THE STUDY ON THE PREVALENCE AND SOME FACTORS RELATED TO ANTIBIOTIC RESISTANCE OF PROPIONIBACTERIUM ACNES AT CAN THO HOSPITAL OF DERMATO-VENEREOLOGY

Nguyen Thi Thuy Trang*, Lac Thi Kim Ngan, Pham Thanh Thao,
Nguyen Le Bang, Huynh Van Ba
Can Tho University of Medicine and Pharmacy
*Corresponding author: nthithuytrang@ctump.edu.vn

ABSTRACT

Background: Acne is an inflammatory disease of the hair follicles. There are many treatments from medication to non-medication in which antibiotics are a widely used and effective group. However, the recent overuse of antibiotics has led to an increase in resistance to drugs by P. acnes. Therefore, this study is extremely necessary. Objectives: To determine the antibiotic resistance rate and a number of factors related to Propionibacterium acnes antibiotic resistance rate in acne patients at Can Tho Hospital of Dermato-Venereology. Materials and methods: the cross-sectional descriptive study was carried out on of 43 acne patients at Can Tho Hospital of Dermato-Venereology. Results: resistance rates for antibiotics were cefuroxime (91.7%), ceftriaxone (87.5%), cefotaxime (87.5%), trimethoprim (85.4%), clindamycin (66.7%), ofloxacin (41.7%), ciprofloxacin (25%), levofloxacin (20.8%), tetracycline (16.7%). All patients participating in the study were resistant to at least 2 or more antibiotics of which the highest resistance level was 6 antibiotics (37.5%). Some related factors such as the history of antibiotic treatment accounted for 35.4%. Severity levels were classified into mild acne 60.1%, average 27.1% and severity 12.5%; there were two clinical forms in our study including acne vulgaris (77.1%) and cystic acne (22.9%). However, when examining the relationship between these factors and antibiotic resistance, this difference is not statistically significant. Conclusion: P. acnes are increasingly resistant to many antibiotics, making treatment more difficult, a number of factors related to this condition for example antibiotic use, level of severity of acne.

Keyswords: Acnes, Propionibacterium acnes, antibiotic resistance

I. INTRODUCTION

Acne is a common disease, affects 80% of aged 11-30 and 5% of aged over 30 in the United State. Acne is an inflammatory disease of the hair follicles [3]. The pathogenesis of acne vulgaris is related to endogenous and exogenous factors, but is strongly associated with three factors: increased sebum production, abnormal keratinization of infundibular epithelium, and bacterial activity of which the main role is *Propionibacterium acnes* [5], [9].

In fact, clinical diagnosis of acne is not difficult, the treatment is still difficult because many patients have self-treated and improperly treated, leading to severe disease results. Therefore, the incidence of severe acne in the hospital increases, requiring patients and doctors to persevere in long-term treatment. The overuse of antibiotics, which can lead to drug resistance of acne-causing bacteria, or the overuse of topical corticosteroids in self-treated is a very common problem today. These problems are the cause of many consequences, affecting the complexity of the clinical and treatment of acne today. Starting from the above issues, we conducted a study "A study on prevalence and some factors related to antibiotic resistance of *Propionibacterium acnes* at Can Tho Hospital of Dermato-Venereology" was conducted with two objectives: (1) To determine the antibiotic resistance rate of *Propionibacterium acnes* in acne patients at Can Tho Hospital of Dermato-Venereology in 2019; (2) To determine the number of factors related to *Propionibacterium*

acnes antibiotic resistance rate in acne patients at Can Tho Hospital of Dermato-Venereology in 2019.

II. MATERIALS AND METHODS

2.1. Study population and setting

2.1.1. Study population

All acne patients came and treated at Can Tho Hospital of Dermato-Venereology in 2019.

2.1.2. Inclusion criteria

The patients were diagnosed with acne: red papules, pustules, cysts, nodules with common on the face, neck, chest, and back site.

The patients consented to participate in the study.

2.1.3. Exclusion criteria

Patients with severe or abnormal systemic disease

Acne-like rash

Patients with mental illnesses, diseases, or syndromes with uncontrolled behavior

Acne patients provided unclear information

2.2. Study methods

2.2.1. Study design

A cross-sectional descriptive study

2.2.2. Sample size and sampling methods

Sampling methods: convenience sampling

Samle size: the samle size is calculated with the following equation:

$$n = \frac{Z^2_{1-\frac{\alpha}{2}} p(1-p)}{d^2}$$

In which:

n: the smallest sample size; Z = 95%; $Z_{1-\alpha/2}$ = 1.96

p: the erythromycin resistance rate of P. acnes. According to Huynh Van Ba (2015) was 92.3%, choose p = 0.923 [1]

d: the allowable error in study, d = 0.08.

Thus n = 42.66. In fact, we had studied on 43 patients.

2.2.3. Study contents

Study clinical characteristics, level and form of clinical acne, and detemine antibiotic resistance rate of *Propionibacterium acnes*.

2.2.4. Statistical analysis

Analyzing data with SPSS 20.0 and Microsoft Excel 2016.

2.2.5. Ethics Approval

The study was conducted by approved of the Scientific and Ethical Research Council of Can Tho University of Medicine and Pharmacy and approved by Can Tho Hospital of Dermato-Venereology and Can Tho University of Medicine and Pharmacy Hospital.

Research subjects have been explained and have agreed to voluntarily participate in the study by taking informed consent. All personal information and illnesses of patients were kept confidential through computerized encryption to ensure the privacy of study participants.

Ensure fairness and objectivity during data collection and processing.

III. RESULTS

Table 1. Distribution of acne patients according to antibiotic resistance status

Antibiotic	Sensitive	Intermediary	Resistance
Tetracycline	30 (62.5%)	7 (14.6%)	11 (16.7%)
Cefuroxime	3 (6.3%)	1 (2.1%)	44 (91.7%)
Levofloxacine	38 (79.2%)	0 (0%)	10 (20.8%)
Trimethoprime	6 (12.5%)	1 (2.1%)	41 (85.4%)
Erythromycin	13 (27.1%)	1 (2.1%)	34 (70.8%)
Clindamycin	16 (33.3%)	0 (0%)	32 (66.7%)
Ceftriaxone	6 (12.5%)	0 (0%)	42 (87.5%)
Cefotaxime	6 (12.5%)	0 (0%)	42 (87.5%)
Ciprofloxacin	36 (75%)	0 (0%)	12 (25%)
Ofloxacin	21 (43.8%)	7 (14.6%)	20 (41.7%)

Antibiotic resistance rates were cefuroxime (91.7%), ceftriaxone (87.5%), cefotaxime (87.5%), trimethoprime (85.4%), clindamycin (66.7%), ofloxacin (41.7%), ciprofloxacin (25%), levofloxacine (20.8%) and tetracycline (16.7%).

Table 2. The relationship between antibiotic resistance rate of *P. acnes* and treatment

Treatment History / Antibiotic		Yes n	Yes %	No n	No %	p
Tetracycline	S	10	33.3	20	66.7	
	I	3	42.9	4	57.1	p=0.891
	R	4	36.4	7	63.6	
Cefuroxime	S	2	66.7	1	33.3	
	I	0	0	1	100	p=0.394
	R	15	34.1	29	65.9	
Levofloxacin	S	15	39.5	23	60.5	p=0.252
	R	2	20	8	80	
Trimethoprime	S	1	16.7	5	83.3	
	I	1	100	0	0	p=0.25
	R	15	36.6	26	63.4	
Erythromycin	S	2	15.4	11	84.6	
	I	0	0	1	100	p=0.138
	R	15	44.1	19	55.9	
Clindamycin	S	4	25	12	75	p=0.286
	R	13	40.6	19	59.4	
Ceftriaxone	S	1	25	3	75	p=0.708
	R	11	34.4	21	65.6	
Cefotaxime	S	1	25	3	75	p=0.708
	R	11	34.4	21	65.6	
Ciprofloxacin	S	11	39.3	17	60.7	p=0.156
	R	1	12.5	7	87.5	
Ofloxacin	S	8	44.4	10	55.6	p=0.276

Antibiotic	Treatment History	Yes		No		p
		n	%	n	%	
	I	1	16.7	5	83.3	
	R	2	20	8	80	

The study showed that there was no relationship between the antibiotic resistance rate of *P. acnes* and treatment (p>0.05).

Table 3. The relationship between antibiotic resistance rate and severity

Antibiotic	Severity Level	Mild	Average	Severity	p
Tetracycline	S	18 (60%)	8 (26.7%)	4 (13.3%)	p=0.215
	I	2 (28.6%)	4 (57.1%)	1 (14.3%)	
	R	9 (81.8%)	1 (9.1%)	1 (9.1%)	
Cefuroxime	S	1 (33.3%)	2 (66.7%)	0	p= 0.516
	I	1 (100%)	0	0	
	R	27 (61.4%)	11 (25%)	6 (13.6%)	
Levofloxacin	S	21 (55.3%)	12 (31.6%)	3 (13.2%)	p=0.329
	R	8 (80%)	1 (10%)	1 (10%)	
Trimethoprime	S	3 (50%)	3 (50%)	0	
	I	0	0	1 (100%)	p=0.056
	R	26 (63.4%)	10 (24.4%)	5 (12.2%)	
Erythromycin	S	8 (61.5%)	3 (23.1%)	2 (15.4%)	
	I	1 (100%)	0	0	p=0.922
	R	20 (58.8%)	10 (29.4%)	4 (11.8%)	
Clindamycin	S	9 (56.3%)	5 (31.3%)	2 (12.5%)	p=0.895
	R	20 (62.5%)	8 (25%)	4 (12.5%)	
Ceftriaxone	S	2 (33.3%)	4 (66.7%)	0	p=0.059
	R	27 (64.3%)	9 (21.4%)	6 (14.3%)	
Cefotaxime	S	2 (33.3%)	4 (66.7%)	0	p=0.059
	R	27 (64.3%)	9 (21.4%)	6 (14.3%0	
Ciprofloxacin	S	20 (55.6%)	12 (33.3%)	4 (11.1%)	p=0.239
	R	9 (75%)	1 (8.3%)	2 (16.7%)	
Ofloxacin	S	11 (52.4%)	8 (38.1%)	2 (9.5%)	
	I	5 (71.4%)	1 (14.3%)	1 (14.3%)	p=0.656
	R	13 (65%)	4 (20%)	3 (15%)	

The study showed that there was no relationship between the antibiotic resistance rate of P. acnes and the severity of acne (p>0.05).

IV. DISCUSSION

The antibiotic sensibility of *P. acnes* with ten antimicrobials agents in our study has shown that the proportion of *P. acnes* isolates were cefuroxime (91.7%), ceftriaxone (87.5%), cefotaxime (87.5%), trimethoprim (85.4%), clindamycin (66.7%), ofloxacin (41.7%), ciprofloxacin (25%), levofloxacin (20,8%) and tetracycline (16,7%). According to previous studies also have the same results such as Nguyen Thanh Hung and Nguyen Tat Thang (2013) revealed the resistance rate to trimethoprim and clindamycin were 95.2% and 88,1%, respectively; and not found to tetracycline, levofloxacin, cefuroxime [4]. Additionally, Sardana K., Gupta T., Garg V. K., Ghunawat S. (2015) showed antibiotic resistance of *P. acnes* towards macrolide, trimethoprim/sulfamethoxazole and clindamycin

was higher degree as compared to tetracycline và levofloxacin. This result leads to durable remissions in relapsed or refractory acne [7]. Fan Y., Hao F. et.al (2016) performed a multicenter descriptive cross-sectional observational study that analyzed the genotypes of antibiotic-resistant strains of *P. acnes*. This study described that the predominant resistance occurred in macrolides and lincomycin with an overall resistance rate of 47.8%. The resistance to tetracyclines was scarce with only two cases identified. The emergence of minimum inhibitory concentration elevation for tetracyclines is associated with its application history (P < 0.005). The tetracyclines have been proved to be vastly susceptible while macrolides and lincomycin face a serious resistance status in China [2]. Each antibiotic agent has its own characteristics of pharmacokinetics, antibacterial spectrums, current clinical application, and the mechanism of resistance.

This consequence is caused by the massive and long-term application of antibiotics, antimicrobial products are easily got from any pharmacy for using no prescription and non-adherence of the patients. Clindamycin or erythromycin is produced in many forms of oral, topical preparations that can be commonly used alone or in combination for acne treatment. A regimen of oral-topical antibiotics with the same groups increased more the resistance rate rather than the different ones. Abuse of antibiotic agents contributes to changes in the human skin microbiome that can result in cross-resistance. Antibiotic resistance is also caused by exposure to patients with acne carrying resistant strains of bacteria.

The treatment history survey helps to evaluate the effects of past antibiotic use on the resistance of bacterial carpets, the longer the duration of antibiotic use, the greater the proportion of antibiotic-resistant *P. acnes* strains. In some studies, the mean of minimum inhibitory concentrations (MICs) of *P. acnes* in patients who had previously been treated with antibiotics tended to be higher than in untreated patients [8]. Sang Ho Moon's study also showed that the antibiotic resistance rate of *P. acnes* in the group with a history of treatment was higher than that of the group with no history of treatment [6]. However, not so similar, in our study in patients without previous treatment there was a higher rate of resistance to antibiotics than the group with a history of treatment, and all antibiotics had a higher rate of resistance in the mild than moderate and severe acne group, but the difference was not statistically significant. Acne affects the psychology of young patients, the more severe the disease, the more worried patients and they want to be treated. In our study, the rate of patients with previous treatment was lower than in the untreated group and we also did not find a relationship between the antibiotic resistance of *P. acnes* and the severity of the disease. This may be because the sample size in our study was not large enough, requiring other studies with larger sample sizes to increase reliability.

V. CONCLUSIONS

Though a study on prevalence and some factors related to antibiotic resistance rate of *Propionibacterium acnes* in Can Tho Hospital of Dermato-Venereology from May 2019 to November 2019 on 48 patients, we have the following conclusions: Antibiotic resistance rates of *P. acnes* were cefuroxime (91.7%), ceftriaxone (87.5%), cefotaxime (87.5%), trimethoprime (85.4%), clindamycin (66.7%), ofloxacin (41.7%), ciprofloxacin (25%), levofloxacine (20.8%), tetracycline (16.7%). And some related factors such as previous antibiotic treatment, the severity of disease, and clinical form were focused in this study because these factors can affect the antibiotic resistance of *P. acnes*. However, the difference between these factors and the antibiotic resistance of *P. acnes* is not statistically significant.

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