Supapaan TS, Kamnuek J, Khakaew C, Jungsuwadee T, Songmuang A, Sripa S, Jinatongthai P, Pitchayajittipong C, Napaporn J. Assessment of Look-Alike, Sound-Alike Similarities Among Brand Names of Tablets and Capsules: A Cross-Sectional Survey in Thailand. Pharmacy Practice 2024 Jul-Sep;22(3):2955

https://doi.org/10.18549/PharmPract.2024.3.2955

Original Research

Assessment of Look-Alike, Sound-Alike Similarities Among Brand Names of Tablets and Capsules: A Cross-Sectional Survey in Thailand

Teeraporn Sadira Supapaan, Jirawat Kamnuek, Chanawat Khakaew, Thanakorn Jungsuwadee, Ananya Songmuang, Saksit Sripa, Peerawat Jinatongthai, Chonladda Pitchayajittipong, Jintana Napaporn

Received (first version): 29-Aug-2023 Accepted: 27-Dec-2023 Published online: 02-Jul-2024

Abstract

Background: Look-Alike, Sound-Alike (LASA) drugs pose significant risks to patient safety due to potential medication errors, primarily from confusion over drug names. Such issues are of global concern and are pervasive across healthcare settings. **Objective:** This study evaluated the similarity between the registered brand names of medication, specifically focusing on tablets and capsules that are commercially accessible in Thailand. Methods: This research analyzed secondary data from Thailand's Bureau of Drug Administration, focusing on tablets and capsules drugs. An orthographic analysis of the 18,108 registered items (as of January 2020) was performed, and similarities and differences were analyzed using Microsoft Excel. Attributes such as registration number, manufacturer details, active ingredients, dosage forms, and strength were considered when categorizing similar names. **Results:** Upon analyzing 18,108 registered tablets and capsules, four groups emerged from pairwise brand name similarity analysis: 1. Matching brand names from one pharmaceutical company with identical active pharmaceutical ingredients (APIs) but multiple registration numbers (66.47%). 2. Matching brand names from various pharmaceutical companies with the same active ingredients (33.03%). 3. Matching brand names from different pharmaceutical companies with different active ingredients (0.39%). 4. Matching brand names from the same pharmaceutical company with different active ingredients (0.11%). The "Tall Man Letter" principle was leveraged to examine potential resemblances among 18,108 Thai pharmaceutical brand names. Twelve terms exhibited notable similarities, with "AMINE," "HYDRO," and "PREDNIS" appearing most frequently. **Conclusion:** These results underscore the prevalence of LASA issues in drug brand names, potentially leading to confusion and errors in medication use, and highlight the need for system improvements to enhance patient safety.

Keywords: look-alike; sound-alike; lasa; brand names; matching; similarity; thailand

Teeraporn Sadira SUPAPAAN. PhD., Assoc.Prof., Faculty of Pharmaceutical Sciences, Ubon Ratchathani University, Ubon Ratchathani, Thailand. teeraporn.s@ubu.ac.th
Jirawat KAMNUEK. PharmD student, Faculty of Pharmaceutical Sciences, Ubon Ratchathani University, Ubon Ratchathani. jirawat.ka.60@ubu.ac.th
Chanawat KHAKAEW. PharmD student, Faculty of Pharmaceutical Sciences, Ubon Ratchathani University, Ubon Ratchathani, Thailand. chanawat.kh.60@ubu.ac.th
Thanakorn JUNGSUWADEE. PharmD student, Faculty of Pharmaceutical Sciences, Ubon Ratchathani University, Ubon Ratchathani, Thailand. thanakorn.ju.60@ubu.ac.th
Ananya SONGMUANG. M.Pharm (Clinical Pharmacy), Department of Pharmacy, Warinchamrab hospital, Ubon Ratchathani province, Thailand. ananyasongmuang1@gmail.com
Saksit SRIPA. PhD., Lecturer, PhD, Faculty of Pharmaceutical Sciences, Ubon Ratchathani University, Ubon Ratchathani, Thailand. saksit.s@ubu.ac.th
Peerawat JINATONGTHAI. B.Sc.Pharm, BCP, BCPS, Asst. Prof., Faculty of Pharmaceutical Sciences, Ubon Ratchathani University, Ubon Ratchathani, Thailand. peerawat.j@ubu.ac.th
Chonladda PITCHAYAJITTIPONG. PhD., Faculty of Pharmaceutical Sciences, Ubon Ratchathani University, Ubon Ratchathani, Thailand. chonladda.p@ubu.ac.th
Jintana NAPAPORN*. PhD., Faculty of Pharmaceutical Sciences, Ubon Ratchathani University, Ubon Ratchathani, Thailand. jintana.n@ubu.ac.th

INTRODUCTION

Look-Alike, Sound-Alike (LASA) drugs consistently present a threat to patient safety, leading to medication errors across inpatient, outpatient, and self-care scenarios.[1-5] These medication errors, often due to confusion over drug names, are a global concern and can occur regardless of the healthcare setting.[6-8] Despite the World Health Organization (WHO)'s International Nonproprietary Names (INN) Expert Group's efforts to standardize nonproprietary names for pharmaceutical substances, the problem persists due to the variability in brand names. This variability, resulting from manufacturers marketing the same drug under diverse names and drugs bearing similar or matching brand names containing different active pharmaceutical ingredients (APIs), intensifies the issue. The differences often vary across countries, highlighting the urgent need for more rigorous investigation and regulation to ensure patient safety. In line with this, the Institute for Safe Medication Practices (ISMP) focuses on using insights about medication safety risks and past errors from various entities to devise effective preventive strategies.[1]

https://doi.org/10.18549/PharmPract.2024.3.2955

Several vital stakeholders express concern about the issue of LASA medication names, including the WHO, the International Pharmaceutical Federation (FIP), and European Medicines Agency (EMA).[8-12] FIP emphasizes the need for pharmaceutical companies to rigorously evaluate proposed drug names for potential LASA issues.[9] Beyond names, other contributing factors to LASA confusion include packaging design, colors, fonts, and unit doses, a problem further exacerbated by the burgeoning generic medicine industry. The EMA advocates unique names, labels, and usage instructions for new medicines to minimize medication errors. The WHO's International Non-proprietary Names Expert Group aims to create internationally standardized pharmaceutical substance names.[7] Additionally, FIP recommends that pharmacists take proactive steps, such as performing regular medicine reviews, developing risk management protocols, and adopting strategies, such as separate storage for look-alike medicines and careful checking of sound-alike medicines to manage LASA-related risks.[9]

Addressing the challenge of LASA drugs is a crucial aspect of medication safety, recognized by the Ministry of Public Health of Thailand .[2,13] However, despite this acknowledgment, solutions, and research have largely remained confined to individual hospitals. This fragmentation has resulted in the absence of national-level systematic solutions and support mechanisms for addressing LASA-related errors. There is a pressing need to encourage in-depth research and increase awareness of the significance of LASA drug confusion. Such efforts can spur policy initiatives toward a more unified approach to this issue. Thai hospitals independently formulated strategies to minimize LASA-related medication errors. Research evaluating the efficacy of these safety policies and investigating the full extent of LASA errors in Thai hospitals needs to be more comprehensive.[3,14,15] To address this gap, This study assessed the similarity among registered brand names of commercially available tablets and capsules in Thailand.

METHODS

This cross-sectional survey study used secondary data from the brand names applicable for both human and animal use. The required permissions were secured to access data from the Food and Drug Administration of Thailand (Thai FDA). The current research was based on a previous study by Napapaporn et al., who analyzed the similarities of brand names for tablets and capsules registered with the Thai FDA in 2012. This investigation highlights a significant concern regarding the potential confusion.[2]

The study predominantly focused on tablets and capsules, which constitute over 60% of the registered dosage forms in the market. As of January 2020, 18,108 tablets and capsules are commercially available.

Consequently, orthographic comparisons of d brand names, were exclusively made for these forms.[16,17] Registered brand names were sorted alphabetically, and the matching among them were noted using Microsoft Excel. The researchers engaged in a meticulous count and compared the brand names alphabetically. Identical brand names were categorized based on various attributes, including registration number, manufacturer details, active pharmaceutical ingredients (APIs), and strength. Descriptive statistics, summarized the findings. This study was approved by the Research Ethics Committee of Ubon Ratchathani University (Approval No. UBU – REC – 28/2564).

RESULTS

In 2020, Thailand had 18,108 tablets and capsules classified as "dangerous drugs" and "specially controlled drugs." A researcher conducted a letter-by-letter analysis to assess the pairwise similarity of these medications' brand names.

Analogous results based on registration numbers, details of pharmaceutical manufacturer details, APIs, and strength were segmented into four primary categories:

1) The first category consisted of brand names from one pharmaceutical manufacturer, having identical API but had distinct registration numbers. This category included 961 registered names and 2,377 registered numbers, accounting for 66.47% of all similarity findings. The number of registration numbers associated with brand names in this group varied from 2 to 29. Brands with just two registration numbers appeared most often Specifically, "Cemol®" had 29 registration numbers from one pharmaceutical manufacturer· The APIs most often associated with multiple registration numbers included amoxicillin, paracetamol, dexamethasone, ampicillin, piroxicam, and tetracycline (Table 1).

2) The second category consisted of brand names from diverse pharmaceutical companies that contained the same active ingredients but with varied registration numbers. Accounting for 33.03% of all observed similarities, this group included 330 distinct brand names linked to 1,181 unique registration numbers. For instance, the brand name "PARACETAMOL TABLETS®" tops the list as the most duplicated, having 70 registration numbers originating from 28 different manufacturers. "DEXAMETHASONE TABLETS®" is the second most duplicated brand name, with 41 registration numbers issued to 18 manufacturers. "PREDNISOLONE TABLETS®" is the third most replicated, with 40 registration numbers assigned to 24 manufacturers. The fourth most frequently duplicated brand name is "PARACETAMOL®", with 26 registration numbers across 12 manufacturers. Finally, both "PREDNISOLONE®" and "CHLORPHENIRAMINE MALEATE TABLETS®" share the fifth position as the most frequently replicated brands, with each having 25 registration numbers distributed across 10 and 13 manufacturers, respectively.

3) The third category of LASA was single brand names from various pharmaceutical manufacturers, each with distinct APIs and multiple registration numbers (7 registered names, 14 registered numbers; 0.39% of the total similarity results) (Table 2). Seven instances of this phenomenon have been observed. For example, GEMZIL® was registered by two manufacturers, one producing a version with gemfibrozil 300 mg as the active ingredient, whereas the other used captopril 25 mg. Similar

https://doi.org/10.18549/PharmPract.2024.3.2955

Table 1. Top ten brand names with single manufacturer, same API, and multiple registration numbers

	Register numbers	Brand name	Generic name
1	29	CEMOL®	Paracetamol 500 mg
2	18	MANOMOXYL®	Amoxycillin trihydrate 500 mg
2	18	PARACETAMOL TABLETS®	Paracetamol 500 mg
3	17	DEXSTAR®	Dexamethasone 0.50 mg
4	11	FELXICAM®	Piroxicam 10 mg
5	11	PARACETAMOL®	Paracetamol 500 mg
6	9	DEXAMETHASONE TABLETS®	Dexamethasone 0.25 mg
7	9	TETRA CENTRAL CAP®	Tetracycline HCL 250 mg
8	8	PYRACON TABLETS®	Paracetamol 500 mg
9	7	AMPICILLIN CAPSULES®	Ampicillin trihydrate 250 mg
9	7	AMPICILLIN CAPSULES®	Ampicillin trihydrate 500 mg
10	6	DEXAMETHASONE TABLET®	Dexamethasone 0.50 mg

Table 2. Lists of registered brand names that originate from either the same or different manufacturers, but with a variety of APIs

Registered brand Name		No.of registration number	No. of manufacturers	Active pharmaceutical ingredients (APIs)	
				Brand name no. 1	**Brand name no. 2**
Third category: different manufacturers					
1.	GEMZIL®	2	2	Gemfibrozil 300 mg	Captopril 25 mg
2.	GLUCONIL®	2	2	Gliclazide 80 mg	Glibenclamide 5 mg
3.	MYOGESIC®	2	2	Orphenadrine citrate 35 mg Paracetamol 450 mg	Tolperisone HCl 50 mg
4.	REGPARA TABLETS 25 MG®	2	2	Cinacalcet hydrochloride 25 mg	Cinnarizine 25 mg
5.	RUMATAB®	2	2	Diclofenac sodium 25 mg	Phenybutazone 200 mg
6.	TOFEN®	2	2	Ketotifen 1 mg	Ibuprofen 400 mg
7.	ZORO KIDNEY TABLETS®[a]	2	2	Potasssium nitrate 60 mg Methylene blue 15 mg Capsicum 17 mg Squill 17 mg Fluid extract of Buchu 17 mg Uva ursi Fluid extract 17 mg	Potasssium nitrate Methylene blue Capsicum Squill Buchu Gentian, Liquorice
Forth category: same manufacturer					
1.	CHEWOQUINE®	2	1	Chloroquine phosphate 250 mg Thiamine hydrochloride 10 mg Ascorbic acid 50 mg	Chloroquine phosphate 250 mg
2.	SETOMYCIN CAPSULES®	1	1	Tetracycline hydrochloride 250 mg Sulfamethizole 250 mg Phenzopyridine hydrochloride 50 mg	Phenazolepyridine 50 mg

[a] The registration for these therapeutic products has been cancelled. There is no available information on APIs for Brand name no. 2.

observations were made for the GLUCONIL®, MYOGESIC®, REGPARA TABLETS 25 MG®, RUMATAB®, TOFEN®, and ZORO KIDNEY TABLETS®. Each has two registrations with different manufacturers and distinct APIs.

4) The fourth category of LASA was single brand names from a single pharmaceutical manufacturer, each with different APIs and multiple registration numbers. This included two registered brand names and four registered numbers, making up 0.11% of all similarity (Table 2). Two such instances have been noted. CHEWOQUINE® and SETOMYCIN CAPSULES® were registered under the same manufacturer but presented different API compositions. For example, the brand name CHEWOQUINE® had two distinct versions. One version combined chloroquine phosphate, ascorbic acid, and thiamine hydrochloride. The second contained only chloroquine phosphate. A similar situation arose with the SETOMYCIN CAPSULES® brand, which offered two different formulations under the same name. The first formulation was a combination of three active ingredients:

https://doi.org/10.18549/PharmPract.2024.3.2955

tetracycline hydrochloride, sulfamethizole, and phenazopyridine hydrochloride. By contrast, the second formulation contained only one active ingredient, phenazopyridine. These examples highlight the complexities and potential for confusion in drug naming practices, where multiple distinct formulations may exist under a single brand name.

In addition, this study employs the principle of "Tall Man Letter" to ascertain moderate similarities across a substantial data set of 18,108 items. To evaluate the registered brand name similarities, the study applied the "Tall Man Letter" methodology, using 37 selected terms from the United States Food and Drug Administration (US FDA) that feature Tall Man Lettering. The selection process was narrowed down to words consisting of five or more letters, culminating in a final list of 24 key search terms: ZOLAMIDE, HEXAMIDE, MAZINE, PAMIDE, PHENE, PRAMINE, SERINE, SPORINE, DAUNO, DRINATE, AMINE, DOBUT, BURIDE, ALAZINE, HYDRO, PROGESTER, PREDNIS, TESTOSTER, XANTRONE, OPINIR, ADIAZINE, SOXAZOLE, TOLAZ, and TOLBUT. However, only 12 key search terms were identified in terms of name similarities (Table 3).

For instance, the term "AMINE" was used as a search parameter and resulted in finding 160 brand names in Thailand, such as BROMLAMINE®, PHARAMINE®, and CHLORAMINE®. Similarly, the search term "HYDRO" yielded 102 brand names including HYDROZIDE PLUS®, HYDROCHLOROTHIAZIDE®, and HYDRODON®.

DISCUSSION

This investigation of brand names examines "dangerous drugs" in Thailand, which, while sold without a prescription, must be dispensed solely by a pharmacist. Additionally, "specially controlled drugs" available in tablet and capsule forms require prescriptions, highlighting intricacies in the country's pharmaceutical naming. With 18,108 registered products available for human and animal consumption, the potential for confusion is considerable, highlighting substantial risks to patient safety.

The first category is marked by singular brand names featuring the same active pharmaceutical ingredients but possessing multiple registration numbers. This group constituted a

Table 3. Summary of the analysis of the registered brand names in Thailand based on the principles of Tall Man Letter.

	Key search terms	No. of registered brand names	Example of brand names	Active pharmaceutical ingredients (APIs)
1	AMINE	160	BROML**AMINE**®	Brompheniramine 4 mg Phenylephrine hydrochloride 10 mg
			PHAR**AMINE**®	Brompheniramine 4 mg
			CHLOR**AMINE**®	Chlorpheniramine maleate 4 mg
			WYR**AMINE** TABLET®	Chlorpheniramine maleate 4 mg
			DR**AMINE**®	Dimenhydrinate 50 mg
			BUS**AMINE**- 500®	Glucosamine sulfate sodium chloride 630.47 mg
			COS**AMINE**-S 500®	Glucosamine 500 mg
			KAS**AMINE**- 500®	Glucosamine 500 mg
			OS**AMINE** 500®	Crystalline glucosamine sulfate 500 mg
			GLUCOS**AMINE**-NIDA®	Glucosamine 500 mg
			CYR**AMINE**®	Pyridoxine hydrochloride 40 mg Thiamine mononitrate 100 mg Vitamin B12 100 mcg
			CYRI**AMINE** S. TABLETS®	Thiamine HCL 100 mg Pyridoxine HCL 7.50 mg Cyanocobalamin 1% WS 7.50 mg
			THI**AMINE** HYDROCHLORIDE®	Thiamine HCL 10 mg
			THI**AMINE** HCL TABLETS®	Thiamine HCL 10 mg
			THI**AMINE** HYDROCHLORIDE 100 MG. TAB®	Thiamine HCL 100 mg
2	HYDRO	102	**HYDRO**ZIDE PLUS®	Amiloride hydrochloride 5 mg Hydrochlorothaizide 50 mg
			HYDROCHLOROTHIAZIDE TABLETS®	Hydrochlorothiazide 50 mg
			HYDRODON®	Hydrochlorothiazide 50 mg
			HYDROMED®	Hydrochlorothiazide 50 mg
			B- **HYDRO**XYZINE 25®	Hydroxyzine HCL 25 mg
			HYDROXIM –10®	Hydroxyzine HCL 10 mg
			HYDROXYZINE TABLETS®	Hydroxyzine HCL 10 mg

https://doi.org/10.18549/PharmPract.2024.3.2955

			HYDROX- 10 (FILM COATED TABLETS)®	Hydroxyzine HCL 10 mg
			CYPROHEPTADINE **HYDRO**CHLORIDE TABLETS®	Cyproheptadine hydrochloride 4 mg
3	PREDNIS	76	**PREDNIS**OLONE®	Prednisolone 5 mg
			PREDNISOLONE TABLETS®	Prednisolone 5 mg
			PREDNISOLONE TABLETS 5 MG®	Prednisolone 5 mg
			PREDNISOLONE TABLETS USP XIX®	Prednisolone 5 mg
			PREDNISOLONE TABLETS BP 1973®	Prednisolone 5 mg
4	DRINATE	24	DIMENHY**DRINATE**®	Dimenhydrinate 50 mg
			DIMENHY**DRINATE** TABLETS®	Dimenhydrinate 50 mg
			DIMENHY**DRINATE** TABLETS 50 MG®	Dimenhydrinate 50 mg
			DIMENHY**DRINATE** TABLETS USP XIX®	Dimenhydrinate 50 mg
			FARMARS(R) DIMENHY**DRINATE**®	Dimenhydrinate 50 mg
5	PAMIDE	5	CHLORPRO**PAMIDE**®	Chlorpropamide 250 mg
			CHLORPRO**PAMIDE** TABLETS®	Chlorpropamide 250 mg
			IN**PAMIDE**®	Indapamide 2.5 mg
			NA**PAMIDE** 2.5 MG®	Indapamide 2.5 mg
			ME**PAMIDE**®	Metoclopramide HCL 10 mg
6	SERINE	5	CLO**SERINE**®	Cycloserine 250 mg
			CYCLO**SERINE** CAPSULES MEIJI®	Cycloserine 250 mg
			HAWON CYCLO**SERINE** CAP®	Cycloserine 250 mg
			AL**SERINE** 200®	Cimetidine 200 mg
			AL**SERINE** 400®	Cimetidine 400 mg
7	MAZINE	5	CHLOR**MAZINE** 50®	Chlorpromazine 50 mg
			CHLOR**MAZINE** 100®	Chlorpromazine 100 mg
			CHLORPRO**MAZINE** 25®	Chlorpromazine 25 mg
			CHLORPRO**MAZINE** TABLETS (100 MG) ®	Chlorpromazine 100 mg
			PLEGO**MAZINE**®	Chlorpromazine 25 mg
8	PRAMINE	3	CE**PRAMINE**®	Dibasic calcium phosphate 175 mg Ferrous fumarate 400 mg Ascorbic acid 60 mg Folic acid 6.2 mg
			MI**PRAMINE**®	Imipramine 25 mg
			TO**PRAMINE**®	Imipramine 25 mg
9	ALAZINE	2	HYDR**ALAZINE** DEAGEES®	Hydralazine 50 mg
			S**ALAZINE**®	Sulfasalazine 500 mg
10	PHENE	1	CLOMI**PHENE** TABLET®	Clomiphene citrate 50 mg
11	SPORINE	1	**SPORINE**X®	Tinidazole 500 mg
12	ZOLAMIDE	1	ACETA**ZOLAMIDE** TABLESTS BP®	Acetazolamide 250 mg

significant majority, with 66.47% of all similarity results, encompassing 961 registered names and 2,377 registered numbers. These findings highlight the need to streamline the drug registration process, improve efficiency, and eliminate obsolete formulations from the market. Outdated registrations should be supported by current versions. During the registration process, it is vital for manufacturers and regulatory authorities to critically assess brand name similarities before market introduction.[18,19] Moreover, when manufacturers decide to acquire multiple registration numbers for a single formulation, there must be clear distinctions in both the brand name and the physical attributes of the product.[2]

The second category, which constituted 33.03% of all similarity findings, comprised one brand names from various pharmaceutical manufacturers, each with identical APIs but different registration numbers. This situation may increase the risk of medication errors, as different manufacturers may employ diverse manufacturing processes, leading to subtle variations in the bioavailability and effectiveness of the medication, even though the APIs are the same.

https://doi.org/10.18549/PharmPract.2024.3.2955

Paracetamol had the highest registration number (70 from 28 companies), all registered in the same brand name. Similarly, dexamethasone and prednisolone were registered by 41 and 40 registration numbers from multiple companies, respectively. Although active pharmaceutical ingredients (APIs) may remain consistent, variations can occur in inactive components known as excipients. These differences in the excipients may lead to unexpected allergic reactions. The role and potential impact of these inactive elements in oral medicines are often underestimated despite the frequent presence of substances that can provoke adverse reactions in certain individuals.[20] Navigating the pharmaceutical sector in Thailand can be challenging owing to the complexities involved in drug registration number ownership. With both distributors and contract manufacturers having these numbers, there is a need for improved systemization in the management of drug listings and registration directories. This mitigates the issue of repeated or similar brand names.[2,18]

The third and fourth categories, which account for smaller percentages of the total similarity results, underscore a unique problem in terms of patient safety. They depict individual brand names from potentially varied or identical pharmaceutical manufacturers, but with distinct APIs and registration numbers. This can lead to serious medication errors, where a healthcare professional, based on brand name recognition, could inadvertently administer a medication with a completely different API, leading to unexpected and potentially harmful side effects.[21] A study paralleling a research emphasized the potential dangers of US registered brand names that are either the same or very similr to those in other countries. Such similarities could results in LASA medication errors, including incorrect drug dispensation. To reduce these risks, this study suggests that manufacturers should thoroughly consider these factors before proposing brand names to regulatory bodies. It also recommends that regulatory authorities consider integrating name checks into their review processes and collaborating with manufacturers to avoid using matching brand names for different APIs. Furthermore, this study underscores the importance of consumers being vigilant when acquiring prescriptions at overseas pharmacies as a precaution against possible name confusion.[21-23] Thailand's current pharmaceutical landscape is fraught with similarities among brand names, which is counterproductive to achieving optimal drug safety. Hence, heightened attention to LASA pair names need to be rigorously implemented across the drugs' entire lifecycle , from its introduction to the market to its post-marketing phase.[2,3] It is crucial to reduce problematic name pairs to minimize confusion among healthcare professionals.[4-6] The concept of drug safety should extend beyond the pre- and post-market stages to a continuum that includes research and development, manufacturing, registration, and medication use. Though the Thai FDA has outlined a strategy for drug registration review, a distinct system or support mechanism has not been fully initiated.[15,19]

This study also applies the "Tall Man Letter" principle to assess potential redundancy and moderate similarity in drug trade names in Thailand, using a database of 18,108 items. From a list of 37 Food and Drug Administration-approved generic drug names, 24 key terms were extracted, each containing five or more characters. Interestingly, only half (12 of 24) exhibited trademark similarities. The most common were "AMINE" (160 instances) and "HYDRO" (102 instances), with drugs containing active ingredients like brompheniramine, dimenhydrinate, glucosamine, hydrochlorothiazide, and hydroxyzine. Other terms showed fewer instances but still underscored the potential for confusion. This study emphasizes the need for careful naming of pharmaceutical products and the value of strategies like "Tall Man Letter" in reducing medication errors due to similar trade names.[1,6,23-25]

This study shows a slight increase in identical brand names from one manufacturer with the same APIs but different registration numbers, consistent with a prior study.[2] These findings persistently underscore the concerns surrounding LASA medication errors and further emphasize the necessity of continually refining product registration and naming practices.

These insights emphasize the urgent need to enhance the clarity and distinctiveness of the naming and labeling of pharmaceutical products. Healthcare professionals need to remain vigilant and ensure that they are familiar with the exact APIs of a product, beyond just its brand name. In addition, patients must be encouraged to understand the medications they are taking, including their generic names and purposes.[26,27]

The magnitude of this percentage signals the considerable potential for confusion, which has serious implications for the accurate prescription, dispensing, and administration of medications. This finding aligns with previous research that also identified drug name similarities as a leading cause of medication errors.[2,24] Such issues are especially critical for high-risk drugs, where incorrect administration can result in significant harm to patients.[5,6]

Furthermore, pharmaceutical companies often market the same drug under various brand names, adding to the complexity and potential for confusion.[28] This highlights the need for stringent regulations in drug nomenclature to prevent LASA medication errors. The WHO along with national drug regulatory bodies should take into account the potential confusion caused by similar drug names when approving new drugs.[29] These findings suggest that healthcare professionals must be vigilant regarding their medication practices and use strategies to prevent errors caused by similar drug names. This includes adopting tall-man lettering and computerized physician order entry (CPOE) systems with built-in alerts for similar drug names.[23,30] There is a pressing need for a comprehensive strategy that includes regulatory, organizational, and practice-level interventions to address the issue of drug name confusion and enhance patient safety.[23,30]

Patient safety should be viewed as a comprehensive process, spanning from the early stages of research and development, through manufacturing and registration stages, culminating in the actual consumption of the medicine.[9] The European Medicines Agency has provided guidelines, suggesting that authorities must ensure that the proposed name of a medicine

https://doi.org/10.18549/PharmPract.2024.3.2955

does not sound like another and that the labeling does not look similar to other products. Additionally, product information instructions (such as package inserts or Patient Information Leaflets) should be clear to prevent medication errors. Each stage of this process should prioritize patient safety, aligning with the broader continuum of patient care and protection.[9,11] Considering these concerns, this study should serve as a guideline for the FDA's registration system to prevent the duplication of brand names. The FDA should include brand name and appearance assessments in drug application submissions. This evaluation should analyze if the proposed brand name resembles any previously drug names. If there is a risk of confusion, both the manufacturer and regulators should address it before approval.[1,25]

Regular reviews of drug registration should be undertaken. An ongoing systematic assessment, and update process could help eliminate outdated or confusing brand names, promoting constant refinement among pharmaceutical manufacturers.[31-33]

Since 2018, the United States Adopted Names Council has employed the Phonetic and Orthographic Computer Analysis software. This software rate the similarity of drug names on a scale from 0 (no similarity) to 100 (exact match), factoring in both phonetic and orthographic elements. According to the US FDA 2021 guidelines, a combined score of 70 or above is categorized as highly similar, potentially signaling conflicts. Scores between 55 and 70 were considered moderately similar, whereas scores below 55 indicated low similarity. In the case of USAN candidates, scores of 70 or higher indicate potential conflicts, whereas scores of 80 or higher are typically disqualifying. In 2021, the US FDA made the POCA tool available online. Health Canada uses the POCA to assess brand names in its Drug Submission Tracking System (DSTS). They ensured all names with a combined similarity score of 50% or higher were included in assessment to mitigate potential confusion.[32-34]

Issues regarding the drug registration ownership exclusivity between manufacturers and distributors must also be addressed. Ideally, a pharmaceutical company should have a brand name associated with only one registration number. The Thai FDA should exert its authority to deny any proposed brand name that could potentially mislead or be confused with a previously authorized product.[13,18,35] Regular and precise updates to the registration database management systems are crucial. Implementing an efficient search function can facilitate the comparison of similar or identical characteristics among drug products. The database should include active, cancelled, withdrawn, or modified licenses. It should account for LASA-name-related medication errors. The system should highlight product similarities and provide essential data to guide manufacturers' decisions.[31,36] By adopting these strategies, we could significantly enhance the clarity and distinctiveness of Thailand's drug nomenclature, reduce potential medication errors, and thus improve patient safety.

CONCLUSIONS

These findings show that the same manufacturers can produce identical brand names with the same APIs and dosage strengths, highlighting the existing issues in Thailand's drug registration system. This study provides suggestions for regulatory bodies to enhance registration processes and alleviate the issues of LASA name errors and other complexities related to ongoing drug use. This aids in ensuring patient safety.

ACKNOWLEDGMENTS

The authors extend their gratitude to Ubon Ratchathani University for the invaluable support in conducting this study.

CONFLICT OF INTEREST

None

FUNDING INFORMATION

This project was funded by the Ubon Ratchathani University, Ubon Ratchathani, Thailand.

AUTHOR CONTRIBUTIONS

Teeraporn Sadira Supapaan: Conceptualization, Methodology, Formal analysis, Writing-original draft preparation; Jirawat Kamnuek: Data collection, Formal analysis; Chanawat Khakaew: Data collection, Formal analysis; Thanakorn Jungsuwadee: Data collection, Formal analysis; Ananya Songmuang: Data collection, Validation; Saksit Sripa: Conceptualization, Methodology, Writing-reviewing and editing; Peerawat Jinatongthai: Formal analysis, Validation.

Chonladda Pitchayajittipong: Methodology, Data collection, Formal analysis; Jintana Napaporn: Conceptualization, Formal analysis, Writing-original draft preparation.

References

1. Institute for Safe Medication Practices (ISMP). (2023). Worksheet for the 2022-2023: ISMP Targeted Medication Safety Best Practices for Hospitals. https://www.ismp.org/system/files/resources/2022-02/2022-2023_ISMP_TMSBP_Worksheet_0.pdf Accessed 13 April, 2023.
2. Napaporn J, Buakaew P, Suksakornthanawat P, et al. Analogous comparison of registered brand name drugs of tablets and capsules commercially available in Thailand: A retrospective study. PLOS ONE. 2022;17(10):e0276321. https://doi.org/10.1371/journal.pone.0276321
3. Chanakit T, Napaporn J, Chiempattanakajohn T, et al. The survey of look alike/sound alike (LASA) drugs available in hospitals in

Thailand. Afr J Pharm Pharmacol. 2013;7(6):227-239.
4. Bryan R, Aronson JK, Williams AJ, et al. A systematic literature review of LASA error interventions. Br J Clin Pharmacol. 2021;87(2):336-351. https://doi.org/10.1111/bcp.14644
5. Bryan R, Aronson JK, Williams A, et al. The problem of look-alike, sound-alike name errors: Drivers and solutions. Br J Clin Pharmacol. 2021;87(2):386-394. https://doi.org/10.1111/bcp.14285
6. Bryan R, Aronson JK, ten Hacken P, et al. Patient Safety in Medication Nomenclature: Orthographic and Semantic Properties of International Nonproprietary Names. PLOS ONE. 2015;10(12):e0145431. https://doi.org/10.1371/journal.pone.0145431
7. The World Health Organization. (2007). WHO launches 'Nine patient safety solutions'. https://www.who.int/news/item/02-05-2007-who-launches-nine-patient-safety-solutions Accessed 12 Aug, 2022.
8. The World Health Organization. (1997). Guidance on INN. https://www.who.int/medicines/services/inn/innquidance/en/ Accessed 24 Dec, 2021.
9. International Pharmaceutical Federation (FIP). Pharmacists' Role in Medication Without Harm. The Hague, The Netherlands: International Pharmaceutical Federation; 2020.
10. Institute for Safe Medication Practices (ISMP). (2009). Survey on LASA drug name pairs: who knows what's on your list and the best ways to prevent mix-ups? Accessed 15 May, 2023.
11. Goedecke T, Ord K, Newbould V, et al. Medication errors: new EU good practice guide on risk minimisation and error prevention. Drug safety. 2016;39:491-500. https://doi.org/10.1007/s40264-016-0410-4
12. European Medicines Agency (EMA). (2021). Recommendations on medication errors. https://www.ema.europa.eu/en/human-regulatory/post-authorisation/pharmacovigilance/medication-errors/recommendations-medication-errors Accessed 01 August, 2023.
13. The Association of Hospital Pharmacist (Thailand). (2020). Framework of hospital drug system. https://www.thaihp.org/?fbclid=IwAR1itl_pQ0hVUnrJEyNBzfI_OBKIvUbos2QeTzhVQBtG1KDFGnaZxFtJN0U Accessed 6 Aug, 2022.
14. Chumchit C, Amrumpai Y, Treesak C. Recognition on medication safety and look-alike/sound-alike medication problems in Thai public hospitals. Silpakorn U Science & Tech J. 2015;9(2):40-51.
15. Wongboonnak P. Look-alike sound-alike drugs situation in Thailand. HCU Journal of Health Science. 2018;22:205-216.
16. Clark KR, Vealé BL. Strategies to enhance data collection and analysis in qualitative research. Radiol Technol. 2018;89(5):482ct-485ct.
17. Hsieh H-F, Shannon SE. Three approaches to qualitative content analysis. Qualitative Health Research. 2005;15(9):1277-1288. https://doi.org/10.1177/1049732305276687
18. Jitruknatee A, Martro J, Tosanguan K, et al. National drug policies in Thailand: evolution and lessons for the future. J Health Sci. 2020:S3-S14.
19. Pitaknitinun K, Lawanprasert Y, Vimolkittipong S. Thailand's legal framework concerning drugs. Journal of Health Science. 2020:S15-S30. https://doi.org/10.7717/peerj.12809
20. Reker D, Blum SM, Steiger C, et al. "Inactive" ingredients in oral medications. Sci Transl Med. 2019;11(483). https://doi.org/10.1126/scitranslmed.aau6753
21. Merchant L, Lutter R, Chang S. Identical or similar brand names used in different countries for medications with different active ingredients: a descriptive analysis. BMJ Qual Saf. 2020;29(12):988-991. https://doi.org/10.1136/bmjqs-2019-010316
22. Schrader T, Tetzlaff L, Beck E, et al.The similarity of drug names as a possible cause of confusion: Analysis of data from outpatient care. Z Evid Fortbild Qual Gesundhwes. 2020;150-152:29-37. https://doi.org/10.1016/j.zefq.2020.01.006
23. Lambert BL, Galanter W, Liu KL, et al. Automated detection of wrong-drug prescribing errors. BMJ Qual Saf. 2019;28(11):908-915. https://doi.org/10.1136/bmjqs-2019-009420
24. Filik R, Purdy K, Gale A, et al. Drug name confusion: evaluating the effectiveness of capital ("Tall Man") letters using eye movement data. Soc Sci Med. 2004;59(12):2597-2601. https://doi.org/10.1016/j.socscimed.2004.04.008
25. Institute for Safe Medication Practices (ISMP). (2019). ISMP List of Confused Drug Names. https://www.ismp.org/recommendations/confused-drug-names-list Accessed 11 Oct, 2022.
26. Raynor DK, Blenkinsopp A, Knapp P, et al. A systematic review of quantitative and qualitative research on the role and effectiveness of written information available to patients about individual medicines. Health Technol Assess. 2007;11(5):iii, 1-160. https://doi.org/10.3310/hta11050
27. La Caze A. Safer dispensing labels for prescription medicines. Aust Prescr. 2018;41(2):46-49. https://doi.org/10.18773/austprescr.2018.009
28. Grissinger M. Multiple brand names for the same generic drug can cause confusion. P t. 2013;38(6):305. http://www.ncbi.nlm.nih.gov/pmc/articles/pmc3737992/
29. Emmerton LM, Rizk MF. Look-alike and sound-alike medicines: risks and 'solutions'. Int J Clin Pharm. 2012;34(1):4-8. https://doi.org/10.1007/s11096-011-9595-x
30. Galanter WL, Bryson ML, Falck S, et al. Indication alerts intercept drug name confusion errors during computerized entry of medication orders. PLOS ONE. 2014;9(7):e101977. https://doi.org/10.1371/journal.pone.0101977
31. U.S. Department of Health and Human Services Food and Drug Administration (FDA), Center for Drug Evaluation and Research (CDER). (2015). Size, shape, and other physical attributes of generic tablets and capsules. https://www.fda.gov/files/drugs/

published/Size--Shape--and-Other-Physical-Attributes-of-Generic-Tablets-and-Capsules.pdf Accessed 10 Jan, 2022.
32. Rider BB, Mehta H, Merchant L. Special considerations for proprietary name review: focus on products That may be prescribed "As Directed". Ther Innov Regul Sci. 2019;53(3):381-386. https://doi.org/10.1177/2168479018782669
33. Karet GB. Linguistic analysis of generic-generic drug name pairs prone to wrong-drug errors for which Tall-Man lettering is recommended. Ther Innov Regul Sci. 2023;57(4):751-758. https://doi.org/10.1007/s43441-023-00526-0
34. Government of Canada. (2014). Guidance document for industry - review of drug brand names. https://www.canada.ca/en/health-canada/services/drugs-health-products/reports-publications/medeffect-canada/guidance-document-industry-review-drug-brand-names.html Accessed 6 August, 2022.
35. Khontum A, Chanthapasa K. Perceptions of communities regarding look-twin sound-twin drugs: a case study of a Sub-District in the Northeastern Region of Thailand. Risk Manag Healthc Policy. 2021;14:2345-2355. https://doi.org/10.2147/rmhp.s303899
36. Lizano-Díez I, Figueiredo-Escribá C, Piñero-López M, et al. Prevention strategies to identify LASA errors: building and sustaining a culture of patient safety. BMC Health Serv Res. 2020;20(1):63. https://doi.org/10.1186/s12913-020-4922-3