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Research Paper

Practice and attitudes regarding the management of childhood diarrhoea among pharmacies in Thailand

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Abstract

Objectives To compare practice behaviour and attitudes of pharmacy personnel in the management of childhood diarrhoea between type I (requiring a pharmacist to be on duty) and type II (pharmacist not required) pharmacies, between those surveyed in 2008 and in 2001, and between new-generation (graduation ≤10 years) and old-generation (graduation >10 years) pharmacists.

Methods The setting was 115 pharmacies in a city in the south of Thailand. The study was separated into two phases: a simulated client method to evaluate history taking, drug dispensing and advice giving among pharmacy personnel and a questionnaire to measure attitudes and factors affecting diarrhoea treatment.

Key findings In the simulated client method study, questions asked and advice given by the providers (the pharmacists or non-pharmacists responding to the simulated clients), especially in type II pharmacies, were insufficient. Only 5.2% of pharmacies correctly dispensed for a child with viral diarrhoea, using oral rehydration salts (ORS) alone. Appropriate ORS dispensing of providers was not affected by shop type, survey time or peer generation. However, 52.2% of providers inappropriately dispensed antibiotics for such illness. In the questionnaire study, 108 completed surveys were obtained (a response rate of 93.9%). The providers working in 2008 more strongly agreed that ORS was effective, safe, used by health professionals and requested by patients, relative to those in 2001 ($P < 0.05$). No potential factor influencing the actual ORS dispensing was identified. Nevertheless, antibiotic dispensing was affected by beliefs in producing recovery and high profit.

Conclusions Practice and attitudes of pharmacy personnel were inappropriate in the management of childhood diarrhoea. Revision of the pharmacy curriculum did not result in improvement of practice as seen by the similarity of practice patterns among the 2001 and 2008 samples. Improvement of knowledge and practice behaviour among providers in pharmacies is needed.

Keywords attitude; diarrhoea; drugstore; management; paediatric; pharmacy; practice

Introduction

Diarrhoeal disease is a primary cause of childhood morbidity and mortality, especially in developing countries. The incidence of morbidity is highest in children below 5 years of age. In 2006, the number of diarrhoea cases in children under 5 years of age in Thailand was 10 611 per 100 000, which was the greatest incidence compared with the other age groups.[1] The mortality of acute diarrhoea arises from dehydration, and is prevented by oral rehydration salts (ORS) dissolved in water to form ORS solution. The World Health Organization (WHO) recommends ORS to treat acute diarrhoea as a safe and effective management.[2] However, several studies have reported that antibiotics and antidiarrhoeal drugs (such as antimotility drugs and adsorbents) were frequently misused for diarrhoea.[3–5] Antibiotics increase the risk of microbial resistance, while antidiarrhoeal drugs have insignificant effects on duration and severity of illness. Moreover, these medicines can cause potential side effects.[6,7]

In developing countries, a large number of people attend primary care for common illnesses including diarrhoea from pharmacies because of ease of access, availability of pharmaceutical products, cheaper price of medicines and convenient service.[8] In Thailand, pharmacies selling human medicines are categorized into two types. Type I pharmacies are required to have a registered pharmacist on duty. The pharmacists are allowed to sell

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antibiotics without prescriptions. For type II pharmacies, it is not mandatory to have a pharmacist and they are only allowed to sell pre-packaged over-the-counter drugs. Although patterns of drug dispensing by pharmacy personnel for diarrhoea have been reported in developing countries, there has been only one study from Thailand.[9] In 2001, Na Thalang and us (WS and SL) conducted a study to investigate variations in the management of childhood diarrhoea associated with types of pharmacies. Furthermore, in 2002, the Thai Pharmacy Council established the first competency standards with the goal that new pharmacists should know how to apply the knowledge and skills obtained from schools of pharmacy. Accordingly, Thai schools of pharmacy used these standards as guidelines to change their curricula towards more pharmaceutical care content and more practice.[10,11] Therefore, practice patterns and attitudes of pharmacy personnel in this study were compared to those in the previous study done by Na Thalang *et al*.,[9] in which the authors of the present study were co-investigators, and also compared younger pharmacists (having graduated not more than 10 years previously) and older pharmacists (having graduated more than 10 years ago) to reflect the competency standard of pharmacy curricula.

The objectives of this study were therefore to compare practice behaviour and attitudes of pharmacy personnel in the management of childhood diarrhoea between type I and type II pharmacies, between those surveyed in 2008 and in 2001, and between new- and old-generation pharmacists.

Methods

Setting

This study was conducted in 2008 in a city in the southern part of Thailand with a population of 160 000 and 198 pharmacies.

Sample

A list of pharmacies was obtained from the Provincial Public Health Office. Ninety six out of 169 type I pharmacies and 19 out of 29 type II pharmacies were randomly selected using computer-generated numbers. The required sample size was 94 shops calculated based on a level of significance of 0.05, an effect size of 0.10 and a proportion of interest of 0.42.[12] Pharmacies with staff working at the school of pharmacy with which the researchers were affiliated were excluded from the current study because the staff may have known that this study was going on and may have changed their behaviour.

Case scenario and evaluation for quality of care in pharmacies

At each recruited pharmacy a fictitious case of acute childhood diarrhoea was presented to the pharmacist or non-pharmacist by the simulated client (SC) with the information that 'I need the medicines for diarrhoea'. No other information was presented unless asked for by the provider (the pharmacist or non-pharmacist who responded to the SC). The following information would be revealed when asked: the patient was a 4-year-old girl who had experienced four episodes of watery diarrhoea for 1 day. Also, she had been thirsty more often than usual. She sometimes had low-grade fever, but had no abdominal pain, no bloody stool or ricey stool, no chronic illness and no history of drug allergy, and she had not taken any medication. For milk intake, she normally drank only UHT milk each day. The clinical presentation of the case was that of viral origin. The appropriate treatment was ORS to replace the fluid deficit resulting from the diarrhoea.

Guidelines for evaluating the appropriateness of history taking, drug dispensing and advice giving were developed based on *The Treatment of Diarrhoea: A Manual for Physicians and Other Senior Health Workers* by the WHO[2] and *Handbook of Nonprescription Drugs* by the American Pharmacists Association.[7] The guidelines were revised and approved by three clinical pharmacy specialists with at least 10 years of experience in pharmacy practice.

Data collection

Data collection was conducted using a simulated client method (SCM) and questionnaire survey.

For the SCM study, the SCs were four pharmacy students acting as the aunt of a girl with diarrhoea and requesting medicines. All SCs were female to eliminate the potential effect of SC gender on the behaviour of pharmacy personnel. The SCs were well-trained in class on how to present the history of illness according to the scenario, to give certain messages when asked by pharmacy personnel, to memorize the response of the providers and to fill in the data-collection form. Subsequently, they were also extensively trained in a real designated pharmacy.

The four SCs were matched into two pairs. The pharmacies to be visited were randomly chosen for each pair of SCs. Even though type I pharmacies are required by law to have a pharmacist on duty, the persons who serve the patients may not be a pharmacist. Therefore, one of the SCs had to identify whether the provider was a pharmacist by asking him or her questions on a drug-related problem: 'My grandfather takes this drug' (showing a strip of warfarin), 'Can he take another drug' (showing a strip of naproxen) 'simultaneously to relieve back pain?' If the provider could give correct information on the question posed by the first SC, it was assumed that he or she was a pharmacist. Then, the SCs asked for the drug for diarrhoea using the aforementioned scenario and purchased the drugs given by the providers. After leaving the shop, the SCs immediately recorded the events and characteristics of pharmacist on the forms. If the provider gave the wrong answer on the question on the drug-related problem posed by the first SC, the SCs left the pharmacy without asking for any medication. However, the pharmacy would be visited again 1 week later. Subsequently, the SCs visited that pharmacy and asked about the drug-related problem again. Whether or not the provider gave correct information, the SCs asked about the management of diarrhoea and recorded who the provider was (a pharmacist or a non-pharmacist). A pharmacy was excluded if the SCs could not identify whether a provider was a pharmacist or a non-pharmacist.

Two weeks after the visit to the pharmacy, another research assistant team (not the SCs) went to the pharmacy on the same day of the week and the same time that the SCs had visited the pharmacies, to increase the possibility of meeting the same pharmacists and the same non-pharmacists. Moreover, the

pharmacist's apparent characteristics as described by the SCs who asked for diarrhoea medication were employed to identify the pharmacist. The research assistants gave the self-administered questionnaire to the targeted provider and explained that the objective of the questionnaire study was to investigate factors affecting dispensing patterns in childhood diarrhoea. The provider was asked to complete the questionnaire and return it to the research assistants. If the questionnaire was not returned in 1 week, the research assistants visited pharmacy personnel again and asked them to fill it in. They visited these providers many times until they received the completed questionnaire.

The questionnaire was separated into three parts. The first part contained questions on demographic data. For the respondents who were pharmacists, their year of graduation from pharmacy school was also collected. The second part comprised questions on history taking, drug dispensing and advice giving for watery diarrhoea using multiple-choice and opened-ended questions. The last part consisted of questions on attitudes and factors associated with dispensing for childhood diarrhoea: intention to dispense three types of drug (ORS, antibiotics and combined drugs), experience of cure from the drugs, attitude towards whether there would be a remarkable recovery with the drugs, attitude towards whether the drugs had fewer side effects, attitude towards the drugs prescribed by most physicians, attitude towards the drugs dispensed by most pharmacies, attitude towards the drugs dispensed by most lecturers in schools of pharmacy, attitude towards client expectation for the drugs, attitude towards whether the drugs generated a high profit and attitude towards the affordability of the drugs for clients. All variables in this part were measured on a five-point Likert scale, ranging from 1 (strongly disagree/very unlikely) to 5 (strongly agree/very likely).

The questionnaire in this study was slightly modified from that in the 2001 study[9] to measure the additional attitudes and factors associated with dispensing for childhood diarrhoea.[8] Items on intention to dispense drugs (e.g. ORS, antibiotics and combined drugs), experience of cure from the drugs, dispensing by most lecturers in schools of pharmacy and ability of clients to purchase the drugs were added to the original questionnaire of the 2001 study. Four experts (lecturers in the Faculty of Pharmaceutical Sciences, with at least 10 years' experience in dispensing) assessed the questionnaire for content, clarity and relevance. The revised questionnaire was pre-tested with 12 pharmacy personnel.

Data gathered in 2008 from the SCM and questionnaire surveys were compared between type I and type II pharmacies, and with the results from 2001 as reported in a previous study.[9] The study, carried out by Na Thalang *et al*. in 2001, reported that only 5.3% of type I and none of the type II pharmacies treated acute diarrhoea in children correctly, using ORS alone.[9] That study investigated 44 pharmacies. At the time of the current study, five of these original pharmacies had gone out of business and one pharmacy was excluded because a pharmacist was a lecturer at the Faculty of Pharmaceutical Sciences. Thus, this study was conducted using the same population as in the previous study but with some additional pharmacies. Comparison between the current study and that in 2001 was considered valid as the same methods of data collection, including SCM with the same scenario and a questionnaire with only minor modification in the 2008 study, were employed in each case. The data were also compared between younger and older pharmacists, employing the demographic data in the questionnaire as the basis for the generation division.

Data analysis

Pharmacy personnel practices obtained from the SCM study were grouped into history taking, drug dispensing and advice giving, and treated as dependent variables. Independent variables included pharmacy type (type I/II), year of the study (2008/2001) and the number of years since graduation (equal to or less than 10 years/more than 10 years). Chi-square test was used to examine the effects of the predictor variables on the actual behaviour of pharmacy personnel. From the questionnaire study, dependent variables were attitudes on treatment of paediatric diarrhoea. Student's *t* test was employed to determine the attitude variations in the set of the predictors. Multiple logistic regression was performed to identify factors affecting the actual dispensing.

Multiple linear regression was used to assess predictors of intention to dispense medication. All tests were conducted at the level of 0.05 type I error.

Ethical approval

This study had ethical approval from Faculty of Pharmaceutical Sciences, Prince of Songkla University. To examine the quality of care in pharmacies, the SCM was employed. In the SCM, the SC disguised herself as a patient seeking health services while the providers are blind to the research objective. The SCM has the advantage of offering a chance to record actual practice of providers from the SCs (i.e. the data collectors) which cannot be assessed from the questionnaire study. Informed consent for the SCM study was not obtained from pharmacy personnel because the process may have altered their actual practice. The concern for appropriate patient treatment was considered to outweigh the issue of informed consent. Additionally, we could explore the problem of health care in this setting and also identify areas for improving the practice of providers. The confidentiality and anonymity of the studied pharmacies were ensured by not having the names of pharmacies on any data-collection forms. All SCs signed a contract specifying that they would not disclose any information to anyone outside the research team regarding the secret shopping. Moreover, all subjects were informed on the objectives of the questionnaire survey. They were asked to complete to questionnaire on a voluntary basis.

Results

Actual practice measured

A total of 115 pharmacies (96 type I and 19 type II) was visited by the SCs. The SC visits was completed in all of the 115 pharmacies. The providers working in type I pharmacies comprised 63 pharmacists (65.6%) and 33 non-pharmacists (34.4%). The majority of pharmacy personnel were female (57.4%).

Table 1 Questions asked by pharmacy personnel: results from the simulated client method (SCM) study

Question	Type of pharmacy			Year of data collection		Graduation of pharmacist	
	I** (non-pharmacists) ($n = 33$)	I† ($n = 96$)	II ($n = 19$)	2008‡ ($n = 115$)	2001§ ($n = 38$)	≤10 years ($n = 29$)	>10 years ($n = 34$)
Associated symptoms	12 (36.4%)	53 (55.2%)	4 (21.1%)*	57 (49.6%)	9 (23.7%)*	16 (55.2%)	25 (73.5%)
Stool frequency	11 (33.3%)	44 (45.8%)	4 (21.1%)*	48 (41.7%)	15 (39.5%)	15 (51.7%)	18 (52.9%)
Age of patient	13 (39.4%)	40 (41.7%)	9 (47.4%)	49 (42.6%)	21 (55.3%)	16 (55.2%)	11 (32.4%)
Stool character	8 (24.2%)	31 (32.3%)	1 (5.3%)*	32 (27.8%)	6 (15.8%)	14 (48.3%)	9 (26.5%)
Drug allergy	7 (21.2%)	22 (22.9%)	2 (10.5%)	24 (20.9%)	N/A	8 (27.6%)	7 (20.6%)
Duration of diarrhoea	6 (18.2%)	20 (20.8%)	2 (10.5%)	22 (19.1%)	5 (13.2%)	10 (34.5%)	4 (11.8%)*
Causative factors							
Changing food or milk	1 (3.0%)	15 (15.6%)	0	15 (13.0%)	6 (15.8%)	9 (31.0%)	5 (14.7%)
Associated illness	1 (3.0%)	1 (1.0%)	0	1 (0.9%)	1 (2.6%)	0	0
Other household member	1 (3.0%)	1 (1.0%)	0	1 (0.9%)	0	0	0
Dehydrated-related symptoms	4 (12.1%)	14 (14.6%)	0	14 (12.2%)	2 (5.3%)	4 (13.8%)	6 (17.6%)
Chronic diseases	4 (12.1%)	8 (8.3%)	0	8 (7.0%)	1 (2.6%)	3 (10.3%)	1 (2.9%)
Medicines taken for diarrhoea	1 (3.0%)	3 (3.1%)	0	3 (2.6%)	2 (5.3%)	2 (6.9%)	0

N/A, value not evaluated. *Chi-square test with $P < 0.05$. **No significant differences when compared with type II pharmacies using Chi-square test with $P < 0.05$. †Pharmacists and non-pharmacists. ‡Present study. §From the study of Na Thalang *et al*.[9]

The most common question asked by pharmacy personnel was symptoms associated with diarrhoea (55.2% in type I and 21.1% in type II pharmacies) (Table 1), especially nausea/vomiting (28.1% in type I and 15.8% in type II pharmacies). Only 42.6% asked the age of the patient. The remaining questions were asked in less than 50% of the encounters. The personnel in type I pharmacies asked the questions on associated symptoms, stool frequency and stool character more frequently than those in type II shops ($P < 0.05$). Neither type I nor type II pharmacies asked questions on recent travel or current medication. In addition, type II providers did not ask about causal factors of illness, symptoms related with dehydration, chronic diseases or medicines taken for diarrhoea. Differences in history taking between non-pharmacists in type I pharmacies and those in type II pharmacies were not observed. Frequencies of history taking between pharmacies surveyed in 2008 and in 2001 differed significantly only in questioning associated symptoms. Apart from questions about duration of illness, there was no marked difference of history taking between younger and older pharmacists.

Only 45.2% of pharmacy personnel dispensed ORS with or without other drugs. A few (5.2%) managed our case correctly; that is, dispensed ORS alone. There was no difference in the correct dispensing across pharmacy type, non-pharmacist grouping, study time or pharmacist generation. Pharmacy personnel commonly dispensed antibiotics and combined drugs for childhood diarrhoea (52.2 and 29.6% respectively). Antibiotics dispensed by these providers were nifuroxazide, cotrimoxazole, norfloxacin, erythromycin and amoxicillin. Combined drugs comprised furazolidone, pectin and kaolin, and antimotility drugs. Pharmacy type or non-pharmacist grouping did not influence the medical treatment for diarrhoea in the child (Table 2[9]). Pharmacies in 2008 were more likely to dispense antibiotics (with or without ORS) and less likely to dispense combined drugs (with or without ORS) compared with those in 2001. However, younger pharmacists dispensed ORS and combined drugs more commonly than did older pharmacists.

Regarding advice, a minority of pharmacy personnel gave the appropriate recommendation on food (12.2% of providers) and milk intake (6.1%). Only 2.6% gave the appropriate advice on both food and milk. Advice given by the providers was not significantly associated with pharmacy type, non-pharmacist grouping or study time ($P > 0.05$).

Our study also compared the actual practice with the questionnaire survey. All aspects of history taking and advice giving in actual behaviour were worse than those reported in the questionnaires ($P < 0.001$). On dispensing, only 6.5% of pharmacy personnel stated in the questionnaire that they would dispense ORS alone, similar to the results shown in the actual practice (5.2%; $P = 0.687$). Dispensing antibiotics alone, combined drugs alone and combined drugs with ORS in the practice were significantly higher than those reported in the questionnaires (antibiotics alone, 22.6 compared with 7.4% respectively; combined drugs alone, 14.8 compared with 3.7% respectively; combined drugs with ORS, 11.3 compared with 0% respectively).

Attitudes towards the treatment of childhood diarrhoea

Out of 115 questionnaires sent, 108 were returned (93.9% response rate). The respondents were from 89 type I (92.7%) and 19 type II (100%) pharmacies. The average age of respondents was 39.10 ± 12.14 years. Most were male (56.5%), owners of pharmacies (66.7%) and pharmacists (58.3%).

Table 2 Drugs and advice given by pharmacy personnel

	Type of pharmacy			Year of data collection		Graduation of pharmacist	
	I** (non-pharmacists) ($n = 33$)	I† ($n = 96$)	II ($n = 19$)	2008‡ ($n = 115$)	2001§ ($n = 38$)	≤10 years ($n = 29$)	>10 years ($n = 34$)
Drug							
ORS only	0	4 (4.2%)	2 (10.5%)	6 (5.2%)	2 (5.3%)	1 (3.4%)	3 (8.8%)
ORS+antibiotics	10 (30.3%)	25 (26.0%)	4 (21.1%)	29 (25.2%)	2 (5.3%)*	9 (31.0%)	6 (17.6%)
ORS+combined drugs	4 (12.1%)	11 (11.5%)	2 (10.5%)	13 (11.3%)	8 (21.1%)	6 (20.7%)	1 (2.9%)*
Antibiotics only	9 (27.3%)	21 (21.9%)	5 (26.3%)	26 (22.6%)	3 (7.9%)*	5 (17.2%)	7 (20.6%)
Antibiotics+combined drugs¶	1 (3.0%)	1 (1.0%)	1 (5.3%)	2 (1.7%)	N/A	0	0
Combined drugs only	6 (18.2%)	12 (12.5%)	5 (26.3%)	17 (14.8%)	15 (39.5%)*	3 (10.3%)	3 (8.8%)
Antimotility drugs only	0	1 (1.0%)	0	1 (0.9%)	1 (2.6%)	0	1 (2.9%)
Adsorbents	2 (6.1%)	11 (11.5%)	0	11 (9.6%)	4 (10.5%)	4 (13.8%)	5 (14.7%)
Other drugs††	6 (18.2%)	24 (25.0%)	2 (10.5%)	26 (22.6%)	N/A	11 (37.9%)	7 (20.6%)
Advice							
Give easy-to-digest diet	5 (15.2%)	13 (13.5%)	1 (5.3%)	14 (12.2%)	8 (21.1%)	3 (10.3%)	5 (14.7%)
Continue milk feeding	3 (9.1%)	7 (7.3%)	0	7 (6.1%)	5 (13.2%)	0	4 (11.8%)
Stop foods	0	0	1 (5.3%)	1 (0.9%)	0	0	0
Stop milk	5 (15.2%)	10 (10.4%)	3 (15.8%)	13 (11.3%)	6 (15.8%)	2 (6.9%)	3 (8.8%)

N/A, value not evaluated; ORS, oral rehydration salts. *Chi-square test with $P < 0.05$. **No significant differences when compared with type II pharmacies using Chi-square test with $P < 0.05$. †Pharmacists and non-pharmacists. ‡Present study. §From the study of Na Thalang *et al*.[9] ¶Combined drugs consisted of furazolidone, pectin and kaolin. ††Other drugs were herbal solution, domperidone syrup and antipyretic syrup.

The pharmacists had graduated from schools of pharmacy an average of 12.44 ± 8.86 years previously.

Attitudes towards drugs used for paediatric diarrhoea are shown in Table 3.[9] Pharmacy personnel reported that they intended to dispense ORS more than any other medication. Compared to the providers in type II pharmacies, those in type I pharmacies held a stronger belief that ORS was prescribed by most physicians and was affordable for the clients. They were also likely to believe that antibiotics led to remarkable recovery, were prescribed by most physicians, were dispensed by most pharmacies, generated high profit and were affordable for clients. Attitudes towards antibiotics reducing the duration of illness and producing high profit were more positive in non-pharmacists in type I pharmacies, compared to those in type II pharmacies. Providers in type I pharmacies more commonly held the view that combined drugs were more affordable for clients than did those in type II pharmacies. Pharmacy personnel in 2008 more strongly believed that all drug groups led to remarkable recovery, caused fewer side effects, were prescribed by most physicians, were dispensed by most pharmacies, were expected by clients to cure them and generated a high profit. New-generation pharmacists tended to perceive ORS and combined drugs more positively in diarrhoea treatment than did the older generation. Perceptions of pharmacists towards antibiotics did not differ significantly between generations.

Predictors of actual dispensing and intention for recommending medication in childhood diarrhoea are shown in Table 4. Remarkable recovery was a significant determinant of intention to dispense all types of medicine (ORS, antibiotics and combined drugs). In actual dispensing, no potential predictors for ORS or for combined drugs were found. On the contrary, producing fast recovery and generating high profit were strong predictors in actual antibiotic dispensing.

Discussion

The main findings reveal that history taking among pharmacy personnel, particularly in type II pharmacies, was inadequate in the management of childhood diarrhoea. Only 5% of pharmacies appropriately dispensed ORS alone. Differences in pharmacy type, survey year and pharmacist generation did not affect the appropriate ORS recommendation. However, more than half of the pharmacy personnel irrationally dispensed antibiotics for viral diarrhoea. The significant predictors of actual antibiotic dispensing were beliefs in making a good recovery and producing high profit.

The strength of the study lies in the use of SCM to evaluate the actual practice. The results on dispensing behaviour from SCM are more accurate than those obtained from self-administered questionnaires.[13] The survey on attitudes and related factors in this study had a high response rate (93.9%), reducing the response bias. Nevertheless, this study has some limitations. There may be differences between SCs in performing and/or recording the information of the encounters. However, they were well trained before gathering data. The gender of SCs may influence the practice of providers and thus we selected only females to be SCs. The pharmacy personnel who filled the questionnaires may not be the ones who dispensed medication when visited by SCs. However, the probability of such error was minimized by identifying the pharmacist before distributing the questionnaire and delivering the questionnaire on the same day of the week and similar period that the providers were investigated in the SCM study.

Table 3 Attitudes towards the treatment of childhood diarrhoea (mean ± SD)†

Attitude	Drug	Type of pharmacy			Year of data collection		Graduation of pharmacist	
		I (non-pharmacist) ($n = 26$)	I ($n = 89$)	II ($n = 19$)	2008‡ ($n = 108$)	2001§ ($n = 38$)	≤10 years ($n = 29$)	>10 years ($n = 34$)
Intention to dispense this drug	ORS	4.54 ± 0.86	4.70 ± 0.59	4.58 ± 0.51	4.68 ± 0.58	–¶	4.90 ± 0.31	4.65 ± 0.49*
	Antibiotics	3.04 ± 1.49	3.18 ± 1.35	3.13 ± 1.31	3.17 ± 1.34	–	3.31 ± 1.20	3.18 ± 1.40
	Combined drugs	2.64 ± 1.22	2.84 ± 1.27	3.06 ± 1.00	2.88 ± 1.22	–	3.34 ± 0.94	2.55 ± 1.44*
Experience of cure from this drug	ORS	4.38 ± 0.57	4.35 ± 0.69	4.21 ± 0.79	4.32 ± 0.71	–	4.55 ± 0.63	4.15 ± 0.78*
	Antibiotics	3.28 ± 1.31	3.39 ± 1.22	2.88 ± 1.26	3.31 ± 1.23	–	3.34 ± 1.11	3.50 ± 1.26
	Combined drugs	3.16 ± 1.18	3.28 ± 1.09	3.22 ± 1.26	3.27 ± 1.11	–	3.55 ± 0.95	3.12 ± 1.11
Attitude towards whether there would be a remarkable recovery with this drug	ORS	4.46 ± 0.58	4.36 ± 0.73	4.11 ± 0.88	4.31 ± 0.76	3.24 ± 1.00*	4.45 ± 0.63	4.21 ± 0.88
	Antibiotics	3.56 ± 1.19**	3.49 ± 1.24	2.75 ± 1.34*	3.38 ± 1.28	2.57 ± 1.22*	3.45 ± 1.15	3.47 ± 1.38
	Combined drugs	3.40 ± 1.23	3.36 ± 1.21	3.11 ± 1.15	3.31 ± 1.20	2.29 ± 1.05*	3.72 ± 0.96	3.00 ± 1.32*
Attitude towards whether the drug caused fewer side effects	ORS	4.04 ± 1.15	4.42 ± 0.92	4.26 ± 0.56	4.39 ± 0.86	3.21 ± 0.99*	4.62 ± 0.82	4.53 ± 0.71
	Antibiotics	2.84 ± 1.18	2.93 ± 1.24	2.63 ± 1.15	2.88 ± 1.23	2.22 ± 1.13*	2.93 ± 1.10	3.00 ± 1.41
	Combined drugs	3.04 ± 1.10	3.00 ± 1.13	3.05 ± 1.08	3.01 ± 1.12	2.16 ± 0.90*	3.41 ± 0.98	2.61 ± 1.17*
Attitude towards the drugs prescribed by most physicians	ORS	4.38 ± 0.80	4.48 ± 0.68	4.11 ± 0.74*	4.42 ± 0.70	3.43 ± 0.55*	4.62 ± 0.56	4.44 ± 0.66
	Antibiotics	3.52 ± 1.16	3.68 ± 1.07	3.11 ± 1.23*	3.58 ± 1.11	2.73 ± 0.93*	3.66 ± 1.01	3.82 ± 1.06
	Combined drugs	3.36 ± 1.04	3.20 ± 1.18	3.16 ± 1.02	3.19 ± 1.15	2.38 ± 0.89*	3.59 ± 1.02	2.73 ± 1.28*
Attitude towards the drugs dispensed by most pharmacies	ORS	4.40 ± 0.65	4.45 ± 0.68	4.16 ± 0.69	4.40 ± 0.69	3.33 ± 0.59*	4.59 ± 0.63	4.38 ± 0.74
	Antibiotics	3.52 ± 1.09	3.66 ± 1.02	3.00 ± 1.21*	3.56 ± 1.07	2.69 ± 0.95*	3.83 ± 0.85	3.62 ± 1.10
	Combined drugs	3.40 ± 1.00	3.51 ± 1.08	3.22 ± 1.00	3.46 ± 1.07	2.71 ± 0.67*	3.79 ± 1.01	3.33 ± 1.16
Attitude towards the drugs dispensed by most lecturers	ORS	4.35 ± 0.69	4.30 ± 0.78	3.95 ± 0.78	4.24 ± 0.78	–¶	4.45 ± 0.78	4.15 ± 0.82
	Antibiotics	3.56 ± 1.23	3.23 ± 1.12	3.22 ± 1.06	3.23 ± 1.11	–	3.07 ± 0.92	3.12 ± 1.18
	Combined drugs	3.00 ± 1.16	2.90 ± 1.07	3.11 ± 0.96	2.93 ± 1.05	–	3.21 ± 0.86	2.55 ± 1.09*
Attitude towards client expectation	ORS	4.40 ± 0.76	4.19 ± 0.91	4.11 ± 0.66	4.18 ± 0.87	3.32 ± 0.63*	3.83 ± 1.04	4.35 ± 0.81*
	Antibiotics	3.20 ± 1.23	3.52 ± 1.04	3.18 ± 1.33	3.47 ± 1.09	2.66 ± 0.97*	3.83 ± 0.89	3.50 ± 0.96
	Combined drugs	3.42 ± 1.21	3.44 ± 1.06	3.47 ± 1.07	3.45 ± 1.06	2.53 ± 0.70*	3.55 ± 0.95	3.36 ± 1.06
Attitude towards whether the drugs generated a high profit	ORS	2.36 ± 1.15	2.60 ± 1.10	2.21 ± 0.98	2.53 ± 1.08	1.44 ± 1.00*	2.79 ± 0.94	2.62 ± 1.18
	Antibiotics	2.65 ± 1.20**	2.81 ± 1.14	2.06 ± 0.83*	2.69 ± 1.12	1.46 ± 0.95*	3.10 ± 0.86	2.68 ± 1.27
	Combined drugs	2.32 ± 1.07	2.60 ± 1.06	2.22 ± 1.06	2.53 ± 1.07	1.54 ± 0.89*	2.93 ± 0.88	2.52 ± 1.15
Attitude towards affordability of the drug for clients	ORS	4.00 ± 0.96**	4.13 ± 0.83	3.11 ± 0.88*	3.94 ± 0.92	–	4.17 ± 0.76	4.18 ± 0.80
	Antibiotics	3.15 ± 0.78	3.46 ± 0.80	2.71 ± 0.85*	3.34 ± 0.85	–	3.62 ± 0.62	3.56 ± 0.89
	Combined drugs	3.24 ± 0.78	3.56 ± 0.86	2.74 ± 0.99*	3.42 ± 0.94	–	3.66 ± 0.90	3.73 ± 0.84

ORS, oral rehydration salts. *Student's t test with $P < 0.05$. **Compared with type II pharmacies using Student's t test with $P < 0.05$. †Scores range from 1 (strongly disagree/very unlikely) to 5 (strongly agree/very likely). ‡Present study. §From the study of Na Thalang *et al.*[9] ¶The questions were not included in the 2001 survey.

Table 4 Predictors of actual behaviour and intention for dispensing in childhood diarrhoea

Attitude	Oral rehydration salts		Antibiotics		Combined drugs	
	Intention Beta† ($n = 108$)	Behaviour Odds ratio ($n = 115$)	Intention Beta ($n = 108$)	Behaviour Odds ratio ($n = 115$)	Intention Beta ($n = 108$)	Behaviour Odds ratio ($n = 115$)
Intention	–	2.057	–	0.848	–	1.349
Experience of cure	0.233	1.119	0.446*	0.714	0.097	0.940
Remarkable recovery	0.273*	1.034	0.266*	2.178*	0.511*	1.299
Fewer side effects	0.077	0.794	–0.006	1.163	0.231*	1.018
Prescribing by physicians	0.037	1.004	–0.076	0.547	0.157	1.825
Dispensing by pharmacies	0.011	0.984	0.034	1.441	0.008	0.390
Dispensing by lecturers‡	–0.132	0.950	0.268*	0.981	0.018	1.604
Client expectation	–0.129	0.602	–0.049	0.926	–0.123	0.764
High profit	0.052	1.014	0.071	1.529*	–0.078	1.084
Socioeconomic status of clients	0.198	0.922	–0.018	0.634	0.022	1.354
R^2	0.276		0.670		0.670	

*Multiple linear regression with $P < 0.05$. †Standardized coefficient. ‡Lecturers in schools of pharmacy.

The self-report on attitudes may depend on the willingness of the respondents to answer truthfully. Also, the study confined the investigation to diarrhoea only, and thus the findings may not be generalized to other diseases.

Less than half of the pharmacy personnel asked key questions for a differential diagnosis, degree of dehydration or severity of diarrhoea. Most of the history taking did not differ significantly across pharmacy type, non-pharmacist grouping, study time or pharmacist generation. No type II pharmacies asked about factors causing diarrhoea, signs and symptoms of dehydration, chronic diseases or history of medication. In the self-reported questionnaires, providers in type I and type II pharmacies said all questions asking about the issues shown in Table 1 were important. This finding showed a discrepancy between knowledge and the actual practice in assessment of illness, which is consistent with earlier research conducted in other developing countries: Turkey and Vietnam.[14,15] Additionally, none of the providers in pharmacies showed concerns about current medication. Health providers should identify drugs simultaneously taken by patients to rule out drug-induced diarrhoea (e.g. amoxicillin, amoxicillin-clavulanate, cephalosporins) and avoid interaction with drugs dispensed by the providers.[16–18] Insufficient history taking by pharmacies was also found in other developing countries, Trinidad and Nepal,[19,20] that could lead to inappropriate dispensing.

Although the WHO encourages the use of ORS to treat acute diarrhoea, our study found that less than half of the pharmacy personnel dispensed ORS. Appropriate dispensing of ORS alone was reported in the questionnaires by only 7% of providers and was actually practised by only 5%. In contrast, Goodburn *et al*. carried out a study in Britain and that reported 30% of community pharmacists in actual practice and 50% in an interview properly recommended ORS alone for childhood diarrhoea.[21] Even though the care provided by most pharmacists in this developed country was inappropriate, it was much better than that found in our study. Although a pharmacist on duty is required by law in type I pharmacies, only 66% of type I pharmacies visited by the SCs had a pharmacist on duty. The problem is also prevalent among other developing countries such as India and Peru.[8] The absence of pharmacists contributes to poorer practice compared to that in developed countries.

Antibiotics have been found to be frequently dispensed by pharmacies (52.2%) for paediatric diarrhoea. The overuse of antibiotics for diarrhoea in children has also been described in other developing countries, such as Nepal, Tanzania and India.[20,22,23] In the current study, providers in 2008 were more likely to dispense antibiotics to the clients than were those surveyed in 2001. Furthermore, nearly a third of the providers inappropriately recommended combined drugs consisting of antibiotics and adsorbents. Antibiotics and adsorbents have been found to be unhelpful for viral diarrhoea. Moreover, these drugs may cause harm to the patients.[2,7] Pharmacy type and pharmacist generation did not affect most drug dispensing. The irrational drug dispensing may be influenced by low quality of history taking.

In accordance with studies conducted in other developing countries, Trinidad[19] and Kenya,[24] the majority of pharmacy personnel held a strong belief that ORS was useful and safe for paediatric diarrhoea. Moreover, our study found that greater proportions of providers in 2008 strongly believed ORS was likely to produce fast recovery, cause fewer side effects, be dispensed by health providers and have high client demand, compared to those of pharmacies in 2001. Although the attitude scores for ORS were higher than those for antibiotics and combined drugs in all types of pharmacies and all generations of pharmacists, the actual ORS dispensing was poor. It is important to evaluate the barriers or other factors influencing the ORS dispensing. In further research, a qualitative study may be useful to identify such factors.

The majority of providers in 2008 had poor knowledge in treatment of childhood diarrhoea with viral infection. They reported that antibiotics and combined drugs produced remarkable recovery for our case. In addition, they perceived

expectations for antibiotics and combined drugs from clients. The providers may judge patients' expectations inaccurately, as was shown in previous studies by Mangione-Smith *et al*.[25] and Shapiro.[26] Also, poor knowledge and faulty beliefs of pharmacy personnel may be the important factors for improper drug dispensing.

Beliefs in fast recovery and producing high profit were associated with dispensing antibiotics in real practices. These factors could encourage the dispensing of more antibiotics. Possibly, the providers believed that the duration of illness reduced by antibiotic dispensing would satisfy patients. Patients' satisfaction was an important determination to ensure the patients return. Additionally, approximately 70% of respondents were the owners of pharmacies. Therefore, commercial interest was a potential factor in the choice of medication, as reported by Kroeger *et al*.[27] Accordingly, consideration of patients' health, such as cost-effectiveness or adverse drug reactions, may be ignored. The strong determinant of intention to dispense ORS, antibiotics and combined drugs was belief in cure of medication and this finding is in accordance with the review by Goel *et al*.[8] The finding is useful in changing pharmacy providers' practice. However, other motivation factors such as economic incentives, competition or location should be assessed in further research.

A minority of pharmacy personnel gave correct recommendation on food and milk. There were no effects of pharmacy type, study year or pharmacist group on the appropriate advice. Some pharmacies recommended patients to stop food and milk, a practice that is not endorsed by WHO guidelines.[2]

The poor practice including history taking, drug dispensing and advice giving by pharmacy personnel may be related to a lack of knowledge. If so, educational intervention could be expected to improve knowledge and practice behaviour of health providers. Our results also indicate that the content of intervention should emphasize the effectiveness of medicines. Several studies have examined the effect of face-to-face education and formal seminars on diarrhoea management among pharmacies in Indonesia and Kenya.[24,28] These interventions significantly improved drug dispensing compared with controls. Additionally, continuing education may be helpful in changing providers' behaviour.

Conclusions

Practice behaviour of pharmacy personnel, particularly those who worked in type II shops, was inappropriate in the treatment of childhood diarrhoea. Pharmacies in 2008 or new generation of pharmacists did not have better practice than those in 2001 or old generation pharmacists. The attitudes towards diarrhoea treatment were still improper in each pharmacy type, survey time, and pharmacist generation. This study implies that the revision of pharmacy education alone could not modify the quality of care in pharmacies. To improve knowledge and practice patterns of pharmacy providers, multifaceted interventions should be organized along with the education revision such as educational program and continuing education. Furthermore, untrained health staff should not be allowed to recommend medication in pharmacies.

Declarations

Conflict of interest

The Author(s) declare(s) that they have no conflicts of interest to disclose.

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