantity. Some of the patients had associated symptoms such as runny nose (41.5%), sneezing (26.4%), fever (20.8%), body aches/pains (11.3%) and headache (15.1%). Almost half of the patients had tiredness (49.1%) and sore throat (52.8%). The onset of the cough was mostly (62.3%) between two to five days (Table 1).

A total of 116 medicinal products were selected by community pharmacists for the treatment of acute cough. The most frequently used products were bromhexine & dextromethorphan syrup (11.2%), diphenhydramine & ammonium chloride syrup (7.8%), and acetylcysteine tablet (6.9%). Considering the products classification, more than half of the medicinal products (62.1%) dispensed were from Class C Poisons. Only 22.4% were from non-scheduled poisons (OTC products) and the remaining 15.5% were from natural products or health supplements. The medicinal products dispensed were grouped as either Class C poisons only or in combination with other groupings. A comparable number of patients received Class C poisons only (39.6%) and a combination of Class C poisons & OTC medicines (32.1%). Some of the patients (15.1%) received a combination of Class C poisons & natural products. Most of the patients (39.6%) received two items for their acute cough treatment (Table 2).

Table 1. Patients' demographic, past medical history and clinical presentation

Characteristics	N (%)	Characteristics	N (%)
Distribution of patients		**Clinical presentation**	
Alpro Pharmacy	15 (28.3)	**Nature of cough and sputum characteristics**	
Lyn Pharmacy	13 (24.5)	**a) Phlegm**	
Bayan Pharmacy	5 (9.4)	Yes	47 (88.7)
Essential Pharmacy	5 (9.4)	No	6 (11.3)
Siang Pharmacy	5 (9.4)	**b) Sputum colour (N = 47)**	
Topcare Pharmacy	5 (9.4)	Clear sputum	20 (42.6)
Lovy Pharmacy	3 (5.7)	Coloured sputum	27 (57.4)
City Wellness Pharmacy	2 (3.8)	**c) Sputum viscosity (N = 47)**	
Basic information		Watery	11 (23.4)
a) Age category (years)		Sticky	14 (29.8)
16 – 20	5 (9.4)	Easy to cough out	2 (4.3)
21 – 30	8 (15.1)	Difficult to cough out	6 (12.8)

31 – 40	13 (24.5)	Sticky and easy to cough out	5 (10.6)
41 – 60	18 (34.0)	Watery and easy to cough out	2 (4.3)
61 and above	9 (17.0)	Sticky and difficult to cough out	7 (14.9)
b) Gender		**d) Sputum quantity (N = 47)**	
Female	37 (69.8)	Less	15 (31.9)
Male	16 (30.2)	Normal	16 (34.0)
c) Ethnicity		A lot	16 (34.0)
Chinese	34 (64.2)	**Associated symptom**	
Malay	15 (28.3)	**a) Runny nose**	
Indian	3 (5.7)	Yes	22 (41.5)
Others	1 (1.9)	No	31 (58.5)
d) Educational level		**b) Sneezing**	
Tertiary	20 (37.7)	Yes	14 (26.4)
Secondary	21 (39.6)	No	39 (73.6)
Primary	8 (15.1)	**c) Fever**	
None	1 (1.9)	Yes	11 (20.8)
Missing Data	3 (5.7)	No	42 (79.2)
e) Smoking		**d) Body aches/pains**	
Non- smoker	49 (92.5)	Yes	6 (11.3)
Ex-smoker	2 (3.8)	No	47 (88.7)
Active smoker	2 (3.8)	**e) Tiredness**	
f) Pregnancy/possibility of pregnancy/breastfeeding (female)		Yes	26 (49.1)
No	37 (100.0)	No	27 (50.9)
Past medical history		**f) Headache**	
a) Asthma		Yes	8 (15.1)
No	53 (100.0)	No	45 (84.9)
b) Gastrointestinal symptoms or GERD		**g) Sore throat**	
No	53 (100.0)	Yes	28 (52.8)
c) Heart disease		No	25 (47.2)
Yes	1 (1.9)	**h) Facial pain**	
No	52 (98.1)	Yes	0 (0.0)
d) Kidney disease		No	53 (100.0)
No	53 (100.0)	**Cough onset (duration in days)[a]**	
		2-5	33 (62.3)
		6-10	15 (28.3)
		11-14	5 (9.4)

Table 2. Medicinal products, classification, groupings and the number of items dispensed by community pharmacist for the treatment of acute cough

	N (%)
Medicinal product	
1. Bromhexine & dextromethorphan syrup	13 (11.2)
2. Diphenhydramine & ammonium chloride syrup	9 (7.8)
3. Acetylcysteine tablet	8 (6.9)
4. Cloperastine tablet	5 (4.3)
5. Dextromethorphan syrup	5 (4.3)
6. Ivy leaf extract & *Pelargonium* root extract lozenge	5 (4.3)
7. Paracetamol & codeine tablet	5 (4.3)
8. Ambroxol tablet	4 (3.4)
9. Cetirizine tablet	4 (3.4)

10. Bromhexine & pholcodine syrup	3 (2.6)
11. Ibuprofen tablet	3 (2.6)
12. Loratadine tablet	3 (2.6)
13. Mulberry leaf & Chrysanthemum capsule	3 (2.6)
14. Paracetamol tablet	3 (2.6)
Others (29 other medicinal products)	43 (37.5)
Total	116 (100.0)
Product classification	
Class C Poison	72 (62.1)
OTC	26 (22.4)
Natural Product - traditional medicine	7 (6.0)
Natural Product - finished herbal product	6 (5.2)
Health supplement	5 (4.3)
Total	116 (100.0)
Dispensed medicines groupings (based on number of patients)	
Class C Poison Only	21(39.6)
Class C Poison & OTC	17 (32.1)
Class C Poison & Natural Products	8 (15.1)
Class C Poison, OTC & Health Supplement	4 (7.5)
Class C Poison, OTC & Natural Products	2 (3.8)
Class C Poison & Health Supplement	1 (1.9)
Total	53 (100.0)
Number of items groupings (based on number of patients)	
1 item	16 (30.2)
2 items	21 (39.6)
3 items	8 (15.1)
4 items	6 (11.3)
5 items	2 (3.8)
Total	53 (100.0)

OTC: Non-scheduled Poison (over-the-counter product)

The duration of treatment was mostly 5.00 days (N = 36, 67.9%). Whereas, 20.8% (N = 11) patients received less than 5 days of treatment while only 11.4% (N = 6) patients had treatment period of more than 5 days. The median overall total cost per patient was RM 15.50 (USD 3.57). Patients receiving the combination of Class C poisons, OTC and health supplements were found to have the highest median total cost of treatment (RM 40.55; USD 9.33). Whereas, those who received Class C poisons only were found to have the least median total cost of treatment (RM 10.00; USD 2.30). Meanwhile, by looking at the number of items dispensed, the highest median total cost per patient was RM 33.75 (USD 7.77) for four items dispensed. The lowest median total cost per patient was RM 9.25 (USD 2.13) for only one item dispensed (Table 3).

Table 3. Total cost per patient based on medicinal products groupings and number of items groupings

	Median (IQR)
Overall total cost per consumer	15.50 (10.00 - 25.00)
Total cost per consumer by medicinal products groupings[a]	
Class C Poison only	10.00 (8.00 - 12.85)
Class C Poison & OTC	15.50 (14.00 - 25.25)
Class C Poison & natural products	23.00 (23.00 - 25.00)
Class C Poison, OTC & health supplement	40.55 (29.38 - 50.53)
Total cost per consumer by number of items[b]	
1 item	9.25 (8.00 - 11.50)
2 items	20.00 (14.00 - 23.75)
3 items	24.50 (20.38 - 34.75)
4 items	33.75 (9.75 - 50.05)

ᵃMedians for Class C Poison, OTC & natural products and Class C Poison & health supplement groupings were excluded due to the small sample size. Kruskal-Wallis test showed significant difference of the total cost per patient for the medicinal products groupings [$\chi2$ (3) = 27.12; p < 0.001].

ᵇMedian for total cost per consumer by 5 items was excluded due to the small sample size. Kruskal-Wallis test showed significant difference of the total cost per patient for the number of items [$\chi2$ (3) = 23.37; p < 0.001.

The assessment of cough severity showed a significant reduction in the median cough VAS score of 31.00 mm. The median cough VAS score at baseline was 65.00 mm and it declined significantly to 25.00 mm after 5 days. Overall, the LCQ-acute total score showed significant improvement from day 1 (median 12.09) to day 5 (median 17.83). The median improvement in the overall LCQ-acute total score was 5.58 (Table 4). The total physical LCQ-acute score showed an improvement with the median of 1.88. Meanwhile, the total psychological and social LCQ-acute score also showed improvements with the medians of 1.64 and 1.88 respectively (Table 5).

Table 4. Changes in Cough Visual Analog Scale (VAS) and Leicester Cough Questionnaire-acute (LCQ-acute) total score between day 1 and day 5.

	Day 1; Median (IQR)	Day 5; Median (IQR)	Change in score; Median (IQR)	Wilcoxon signed-rank test results
Cough VAS score (mm); (N = 51)	65.00 (50.00 – 80.00)	25.00 (6.00 – 40.00)	31.00 (20.00 – 46.00)	Z = -6.158 p < 0.001
LCQ-acute score; (N = 52)	12.09 (8.85 –13.90)	17.83 (14.85-19.54)	5.58 (3.46-7.76)	Z= -6.220 p < 0.001

Table 5. Changes in Leicester Cough Questionnaire-acute (LCQ-acute) score for physical, psychological and social components between day 1 and day 5.

	LCQ-acute score; Day 1 Median (IQR)	LCQ-acute score; Day 5 Median (IQR)	Change in LCQ-acute score Median (IQR)	Wilcoxon signed-rank test results
LCQ-acute physical score				
Q1: In the last 24 hours, have you had chest or stomach pains as a result of your cough?	4.00 (4.00 – 6.00)	7.00 (6.00 – 7.00)	1.00 (0.00 – 2.75)	Z = -5.326; p < 0.001
Q2: In the last 24 hours, have you been bothered by sputum (phlegm) production when you cough?	4.00 (2.00 – 5.00)	6.00 (5.00 – 6.00)	2.00 (1.00 – 3.00)	Z = -5.667; p < 0.001
Q3: In the last 24 hours, have you been tired because of your cough?	3.00 (2.00 – 4.00)	5.50 (5.00 – 7.00)	2.00 (1.00 – 3.00)	Z = -5.674; p < 0.001
Q9: In the last 24 hours, exposure to paints or fume has made me cough.	4.50 (3.25 – 6.00)	6.00 (5.00 – 7.00)	0.50 (0.00 – 2.00)	Z = -3.899; p < 0.001
Q10: In the last 24 hours, has your cough disturbed your sleep?	3.00 (2.00 – 4.75)	6.00 (5.00 – 6.75)	2.00 (1.00 – 4.00)	Z = -5.797; p < 0.001
Q11: In the last 24 hours, how many times a day have you had coughing bouts?	3.00 (2.00 – 4.00)	6.00 (5.00 – 6.00)	2.00 (1.00 – 3.00)	Z = -5.819; p < 0.001
Q14: In the last 24 hours, have you suffered from a hoarse voice as a result of your cough?	4.00 (2.00 – 4.00)	6.00 (5.00 – 7.00)	1.00 (0.00 – 3.00)	Z = -5.377; p < 0.001
Q15: In the last 24 hours, have you had a lot of energy?	3.00 (2.00 – 4.00)	6.00 (4.00 – 6.00)	2.00 (1.00 – 3.00)	Z = -5.627; p < 0.001
Total physical LCQ-acute score	**3.81 (2.91 – 4.47)**	**5.75 (5.13 – 6.38)**	**1.88 (1.28 – 2.50)**	**Z = -6.170; p < 0.001**
LCQ-acute psychological score				
Q4: In the last 24 hours, have you felt in control of your cough?	3.00 (2.00 – 4.00)	5.00 (4.00 – 6.00)	2.00 (1.00 – 3.00)	Z = -5.747; p < 0.001

Q5: How often during the last 24 hours have you felt embarrassed by your coughing?	4.00 (2.00 – 5.00)	6.00 (5.00 – 7.00)	2.00 (0.00 – 3.00)	Z = -5.242; p < 0.001
Q6: In the last 24 hours, my cough has made me feel anxious.	4.00 (3.00 – 5.00)	6.00 (5.00 – 7.00)	2.00 (0.00 – 3.00)	Z = -4.992; p < 0.001
Q12: In the last 24 hours, my cough has made me feel frustrated.	4.00 (3.00 – 5.00)	6.00 (5.00 – 7.00)	2.00 (1.00 – 3.00)	Z = -5.687; p < 0.001
Q13: In the last 24 hours, my cough has made me feel fed up.	4.00 (2.00 – 4.00)	6.00 (5.00 – 7.00)	2.00 (1.00 – 3.00)	Z = -5.878; p < 0.001
Q16: In the last 24 hours, have you worried that your cough may indicate a serious illness?	5.00 (4.00 – 6.00)	6.00 (5.00 – 7.00)	1.00 (0.00 – 2.00)	Z = -4.814; p < 0.001
Q17: In the last 24 hours, have you been concerned that other people think something wrong with you?	4.00 (3.00 – 6.75)	6.00 (5.00 – 7.00)	1.00 (0.00 – 3.00)	Z = -4.867; p < 0.001
Total psychological LCQ-acute score	**4.00 (3.14 – 4.96)**	**6.00 (5.04 – 6.71)**	**1.64 (1.04 – 2.68)**	**Z = -6.117; p < 0.001**
LCQ-acute social score				
Q7: In the last 24 hours, my cough has interfered with my job, or other daily tasks.	4.00 (2.00 – 4.75)	6.00 (5.00 – 7.00)	2.00 (1.00 – 3.00)	Z = -5.745; p < 0.001
Q8: In the last 24 hours, I felt that my cough interfered with the overall enjoyment of my life.	4.00 (2.00 – 5.00)	6.00 (5.00 – 7.00)	2.00 (1.00 – 3.75)	Z = -5.747; p < 0.001
Q18: In the last 24 hours, my cough interrupted conversation or telephone calls.	4.00 (3.00 – 4.75)	6.00 (5.00 – 7.00)	2.00 (1.00 – 3.00)	Z = -5.525; p < 0.001
Q19: In the last 24 hours, I feel that my cough has annoyed my partner, family or friends.	4.50 (3.00 – 6.00)	6.00 (6.00 – 7.00)	1.00 (0.25 – 2.00)	Z = -5.506; p < 0.001
Total social LCQ-acute score	**3.88 (3.00 – 4.75)**	**6.00 (5.25 – 6.75)**	**1.88 (1.25 – 2.75)**	**Z = -6.167; p < 0.001**
LCQ-acute total score	**12.09 (8.85 –13.90)**	**17.83 (14.85-19.54)**	**5.58 (3.46-7.76)**	**Z = -6.220; p < 0.001**

This was among the first study in Malaysia which assessed the treatment outcome of minor ailments managed by community pharmacists. The patients in this study had acute cough symptoms which were mild and can be self-medicated as guided by community pharmacists. Most of the patients manifested with phlegm and coloured, sticky sputum. They also had symptoms including tiredness, sore throat and runny nose which are commonly found among patients with acute cough [1]. Acute cough in this study was unlikely to be associated with smoking as majority of the patients were non-smokers and the onset of cough were within two weeks. This was because the cough associated with smokers and ex-smokers is often chronic in nature. A Scottish study presented the higher prevalence for smokers and ex-cigarette users to develop both chronic cough and chronic phlegm than those who had never smoked [17]. The cough in this study was also not associated with asthma, gastrointestinal symptoms or GERD as all patients did not have history of such conditions. This was supported by a European Community Respiratory Health Survey which found a positive correlation between productive cough with asthma and GERD [18]. A previous study also reported that the only manifestation of asthma was chronic cough [19]. Chronic cough usually lasts more than 3 weeks. It can be related to the obstruction of airways and excessive mucus production commonly contributed by asthma and chronic obstructive pulmonary disease (COPD). Thus, symptoms such as wheezing or dyspnoea are common in both asthma and COPD [20].

In Malaysia, the National Medicines Policy advocates the quality use of medicines for better health outcomes [21]. Within this context, community pharmacists are responsible to assist patients in their minor ailments' treatment using their eligibility in non-prescription Class C Poisons provision. Indeed, this study found that the main choices of treatment were Class C Poisons in all the patients [22]. Most of the responding pharmacists gave a combination of medicinal products with mostly two items due to the presentation of other associated symptoms. This study showed the top three most commonly used medicinal products to treat acute cough were bromhexine & dextromethorphan syrup, diphenhydramine & ammonium chloride syrup and acetylcysteine tablet. Meanwhile,

acute cough treatment pattern can be different as observed in other countries [2]. For instance, ambroxol and acetylcysteine were the most popular OTC medicines given for common cold in Germany. Conversely, oral decongestant or first-generation sedative antihistamines were most often used in North America [2]. Besides, a simulated study conducted in 25 community pharmacies in Qatar showed that cough syrups, analgesics and antihistamines were frequently dispensed for cough associated with common cold and allergic rhinitis [23].

Besides non-prescription medicines, the community pharmacists tend to use other medicinal products such as natural products and herbal supplements. Ivy leaf extract & *Pelargonium* root extract lozenges were found in this study as the most common natural product utilized for acute cough. There were several studies showing the efficacy of these natural herbs in cough treatment. A study in Germany revealed that ivy leaves cough liquid was effective in improving cough severity as assessed by cough VAS score when given to patients with acute cough [5]. Meanwhile, another study conducted in Germany showed *Pelargonium sidoides* preparation improved the symptoms of cough, sputum, rales and dyspnoea in patients with acute bronchitis [24]. Hence, natural products are proven effective to complement conventional medicines for the cough treatment.

Medicine affordability is one of the driving factors that influences patients' choices of treatment. Previous studies in Malaysia showed that the patients paid lesser when they had their minor ailments managed in community pharmacies than in doctor clinics [25, 26]. This study found that the median total cost per patient for acute cough treatment was only RM 15.50 (USD 3.57). Meanwhile, taking Qatar as an example, the median cost for treating minor ailments such as common cold was QAR 51 (USD 13.97) while for allergic rhinitis was QAR 60 (USD 16.44) by the community pharmacists [23]. Besides, an observational study in 13 European countries showed that the cost of treatment involved the general practitioner visits fees and medicines costs [27]. The study showed the mean cost per patient for the acute cough treatment in Balatonfured, Hungary was €23.88 (USD 26.68) while in Jonkoping, Sweden was €116.47 (USD 130.12) [27]. Therefore, the low cost of treatment prompts patients to seek for treatment from the community pharmacies in Malaysia.

The efficacy of treatment is essential despite the low cost of treatment. Reduction in cough severity was observed among all the patients with the average improvement of 31.00 mm in the cough VAS score within 5 days of treatment by using non-prescription medicines or combination with natural products. Similar findings were reported in other countries. For instance, in United Kingdom, a study reported that there was an improvement (38.9 mm) in the acute cough severity as measured by cough VAS score when the patients were given diphenhydramine, ammonium chloride & levomenthol demulcent between baseline and day 4 of treatment [28]. Besides, a study showed that ivy leaf cough liquid achieved the Minimum Important Difference (MID) for VAS score of 17 mm in acute cough after 3 days as compared to after 4 days of treatment with placebo [5]. These findings support the use of both non-prescription medicines and natural products in the treatment of acute cough.

An assessment of the patients' quality-of-life can provide a clearer insight of the treatment outcomes. Cough can have impacts in three aspects of the patients' life which include physical, psychological and social. The impacts contributed by cough physically often are syncope, chest pains, hernia and sleep deprivation [29]. Besides, psychological and social impacts of cough such as social isolation, embarrassment, anxiety and interference with work can be present but are often overlooked [29]. In this study, the LCQ-acute total physical and social scores improvement were slightly higher than the psychological domain among the patients. However, an overall improvement in LCQ-acute total score of 5.58 comprising the sum of physical, psychological and social components was observed after 5 days of treatment. Meanwhile, a study in United Kingdom reported that diphenhydramine, ammonium chloride and levomenthol demulcent gave a mean difference in LCQ-acute total score of 10.8 after 8 days of treatment [28]. The longer period of treatment could be the reason of higher improvement in the LCQ-acute total score [28].

IV. CONCLSION

Patients with mild acute cough who received treatment from the community pharmacists showed significant improvement in their cough severity and quality of life from the perspective of physical, psychological and social aspects. The prominent trend of community pharmacists' choices of acute cough treatment was involved Class C Poisons and combination with other complementary medicinal products when necessary. The cost of treatment was generally affordable.

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