Cost Effectiveness of Treatment for Moderate to Severe Psoriasis at the Rizal Medical Center*

Ivy Sanciangco Cagulada, MD[1]

ABSTRACT

Background: Cost-effectiveness studies are important for chronic diseases such as psoriasis, which may cause significant financial burden and negatively affect the patient's quality of life.

Objectives: This study evaluated which among the treatment options, namely topicals + phototherapy (TP), topicals + systemic (TS), and topicals + biologics (TB), is the most cost-effective for the management of moderate to severe psoriasis at the Rizal Medical Center's Psoriasis Center.

Methods: A total of 65 moderate to severe psoriasis patients seen at the Rizal Medical Center's Psoriasis Center in 2021 were included in this retrospective cross-sectional study. Chart review was conducted to account all direct costs of treatment. The effectiveness in relation to the overall cost was assessed using the psoriasis area severity index (PASI) and the dermatological life quality index (DLQI).

Results: Our study showed that TS is the most cost-effective treatment for moderate to severe psoriasis with the lowest cost per PASI75 and DLQI<5 improvement valued at Php335.36, followed by TP valued at Php 762.87, and lastly by TB at Php 19,058.03. Despite TB incurring the highest cost, all patients in this treatment group showed the highest mean difference of PASI and DLQI.

Conclusions: Our findings suggest that topical with systemic medication is the most cost-effective treatment for moderate to severe psoriasis.

Keywords: psoriasis; psoriasis treatment; cost effectiveness

INTRODUCTION

In health care, treatment or therapy is cost-effective when the best result is achieved for a comparably reasonable price.[1] Understanding treatment efficacy in relation to cost may help both doctor and patient achieve maximum treatment results especially for long-term health conditions which may require treatment cycles. A chronic recurrent disease like psoriasis is a skin condition in which skin cells multiply up to ten times faster than usual. The scalp, elbows, knees, and lower back are the most common body areas for the pinkish to red plaques topped with white scales. It can be triggered by trauma, infection or stress.[2]

During the Psoriasis Day consortium in October 2020, the National Psoriasis Foundation USA revealed that 125 million individuals globally had psoriasis.[3] In the Philippines, according to data obtained from Psoriasis Philippines, there are approximately 1 to 2 million Filipinos suffering in silence from psoriasis.[4]

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[1]Resident, Rizal Medical Center

The Rizal Medical Center Department of Dermatology opened its Psoriasis Center on April 17, 2018, with the goal of providing patients with a broad range of diagnostic and treatment modalities.[5] The center is constantly meeting the needs of patients, most of whom come from Metro Manila. Under the Psoriasis Philippines' Patient Rescue Program, the Rizal Med Psoriasis Center is a partner for patients from the southern and eastern parts of Luzon.[6]

Currently there is no absolute cure for psoriasis, and patients go through cycles of treatment as required, which might result in recurring costs. Topical, phototherapy, systemic, biologic and combination therapies are included in all established clinical practice guidelines for the condition. Last 2021, the center formulated its own clinical pathway to standardize the care for psoriasis patients based on the disease severity. Cost-effectiveness of treatment is of great importance given the financial impact of the disease to the health care institution and most especially to the patients.[7]

Significance of the Study

The data gathered in this study may be utilized for financial and program planning, and may have the potential in identifying areas for rational budget allocation. The findings of this study may also be used to identify areas for center development and hospital fund management toward increased patient access to treatments and, more importantly, the efficacy of treatment protocols. Additional guidance that could be derived from this study would be on how to maximize patient response to treatment with the reasonable cost to the hospital and the center.

Cost-effectiveness analysis of treatment is of growing importance in all health care systems. These types of studies that compared the different psoriasis treatment modalities were already done in countries like Malaysia, Finland, and the US.[9,10,11] However, there is no published data in the Philippines on the cost-effectiveness of treatment for psoriasis. At the Rizal Medical Center, the Psoriasis Center continually finds ways to provide effective and affordable care. It is of great value to the center and to the patients to know which among the treatments for psoriasis is the most cost effective.

Research Objectives

A. General Objectives

This study aimed to determine the most cost-effective treatment for moderate to severe psoriasis based on the clinical pathway at the Rizal Medical Center Psoriasis Center

B. Specific Objectives

1. Described the characteristics of the psoriasis patients with moderate to severe disease in terms of:
   - 1.1 age
   - 1.2 gender;
   - 1.3 disease duration;
   - 1.4 Psoriasis Area Severity Index (PASI) baseline score;
   - 1.5 Dermatology Life Quality Index (DLQI) baseline score; and
   - 1.6 Presence of Psoriatic Arthritis

2. Described the characteristics of moderate to severe psoriasis patients according to treatment modality:
   - 2.1 Phototherapy ± Topical medication
   - 2.2 2.2Systemic ± Topical medication
   - 2.3 2.3Biologics ± Topical medication

3. Determined the distribution of cost diagnostic and treatment modality per patient:

3.1 applicable diagnostic test (blood chemistry, imaging, urinalysis, gene expert, etc);
3.2 topical medications;
3.3 phototherapy cost;
3.4 systemic medications; and
3.5 biologics

4. Determined the proportion of patients who improved after 3 months of treatment per treatment modality

5. Evaluated and compared the three treatment modalities according to cost and effectiveness

METHODOLOGY

Study Design

A cross-sectional study was conducted at the Rizal Medical Center's Psoriasis Center involving patients with moderate to severe psoriasis given any of the 3 treatment options: topical + phototherapy (TP), topical + systemic (TS) and topical + biologics (TB) from January to December of the year 2021.

Study Population

This study involved individuals diagnosed with moderate to severe psoriasis with psoriasis activity severity index (PASI) of >10 and/or dermatology quality life index (DLQI) of>10. Other inclusion criteria were as follows:

- age 19 years old and above
- seen during teledermatology or physical consult at the out-patient department
- managed with phototherapy, systemic or biologics
- diagnosed case of psoriasis with or without biopsy
- with or without comorbidities (Hypertension, Diabetes Mellitus, Malignancy, etc.)

The exclusion criteria were as follows:

- patients without recorded Psoriasis Area and Severity Index (PASI) or Dermatology Quality Life Index (DLQI) score
- patients who were managed with more than one type of treatment excluding topical medications
- mild psoriasis
- hospitalized patients
- patients lost to follow up for a minimum of 3 months

Sampling Design

Total enumerative sampling was utilized for this study to appropriately estimate the total cost incurred for each treatment modality in the given year. All charts of patients that were able to satisfy the selection criteria were included to better estimate the parameters involved in the study.

Data Collection

Clinical data of the eligible participants were obtained from the psoriasis census, teledermatology census, phototherapy outpatient department (OPD) charts, and electronic health records (EHR). Demographic profile as well as the PASI and DLQI were gathered from the EHR in categorizing the disease severity.

The total cost was computed based on the number of consults for 3 consecutive months. Direct cost of treatment which included diagnostics and phototherapy cost were acquired from the hospital's actual charges whereas cost of medications like topicals, systemics and biologics were based on the Drug Price Reference Index of the Department of Health (DOH) or, if not available, by the local pharmacy and manufacturer's suggested retail price (SRP) especially for biologics.

Statistical Analysis

The cost was computed at baseline and after 12 weeks. Descriptive statistics, frequency distribution, and percentages were used to summarize the demographic profile of the patients, as well as the disease severity of the respondents, treatment modality costs and efficacy. Effectiveness of treatment was measured by an improvement of 75% from baseline of PASI (PASI 75) or a change of DLQI to $\leq$ 5 after 3 months. The cost per treatment was estimated by itemizing the actual cost per consult or visit, which included diagnostic tests, phototherapy sessions, systemic and biologic medications.

Paired t-test was used to determine if there is a significant difference on the PASI and DLQI score before and after the treatment, per treatment modality. One-way ANOVA was used to determine if there was a significant difference of PASI and DLQI improvement among treatment modalities. Post-hoc analysis Turkey-Kramer Honest Significant Difference (HDS) test was then employed for test with $p<0.05$. To evaluate data with an atypical distribution, Kruskal-Wallis and Dunn's test were used. To ascertain the degree of correlation between the three treatment options' costs and patient improvement levels, Pearson R correlation was used.

All valid data were included in the analysis. Null hypothesis was rejected at 0.05α-level of significance. SPSS version 26 (IBM Corp, Armonk, NY) was used for the data analysis.

Results

A total of 581 psoriasis patients were seen at the study center in the year 2021. Screening for eligible participants was done, excluded from the study were 32 pediatric patients ages 18 years old and below, 330 patients who were lost to follow up for 3 months, and 154 patients who had mild disease and thus were managed only with topical medications. The remaining 65 patients were included in the study. (Figure 1)

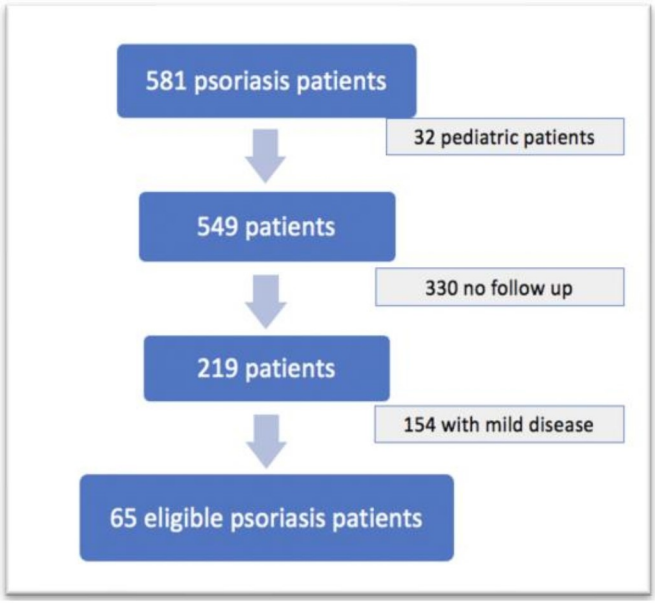

Figure 1. Eligible participants selection

The demographic characteristics for each type of treatment are shown in Table 1. There are three treatment groups for the patients: topical + phototherapy (TP), topical + systemic (TS), and topical + biologics (TB). The majority of the respondents were female (58.46%) between the ages 46-85 (53.85%), and had physical consults (56.92%). Among the participants, 33.85% had psoriatic arthritis. The mean PASI and DLQI were 17.02 (SD=6.52) and 15.71 (SD=5.96), respectively.

Table 1. Demographic Characteristics of the Respondents

Demographic Characteristics of the Respondents according to Treatment Modality (N = 65)				
Characteristics	**Treatment Modality (N = 65)**			**Total (N= 65)**
	Topical + Phototherapy (TP) (n=28)	**Topical + Systemic (TS) (n=28)**	**Topical + Biologics (TB) (n=9)**	
Age (Years; *f*, %)				
18 to 30 Years Old	11 (39.29%)	8 (28.57%)	1 (11.11%)	20 (30.77%)
31 to 45 Years Old	3 (10.71%)	3 (10.71%)	2 (22.22%)	8 (12.31%)
46 to 60 Years Old	13 (46.43%)	17 (60.71%)	5 (55.56%)	35 (53.85%)
More than 60 Years Old	1 (3.57%)	0 (0.00%)	1 (11.11%)	2 (3.08%)
Sex (*f*, %)				
Male	12 (42.86%)	10 (35.71%)	5 (55.56%)	27 (41.54%)
Female	16 (57.14%)	18 (64.29%)	4 (44.44%)	38 (58.46%)
Presence of Psoriatic Arthritis (*f*, %)	7 (25.00%)	12 (42.86%)	3 (33.33%)	22 (33.85%)
Type of Consultation (*f*, %)				
Physical Consultation	28 (100.00%)	1 (3.57%)	8 (88.89%)	37 (56.92%)
Teledermatology	0 (0.00%)	27 (96.43%)	1 (11.11%)	28 (43.08%)
Baseline Psoriasis Area Severity Index (PASI; $\bar{x}$, SD)	15.21 (4.81)	16.79 (5.76)	23.38 (9.63)	17.02 (6.52)
Baseline Dermatology Life Quality Index (DLQI; $\bar{x}$, SD)	16.61 (6.18)	14.25 (5.47)	17.44 (6.37)	15.71 (5.96)

The within-group and between-group comparisons of the PASI and DLQI according to treatment modality is presented in Table 2. It can be noted from the table that within-group comparisons indicated a significant decline in the mean PASI scores of the three treatment modalities from baseline to endline ($p<0.05$). Between-group analyses of the mean PASI difference scores of the three treatment modalities indicated that at least one of the three treatment modalities had a significantly different mean score. Post-hoc analysis indicated that the mean PASI severity difference scores of TB group was significantly higher compared to both TP and TS. However, the post-hoc comparison of the mean PASI difference scores between the TP and the TS groups was not statistically different ($p>0.05$). It is also interesting to note that among the different treatment modalities, 66.67% of the TB group had improvement in PASI score of at least 75%, while 28.57% of the TP group and 17.86% of the TS had improvement in PASI scores of at least 75% from baseline to endline.

On the other hand, the mean DLQI scores of the three treatment modalities significantly decreased ($p<0.05$) from baseline to endline. Between-group comparison indicates that there was a statistically significant difference in the mean DLQI difference scores between TS and TB, while DLQI score difference between TS and TP, and TB and TP were not statistically different. An improvement of 5 score units in DLQI was observed in 88.89% for the TB group, while it was 57.14% for the remaining two groups.

Table2. Comparisons of Psoriasis Area Severity and Dermatology Life Quality Indices

Between-Group and Within-Group Comparisons of the Psoriasis Area Severity Index and Dermatology Life Quality Index of the Respondents According to Treatment Modality (N = 65)

Variable and Treatment Modality	Within-Group Comparisons[a]				Between-Group Comparison[a]	
	Baseline Mean (SD)	Endline Mean (SD)	Frequency (%) with Improvement[b]	*p*-value (Two-Tailed)	Mean Difference (SD)	*p*-value (Two-Tailed)
Psoriasis Area Severity Index						
Topical + Phototherapy (TP)	15.21 (4.81)	8.01 (5.76)	8 (28.57%)	0.001†	7.20 (6.63)[a]	
Topical + Systemic (TS)	16.79 (5.76)	8.40 (5.47)	5 (17.86%)	0.001†	8.34 (6.52)[a]	0.010†
Topical + Biologics (TB)	23.38 (9.63)	6.21 (7.72)	6 (66.67%)	0.008†	15.59 (9.50)[b]	
Dermatology Life Quality Index						
Topical + Phototherapy (TP)	16.61 (6.18)	9.13 (7.45)	16 (57.14%)	0.001†	7.48 (7.56)[ab]	
Topical + Systemic (TS)	14.25 (5.47)	8.29 (5.97)	16 (57.14%)	0.001†	5.96 (6.43)[a]	0.044*
Topical + Biologics (TB)	17.44 (6.37)	4.56 (4.85)	8 (88.89%)	0.001†	12.89 (7.42)[b]	

[a]Between-group comparisons were conducted using One-Way Analysis of Variance (ANOVA) and post-hoc analyses were conducted using Turkey-Kramer Honest Significant Difference (HDS) test. Within-group comparisons were conducted using paired *t*-test.
[b]Significant improvement on PASI score is at ≥75% change in baseline PASI score; significant improvement on DLQI score ≤5 than baseline DLQI score.
*Significant at 0.05
†Significant at 0.01

The distribution of the different expenses of the participants according to treatment modality is illustrated in Table 3. For patients in the TP group, most did not have diagnostic tests. The most frequently performed test were the complete blood count and liver function tests (ALT and AST) for all treatment groups. In addition, more than two-thirds of the participants in the TB group had chest x-ray, while only 7.14% and 39.29% of those managed with TP and TS groups underwent the same diagnostic procedure, respectively. The mean expenditure of the TP, TS, and TB groups for the different diagnostic and laboratory tests were PHP 1,487.50 (SD=510.63), PHP 2,144.20 (SD=880.61), and PHP 4,104.38 (SD=3,394.40), respectively.

The most commonly prescribed topical medications in patients under the TP treatment group were halobetasol cream (71.43%), clobetasol ointment (60.71%), and calcipotriol ointment (50.00%) On the other hand, the most commonly utilized topical medications in the TS group were clobetasol ointment (89.29%) and calcipotriol ointment (53.57%). And in the TB group, it was clobetasol ointment and halobetasol cream (66.67%). For topical medications, the mean expenditures were PHP 4,727.71 (SD=2,152.30) for TP, PHP 3,251.02 (SD=2,464.65) for TS, and PHP 2,348.32 (SD=2,039.84) for TB group. (Appendix II)

The mean expenditure of TP for the phototherapy sessions was PHP 8,028.57 (SD=3,672.41), while the TS group, who were all given methotrexate, had an average expenditure of PHP 200.26 (SD=54.37). In the TB group, two kinds of biologics were given, namely ixekizumab and

secukinumab, with a total mean expenditure of PHP 165,525.59 (SD=72,412.90).

In summary, the mean total expenditure of TP was PHP 13,016.99 (SD=3,989.37), TS was PHP 5,317.54 (SD=2,334.54), and TB group was PHP 171,600.58 (SD=71,933.40). Comparative analyses indicated that the mean total expenditure of the three treatment modalities were significantly different (p=0.001). In particular, TB had the highest mean total expenditure, followed by TP, and the last being the TS.

Table3. Distribution of expenditure of respondents according to treatment modality

Medical Expenditures	Treatment Modality (N = 65)		
	Topical + Phototherapy (TP) (n=28)	Topical + Systemic (TS) (n=28)	Topical + Biologics (TB) (n=9)
Diagnostic Test/Laboratory fees*	[n=5] 1,487.50 (510.63)	[n=25] 2,144.20 (880.61)	[n=8] 4,104.38 (3,394.40)
Topical Medications (PHP; x̄, SD)	4,727.71 (2,152.30)	3,251.02 (2,464.65)	2,348.32 (2,039.84)
Specific Modalities (PHP; x̄, SD)			
Phototherapy	8,028.57 (3,672.41)	–	–
Systemic Medication ***(methotrexate)***	–	200.26 (54.37)	–
Biologics	–	–	165,525.59 (72,412.90)
• ***Secukinumab (n=7)***	–	–	135,090.61 (46,135.60)
• ***Ixekizumab (n=2)***	–	–	272,048
Average Total Expenses (PHP; x̄, SD)	13,016.99 (3,983.37)	5,317.75 (2,334.54)	171,600.58 (71,933.40)

*not all patients have undergone diagnostic tests

The association of the PASI and DLQI mean difference scores and the treatment costs according to treatment modality is illustrated in Table 4. The correlation of all PASI mean difference scores (from baseline to endline) with the treatment cost were very weak to weak and were not statistically significant (p>0.05), regardless of the treatment modality. Although the *r-value* for the correlation between PASI and TB treatment is -0.04, the p-value is more than 0.05, indicating that the association is not significant. Likewise, the association of the DLQI mean difference scores and treatment cost ranged from very weak to weak and were all not statistically significant (p>0.05) for all treatment modalities. Hence, the increase in total cost does not guarantee an increase in the PASI/DLQI score difference.

Table4. Association of Psoriasis Area Severity and Dermatology Life Quality Indices Scores and Treatment Cost according to Treatment Modality

Association of the Psoriasis Area Severity and Dermatology Life Quality Indices Mean Difference Scores and the Treatment Costs according to Treatment Modality (N = 65)

Treatment Modalities	PASI and Treatment Cost			DLQI and Treatment Cost		
	r-value	*p*-value (Two-Tailed)	Interpretation[a]	*r*-value	*p*-value (Two-Tailed)	Interpretation[a]
Topical + Phototherapy (TP)	0.36	0.060	Weak, Positive Not Significant	0.15	0.445	Very Weak, Positive Not Significant
Topical + Systemic (TS)	0.03	0.869	Very Weak, Positive Not Significant	0.35	0.072	Weak, Positive Not Significant
Topical + Biologics (TB)	–0.04	0.912	Very Weak, Negative Not Significant	0.23	0.550	Weak, Positive Not Significant

[a]Correlation Coefficient (*r*-value) Interpretation: 0.0 to 0.20 = Very Weak, 0.21 to 0.40 = Weak, 0.41 to 0.60 = Moderate, 0.61 to 0.80 = Strong, 0.81 to 1.00 = Very Strong
*Significant at 0.05
†Significant at 0.01

Table 5 shows the summary of base-case results of the cost- effectiveness analysis from the societal perspective over a 3-month period. TB modality has the highest percentage of patients in terms of overall effectiveness on both PASI and DLQI. However, in terms of cos effectiveness, TS was shown to be the most cost-effective for having the lowest cost per PASI-75 and/ or DLQI ≤5, valued at 335.36 Php.

Table5. Base-Case Result of the Cost-Effectiveness

Treatment Modalities	Total Cost	Effectiveness (%)[a]	Cost-effectiveness[b]
Topical + Phototherapy (TP)	12,968.78	60.71 (17/28)	762.87
Topical + Systemic (TS)	5,365.75	57.14 (16/28)	335.36
Topical + Biologics (TB)	171,522.24	100.00 (9/9)	19,058.03

[a]*Effectiveness (%) = percentage of patients achieved PASI-75 and/or DLQI ≤5.*
[b]*Cost-effectiveness = total cost divides by the number of patients achieved PASI-75 and/or DLQI ≤5.*

DISCUSSION

This study is the first in the Philippines that aims to estimate the cost of psoriasis treatments and determine which treatment option is the most cost effective. The three treatment options compared are based on the clinical pathway guideline currently followed in the study center. The results of this study indicate that TS is the most cost-effective, despite TB demonstrating the highest result in terms of effectiveness. This is important because cost-effectiveness analysis determines the most cost-effective method by taking into consideration both cost and efficacy.

In this study, the significant decrease in PASI and DLQI scores compared to baseline showed that all treatment modalities are effective on psoriasis patients with moderate to severe disease. However, the baseline PASI and DLQI scores and the mean score differences of patients

treated with TB are significantly higher compared to TP and TS. The same is observed in a study by Mattei et al., where patients with moderate-to-severe plaque psoriasis receiving biological therapies have considerably high mean PASI and DLQI scores.[12] A higher baseline PASI and DLQI score for biologics treatment means that in this institution, biologics are chosen as treatment for severe psoriasis cases. A literature review by Ruiter et al. showed that in most cases, treatment with biologic is the option given to patients when conventional therapies such as TP and TS fail.[13] It is also important to note that the effectiveness of treatment as shown by the improvement of PASI and DLQI from baseline for patients receiving TP and TS are comparably not significant from each other.

The same result was observed in a study in Malaysia by Azizam et al. involving 90 patients with moderate to severe psoriasis which showed that systemic treatment is the most cost-effective option among the three modalities.[9] This finding is also supported by a meta-analysis study by Hankin, et al where the authors concluded that the most cost-effective treatment is methotrexate.[11] A study conducted in Germany also recommended methotrexate to be the first line treatment as it is the most cost-effective, followed by biologics.[14] To the knowledge of the authors, there are no other published articles that contradict these findings.

These results build on existing evidence that systemic therapy is the most cost-effective among the treatment options for moderate to severe psoriasis. Although it improved PASI and DLQI scores by half as much as biologics, its price was just 3-4% of the total cost of TB and 40% of the cost of TP. The clinical pathway used at the Rizal Medical Center's Psoriasis Center (Annex I) suggested that for moderate to severe psoriasis, the patients are advised first to add phototherapy as adjunct to topical medications. It is only in instances when phototherapy treatment is not available, contraindicated, failed or not preferred by the patient, then the next option will be systemic therapy followed lastly by biologics. Given the results of this study, this may help in improving the clinical pathway by determining the appropriate order of treatment options, keeping in mind that we aim for the best treatment outcome with the least possible cost for the patients.

It is important to note that although TB is the highest costing treatment, it has the highest improvement in terms of PASI and DLQI scores. The current challenge is to reduce the cost of biologics and increase the distribution of biologics to people affected with severe psoriasis. This information can clarify how effectively biologic treatments differ from phototherapy and oral systemic medications, to answer patients' concerns about the high expense of biologic therapy.

The reliability of this data is impacted by limitations such as the small sample size and short study period of 3 months. This holds true in evaluating further the relationship of PASI and DLQI to treatment cost particularly in the TB group where a bigger sample size and longer duration of data collection is preferred to generate more precise and more reliable estimates. The study also only determined the direct costs of psoriasis treatment and not included the indirect costs such as transportation cost, food allowance, absenteeism and loss of productivity which is substantial to determine the true cost of psoriasis treatment. Another limitation is the exclusion of the income class and lifestyle of subjects in this study as these also play an important role in optimizing the improvement. Also, there are subjects who might have done their diagnostic tests outside the study center, and therefore did not reflect the actual costs. Although the costs of the topical

medications are standardized according to the Drug Price Reference Index (DPRI) and the local pharmacy, the totaled quantity was based on the prescription given during teledermatology and fingertip unit (FTU) in the physical charts which may only be an approximate of the actual consumption of the topical medication. The side effects of these treatments are another crucial factor to take into account, as well as the possible inconsistency of the PASI and BSA because of observer variability. Another limitation is patient's compliance to treatment at home especially those in the TS group since it is considerably important and essential and may have hampered in achieving PASI75. Lastly, this study covered only the year 2021, which is included in the COVID-19 pandemic years, when access to health care was greatly affected by various community quarantine implementations.

Further studies are needed to determine both direct and indirect costs to quantify the burden of treatment cost in the health care and societal perspective. A prospective study carried out over a longer period of time (6 months or more) will also provide a more accurate calculation of actual costs, especially for topical medications, and will predict the immediate and long-term consequences of therapy, taking into account not only the side effects but also the quality of life and disease activity.

CONCLUSION

Economic burden is high for psoriasis, it being a chronic disease, which also means dealing with lifelong care and treatment. This study showed that the combination of topical plus systemic treatment is the most cost-effective treatment for moderate to severe psoriasis. Although least cost-effective, biologics demonstrated the highest improvement in PASI and DLQI.

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