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Cost and use of 'Wann Pra Chim' gel in U-Thong hospital: A 5-year retrospective study

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ABSTRACT

The development of medicinal plants for hospital use, akin to traditional medicine formulations, requires comprehensive fact-sheet information for support. This study aimed to retrieve and analyze data from the hospital information system on the use of "Wann Pra Chim" gel, which is developed in-house by U-Thong hospital. Over a 5-year period, a total of 4,320 patient records were analyzed, with a higher number of outpatient department (OPD) cases than inpatient department (IPD) cases. The majority of patients were general employees, unemployed individuals, and farmers. Physicians were the primary prescribers of the gel, accounting for the highest total gel volume. The most common diagnoses based on ICD-10 codes for which the gel was prescribed included assault by explosive material, pemphigus, and decubitus ulcers and pressure areas. A comparative cost analysis revealed that "Wann Pra Chim" gel had the lowest cost compared to two commercial alternatives, demonstrating its benefits in terms of cost and usage in volume for both OPD and IPD patients.

Keywords: herbal medicine; hospital information system; Wann Pra Chim gel; *Dioscorea bulbifera*

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1. INTRODUCTION

Wann Pra Chim (*Dioscorea bulbifera* L. [Family: Dioscoreaceae]), commonly known as "air potato", is widely found in America, Africa, China, India and, tropical Asia, including several provinces of Thailand (Gutierrez, 2021). *D. bulbifera* is a herbaceous vine with large underground tubers and small edible bulbil-type tubers that develop in the leaf axils. The tubers are round, approximately 0.6–2.5 cm in size, and resemble capsules (Gutierrez, 2021; Wheeler et al., 2007).

Traditionally, *D. bulbifera* has been utilized in Thai folk medicine as a diuretic and anthelmintic agent. Furthermore, it has been included in longevity preparations as well as treatments for wounds and inflammation. In regions such as Cameroon and Madagascar, the plant bulbs are ground, and then applied to abscesses, boils, and wound infections. In Zimbabwe, infusions made from this plant are applied to cuts and sores in both humans and animals. In India, the bulbs are utilized for treating piles, dysentery, and syphilis, as well as for reducing the pain and inflammation of ulcers (Cogne, 2002; Mbiantcha et al., 2011; Guan et al., 2017).

The extensive use of *D. bulbifera* in traditional medicine in various cultures highlights its potential for wound healing and the treatment of pressure ulcers. In Kuete et al. (2012) studied the microbial growth-inhibiting effects of crude methanol extract in two fractions (DBB1 and DBB2) and six compounds (compounds 1–6) isolated from the tubers of *D. bulbifera*. The ability of these compounds to inhibit mycobacterial species and Gram-negative bacteria were examined using microplate Alamar blue assays (MABA) and, broth microdilution methods (Kuete et al., 2012). In Chaniad et al. (2020) studied the efficacy of the wound healing, anti-inflammatory, and antioxidant properties of crude extracts that were obtained via maceration with ethanol at room temperature and reflux extraction with water. They found that myricetin was the most effective compound, (IC_{50} 39 μM), followed by kaempferol (IC_{50} 46.6 μM) and quercetin (IC_{50} 56.2 μM). The ethanol extract had shown a lower IC_{50} value than the water extract and demonstrated a higher anti-inflammatory potential than wound healing potential.

Currently, the national master plans for Thai herbal development No. 1 (2017–2021) and No. 2 (2021–2024) are being implemented (National Strategy Secretariat Office, 2018). The plan focuses on integrating and transitioning to the concept of a "Herbal City" as well as promoting and developing herbal products in potential areas. Concurrently, the Thai herbal pharmacopeia is being compelled to meet international standards (Putiyanan et al., 2008).

Wann Pra Chim gel is a champion product of the Suphan Buri province that uses the above-ground tubers of *D. bulbifera*. The product was developed using Thai traditional wisdom combined with pharmaceutical knowledge to prepare the gel for external use. This herbal gel has been used in U-Thong hospital to aid in the healing of pressure ulcers, abrasions, and wound infections (Tungsukruthai et al., 2022). A previous study conducted at U-Thong hospital reported that this gel significantly reduced the wound size and incidence of adverse drug reactions (1 out of 1,026 patients). Additionally, 99% of the patients expressed a willingness to use the gel again, indicating high patient satisfaction. These findings support the efficacy and safety of Wann Pra Chim gel in wound healing (Tungsukruthai et al., 2022).

Pressure ulcers occur in patients whose skin has been subjected to pressure for a prolonged period, which results in impaired blood flow to the affected area (Mervis & Phillips, 2019). This leads to redness and skin breakdown. If preventive care is not initiated in the early stages, it results in pressure sores, and complications in treatment. This condition incurs high costs, including travel to the hospital, medications, and wound dressings, as well as impacts the patient's mental health. Pressure ulcers can develop infection, necrosis, and foul odors. Normally, healing takes from one month to two years.

Patients returning to the hospital for treatment often require expensive antibiotics. Furthermore, physicians usually prescribe additional oral antibiotics and tissue restorative treatment gels (Norman et al., 2016). In rural communities with limited income, the high cost of medicine is a significant burden. U-Thong hospital, a community hospital with over 150 beds, aimed to provide effective herbal medicines for pressure sores at an affordable price. Thus, Wann Pra Chim gel was prepared and introduced for hospital use to treat pressure sores.

The objective of this study was to retrospectively gather data regarding Wann Pra Chim gel, including its indications, patient demographics, professional prescriptions, medicinal value, and the diseases treated. These data were then used to develop a guideline, with particular emphasis on subgroup intensive care planning and directions for future clinical studies.

2. MATERIALS AND METHODS

2.1 Study design

In this quantitative retrospective study, data were collected from the electronic hospital information system (HIS) databases and patient medical records at U-Thong hospital. Designated as a midlevel referral hospital (M2) by the Health Service Development Plan of the Ministry of Public Health, U-Thong hospital has been a pioneer in developing herbal medicine since 1990. It was the first hospital to pass the Good Manufacturing Practice (GMP) assessment in 2010 and has received the National Excellent Service Models in Thai Traditional Medicine (Diamond level in 2015) and National Outstanding Herbal Medicine Manufacturing Award.

2.2 Target population

All patients prescribed Wann Pra Chim gel at U-Thong hospital from January 1, 2018, to December 31, 2022 whose medical records were available in the HIS were included in the study. Patients whose data were incomplete or not recorded in the electronic database were excluded.

2.3 Ethical consideration

The study was approved by the Human Research Ethics Committee of Silpakorn University (No: REC 65.1117-191-9507) and the director of U-Thong hospital. The need for informed consent was waived due to the use of electronic medical records.

2.4 Data retrieval from HIS

All data from the electronic databases were retrieved by the administration of U-Thong hospital's HIS. Information on the use of Wann Pra Chim gel from January 1, 2018, to December 31, 2022, was retrieved using SQL language queries annually (see appendix).

2.5 Data analysis

The data retrieved each year were exported as a comma-separated values (CSV) file and converted into a spreadsheet (.xlsx) using Microsoft Excel. The collected data were divided into two parts: Part 1, product information (counting unit, quantity, standard code, indications, quantity of use, and prescriber) and Part 2, patient information (sex, weight, height, age, treatment date, and International Classification of Diseases 10th Revision [ICD-10] diagnosis). Descriptive statistics were used to report the data. Categorical variables are presented as frequency and percentage, and numerical data are presented as mean with standard deviation (mean ± SD).

2.6 Costs analysis

The cost of Wann Pra Chim gel use at U-Thong hospital was calculated in terms of total use in grams each year (Robinson, 1993). The cost of buying Wann Pra Chim gel from the hospital was set at 100 baht for 50 g and 45 baht for 15 g. The following two commercial products with similar indications were also selected for comparison:

Solcoseryl jelly (20 g/tube at 132.5 baht, average price from two government hospitals) and Curiosin® (15 g/tube) at 1,118.0 baht (Ministry of Public Health, 2024). This structured and detailed approach ensures that the study is both comprehensive and rigorous, allowing for meaningful insights into the clinical use and cost-effectiveness of Wann Pra Chim gel.

3. RESULTS AND DISCUSSION

3.1 Results

3.1.1 Patient demographics

This study included patients from both the outpatient department (OPD) and inpatient department (IPD). The average age of the patients from both departments was not significantly different between the males and females (Table 1). However, the female patients were slightly older than the male patients (65.71 ± 20.88 vs 60.33 ± 19.59 years). According to the HIS, the youngest OPD and IPD patients to be administered the Wann Pra Chim gel were under 1 year old, and 3 years old, respectively. The oldest patient to be administered the gel was over 100 years old (Table 1). Over the 5-year period, the use of Wann Pra Chim gel among OPD patients remained consistent, while its usage in IPD patients reduced during the COVID-19 pandemic (2021–2022).

The patients were categorized into six occupational groups (Table 2). The majority of the patients were general employees, unemployed, or engaged in farming. In Thailand, the citizens are covered by the Universal Health Coverage Scheme, which is supported by the government.

Table 1. Characteristics of patients shown in electronic health record who were prescribed Wann Pra Chim gel during 2018–2022

Characteristic	Value	
1. Sex	Male 1,920 (46.19%)	Female 2,237 (53.81%)
2. Age	Male 60.33 years (S.D. 19.59)	Female 65.71 years (S.D. 20.88)
3. Services	IPD 427 times (10.27%)	OPD 3,730 times (89.73%)
4. Health insurance	Elderly people in area Disabled people in the area Direct disbursement Gold card in the area Social security, U-Thong hospital	1,410 (38.00%) 1,131 (30.48%) 715 (19.27%) 321 (8.65%) 134 (3.61%)
5. Top 3 diagnosis found and prescribing Wann Pra Chim gel	1) Assault by explosive material, +decubitus ulcer and pressure area 2) Assault by explosive material, +Removal of nonsurgical wound dressing/+diabetic complication 3) Essential (primary) hypertension	286 times (21.3%) 214 times (15.9%) 37 times (2.76%)
6. Top 3 occupation	General employee Not working Farming/agriculture	1,475 (43.33%) 1,148 (33.72%) 575 (16.89%)
7. Re-prescribed Wann Pra Chim gel	2–5 times 6–8 times 9–10 times >10 times (13 times)	382 (9.19%) 51 (1.23%) 23 (0.55%) 12 (0.29%)

Table 2. Distribution of patients prescribed Wann Pra Chim gel by sex, department (OPD/IPD), and occupation

OPD	2018		2019		2020		2021		2022	
	M	F	M	F	M	F	M	F	M	F
General employee	132	165	152	150	133	119	121	152	121	107
Not working	78	124	87	136	119	133	97	167	118	139
Farming, agriculture	52	90	60	58	92	43	71	69	53	60
Serving in government	43	40	31	37	20	22	35	30	18	33
Trading/private sector	22	34	32	13	8	17	17	23	15	14
Student	21	20	24	21	3	15	11	14	2	14
Monk	5	0	15	0	8	4	3	2	4	5
Grand Total	353	473	401	415	383	353	355	457	331	372
IPD										
General employee	18	13	15	23	15	24	10	18	20	15
Not working	7	19	11	17	6	17	5	21	3	13
Farming, agriculture	6	14	9	12	7	7	5	3	5	7
Trading/private sector	2	2	3	7	8	2	3	1	2	4
Student	1	1	0	0	2	0	0	0	0	0
Serving in government	2	0	3	4	1	2	2	0	3	0
Monk	3	0	0	0	2	1	0	0	1	0
Grand Total	39	49	41	63	41	53	25	43	34	39

3.1.2 Wann Pra Chim gel orders and usage information

From 2018 to 2022, a total of 4,320 patients were prescribed the gel (Figure 1). The number of OPD patients was 8–10 times higher than that of IPD patients (Figure 2). The number of patients using the gel remained consistent over the years. The 50 g product was preferred over the 15 g product, which may be attributed to the fact that the gel had to be applied 2–3 times per day (Figure 3).

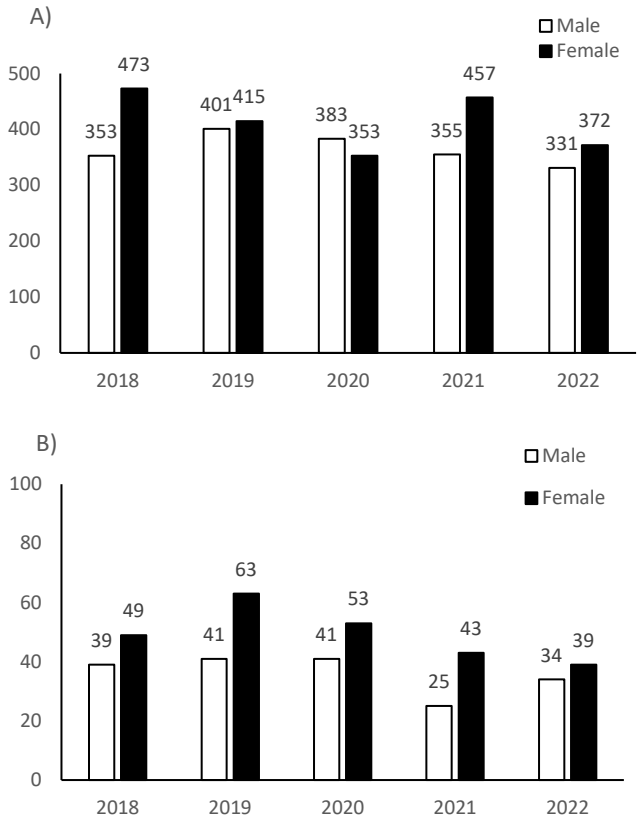

Figure 1. Demographics data of 4,320 patients who were prescribed the Wann Pra Chim gel during 2018–2022; (A) outpatients, (B) inpatients

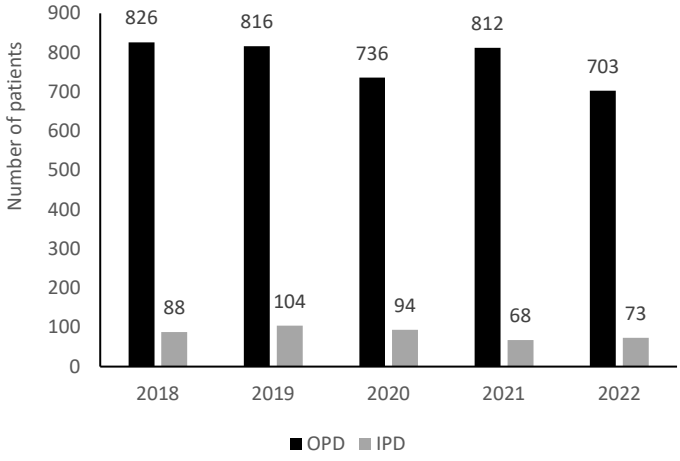

Figure 2. Annual distribution of patients prescribed the Wann Pra Chim gel (2018–2022)

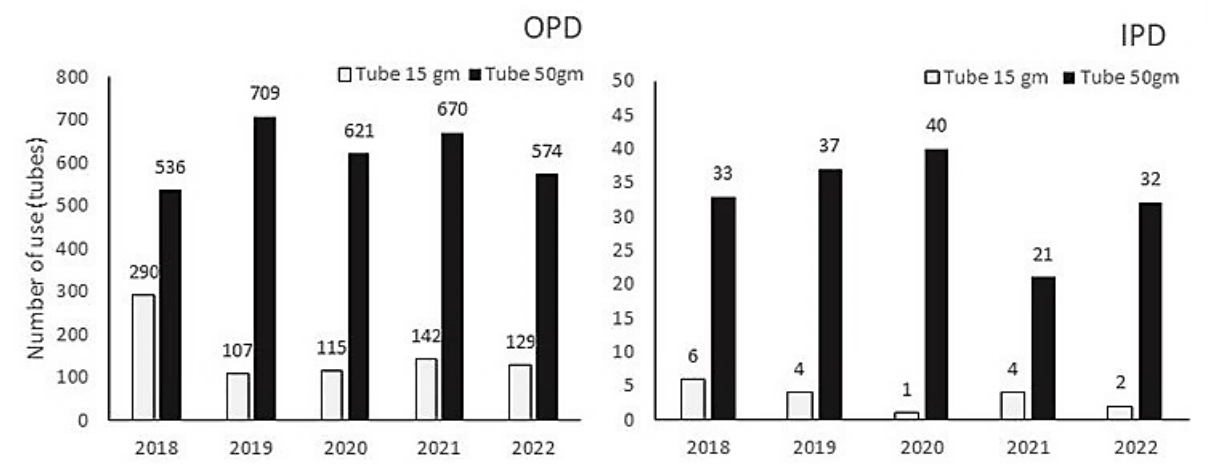

Figure 3. Usage of Wann Pra Chim gel by volume on patients in the inpatient and outpatient departments during 2018–2022

U-Thong hospital permits physicians, nurses, Thai traditional medicine practitioners, family medicine practitioners, and other personnel such as Thai folk medicine practitioners and alternative medicine practitioners to prescribe the gel. The physicians ordered the highest volume of gel over the 5-year period. The nurses ordered the second highest volume of gels. The gel was consistently accepted and used by various professionals over the 5 years (Figure 4).

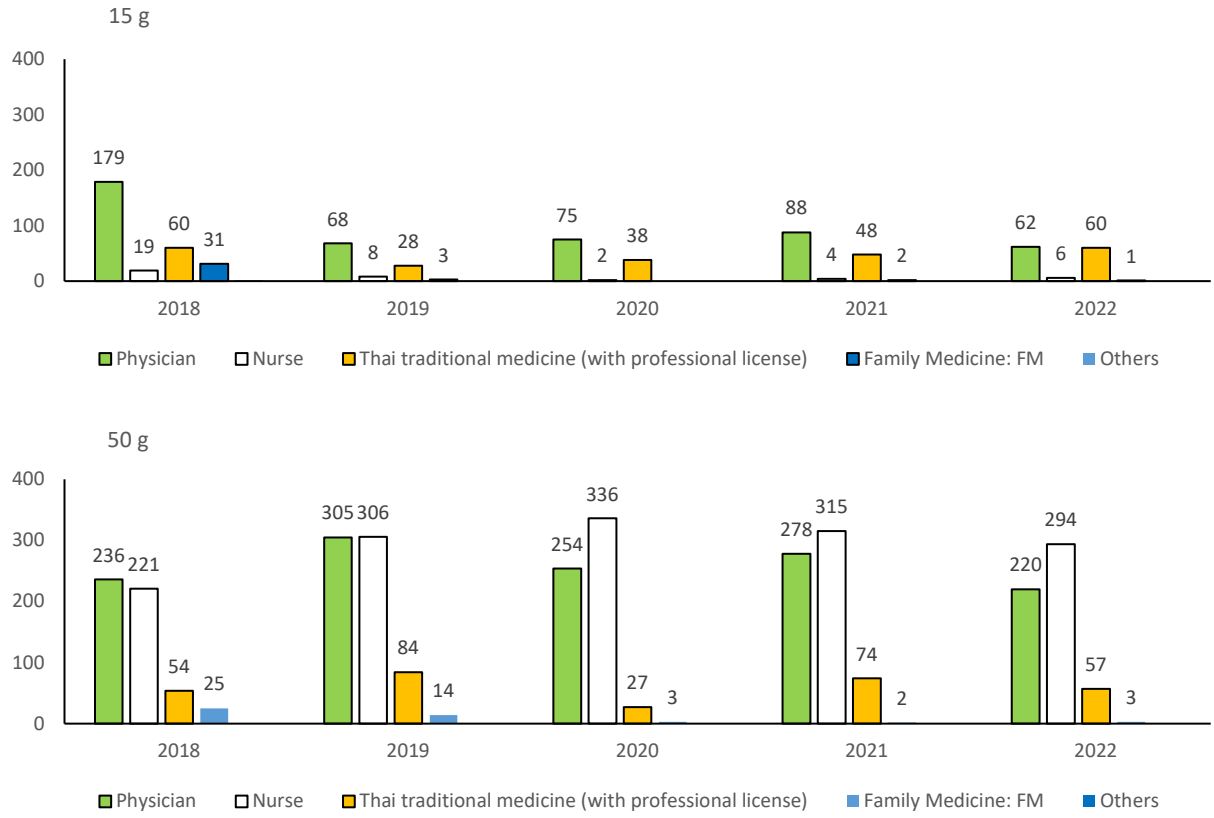

Figure 4. Annual prescription trends for the Wann Pra Chim gel according to prescribing professionals (2018–2022)

3.1.3 Indications for Wann Pra Chim gel by according to ICD-10 code

The ICD-10 codes for the diagnoses were retrieved from the database for each year from 2018 to 2022. The ICD-10 codes were grouped and counted for each diagnosis, among the OPD and IPD patients (Tables 3 and 4). In the OPD group, the most common diagnoses were assault by explosive material, pemphigus, and pressure ulcers, including decubitus ulcers and pressure areas. In the IPD group, the most frequent diagnoses were essential hypertension, palliative care, and hypokalemia. Furthermore, each patient often had more than one ICD-10 diagnosis because of the chronic conditions.

Table 3. Frequency distribution of ICD-10 diagnoses for patients prescribed Wann Pra Chim gel in the outpatient department (OPD)

Diagnosis ICD-10 (OPD)	Frequency	% of Total
Assault by explosive material: at trade & service area: during unspecified activity	1339	15.56
Pemphigus	968	11.25
Decubitus ulcer and pressure area, unspecified	899	10.45
Attention to surgical dressings and sutures	575	6.68
Non-insulin-dependent diabetes mellitus, without complications	568	6.60
Palliative care	477	5.54
Application of other wound dressing—as a primary procedure code	365	4.24
Other specified counseling	308	3.58
Attention to other artificial openings of urinary tract	220	2.56
Local infection of the skin and subcutaneous tissue, unspecified	211	2.45
Reduced mobility	192	2.23
Disorder of lipoprotein metabolism, unspecified	172	2.00
Anemia, unspecified	162	1.88
Hypokalemia	153	1.78
Special screening examination for eye and ear disorders	153	1.78
Hyposmolality and hyponatremia	149	1.73
Hyperlipidemia, unspecified	148	1.72
Other physical therapy	135	1.57
Personal history of diseases of the circulatory system	129	1.50
Urinary tract infection, site not specified	112	1.30
Follow-up examination after other treatment for other conditions	102	1.19

Note: Data shown for frequencies > 100

Table 4. Frequency distribution of ICD-10 diagnoses for patients prescribed Wann Pra Chim gel in the inpatient department (IPD)

Diagnosis ICD-10 (IPD)	Frequency	% of Total
Essential (primary) hypertension	355	9.55
Palliative care	316	8.50
Hypokalemia	313	8.42
Urinary tract infection, site not specified	227	6.11
Disorder of lipoprotein metabolism, unspecified	221	5.94
Other specified counseling	202	5.43
Hyposmolality and hyponatremia	200	5.38
Other physical therapy	178	4.79
Non-insulin-dependent diabetes mellitus, without complications	173	4.65
Decubitus ulcer and pressure area, unspecified	153	4.12
Pneumonia, unspecified	151	4.06
Septicemia, unspecified	132	3.55
Anemia, unspecified	112	3.01
Septic shock	98	2.64
Acute renal failure, unspecified	90	2.42
Congestive heart failure (I)	81	2.18
Special screening examination for other viral diseases	77	2.07
Nosocomial condition	63	1.69
Gastrointestinal hemorrhage, unspecified	62	1.67

Note: Data shown for frequencies > 50

3.1.4 Cost comparison between the Wann Pra Chim gel and other products

To evaluate the cost benefits of using herbal medicine at U-Thong hospital, the total volume of 15 g and 50 g Wann Pra Chim gel tubes was calculated and presented (Table 5). Subsequently, the costs were compared with those of two commercial products used for treating pressure ulcers (Figure 5). The use of Wann Pra Chim gel was more cost-effective than Solcoseryl gel, with annual savings ranging from 130,000 to 150,000 baht. Moreover, a significantly higher cost saving, potentially 10–20 times more, was observed with Wann Pra Chim gel use than with Curiosin use (Figure 5).

Table 5. Annual usage and cost analysis of Wann Pra Chim gel

		Wann Pra Chim gel	Solcoseryl 20 g	Curiosin 15 g
	Gel volume (g)	Cost (baht)	Cost by equal volume (baht)	Cost by equal volume (baht)
2018	32,890	70,220	217,896	2,451,401
2019	38,965	79,595	258,143	2,904,191
2020	34,790	71,320	230,484	2,593,015
2021	36,740	75,670	243,403	2,738,355
2022	32,265	66,495	213,756	2,404,818
Total	175,650	363,300	1,163,681	13,091,780

Note: Data represents the total amount of Wann Pra Chim gel used each year, displayed in grams. The costs were calculated based on the standard prices from government hospitals for each product size

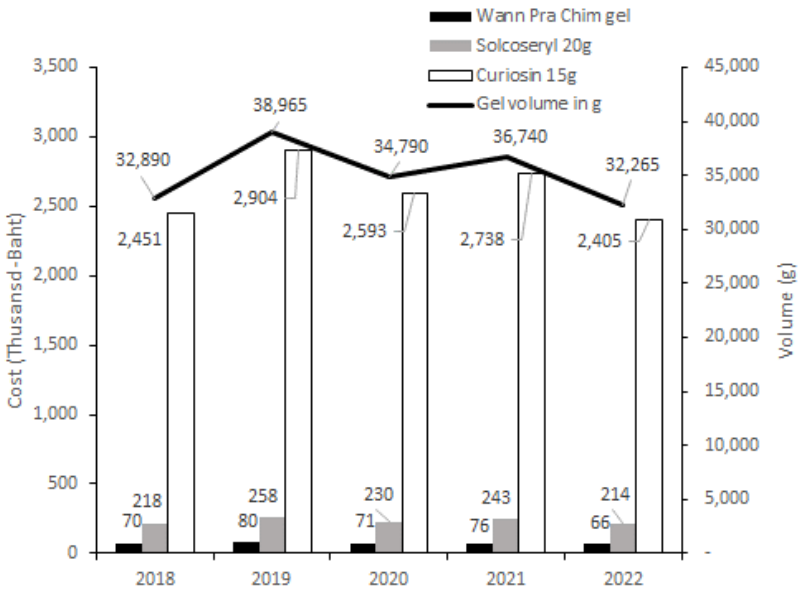

Figure 5. Comparison of the Wann Pra Chim gel usage and cost with those of other commercial products

3.2 Discussion

Data retrieved from the HIS indicated that the Wann Pha Chim gel was prescribed at U-Thong hospital from 2018 to 2022 for both OPD and IPD patients. The gel was predominantly used for explosive injuries, pemphigus, ulcers and pressure areas, and surgical dressings. The 50 g tube was more commonly used than the 15 g tube, which may be attributed to the need for application 2–3 times per day. The gel was developed as an alternative to supportive care and the utilization of herbal products. The summarized ICD-10 codes correspond to the pharmacological effects related to antibacterial activities (Kuete et al., 2012) and the preliminary efficacy of *Dioscorea bulbifera* Linn. gel in wound healing (Tungsukruthai et al., 2022). However, further research is required to explore additional pharmacological effects on pressure ulcers.

In this study, a total of 4,320 patients were prescribed Wann Pra Chim gel between January 1, 2018, and December 31, 2022. The patients age varied, from under 1 years old (OPD patient) to 112 years old (female OPD patient). Currently, there is no formal restriction on the use of Wann Pra Chim gel on the basis of age. However, infants and young children may have more sensitive skin and exhibit different physiological responses to topical treatments than adults. To ensure its safe and appropriate use, physicians should evaluate each patient individually, considering the wound severity, patient's skin sensitivity, and any underlying conditions. Over the 5-year study period, physicians, nurses, and traditional medicine practitioners continued to prescribe and apply Wann Pra Chim gel. Most of the patients at U-Thong hospital were covered by insurance for the elderly and disabled residents in the area, or by direct reimbursement (Table 1). The study participants were primarily general employees, unemployed, or farmers.

Wann Pra Chim gel, which was developed at the hospital 10 years ago, has been promoted as the best herbal product in the Suphan Buri province. It is widely used at U-Thong hospital and many sub-district health promoting hospitals (data not shown). Although the effectiveness of Wann Pra Chim gel has not been previously reported, our data indicate that it was prescribed multiple times in many patients with no adverse drug reactions, consistent with Tungsukruthai et al. (2022). The return of OPD patients and their satisfaction with the outcomes suggest that the gel yields positive results. The 50 g tube of Wann Pra Chim gel was more popular than the 15 g tube because the gel needs to be applied 2–3 times per day.

A cost comparison with two other commercial products (Solcoseryl jelly and Curiosin gel) revealed that the Wann

Pra Chim gel was the least expensive. Over the 5 years, Wann Pra Chim gel use yielded savings of approximately two times and ten times the Solcoseryl and Curiosin costs, respectively. This reduced the cost for both the hospital and patients in terms of treatment costs, travel expenses and cost of other medications. However, the production capacity of the gel is limited by the availability of herbal materials. Currently, efforts are being made to expand and support the production of Wann Pra Chim gel. Increased production and usage in the future could lead to even greater cost savings than those reported in this study. To encourage the domestic use of herbal products, strategies should be implemented by hospitals and the Ministry of Public Health in Thailand to subsidize the cost of high-priced imported commercial products.

Although, this study provides an overview of the use of Wann Pra Chim gel at U-Thong hospital over the past 5 years, it has some limitations. The efficacy and effectiveness of the product were not evaluated; this warrants an evaluation in further studies. During the study period, factors such as outcome results, source of herbs and materials, and government policies supporting the use of herbal products in Thai hospitals may have influenced the use of Wann Pra Chim gel.

4. CONCLUSION

Information obtained from hospital databases revealed the usefulness of Wann Pra Chim gel in terms of quantity used, patient demographics, prescription sources, diagnoses, and cost. The study demonstrated the continued use of Wann Pra Chim gel over 5 years (2018–2022) at U-Thong hospital. The primary indicators for the gel's use included explosive injuries, pemphigus, decubitus ulcers, bed sores, and wound dressing requiring antibacterial treatment. Compared to the two commercial products, Wann Pra Chim gel significantly minimized the costs. This study provides valuable information regarding production planning, and clinical care focus in specific subgroups, such as those with pressure ulcers, and for future clinical studies.

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