

Comparison between the diagnosis of acne vulgaris by teledermatology and face-to-face consultations



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ABSTRACT

Background: Acne vulgaris is a common skin disorder in the pilosebaceous unit that is self-limited, especially in adolescents. Adam Malik Hospital in Medan reported the incidence of acne vulgaris to be 1.10%. Telemedicine has become popular in recent years, especially during the COVID-19 pandemic. SAF teledermatology using digital cameras has also increased patient service satisfaction, promising diagnostic reliability and clinical outcomes similar to face-to-face visits. This study aimed to compare teledermatology's diagnostic test parameters and accuracy and face-to-face consultations in diagnosing acne vulgaris.

Methods: This study was an observational analytic study with a cross-sectional design involving 110 suspected acne vulgaris. The characteristics of sex and age were recorded. The resident established the diagnosis of acne vulgaris directly and teledermatologically by the consultant based on photo documentation of 5 facial lesion areas, namely the forehead, chin, right cheek, left cheek, and the entire face, along with the photo with photos from the history submitted by the resident. Diagnostic tests were carried out, including sensitivity, specificity, positive predictive value, negative predictive value, accuracy, and an agreement test.

Results: Acne vulgaris was more common in women (76 patients, 69.1%) and patients aged 18-22 years (55 patients, 50%). Of 110 patients, 105 were diagnosed with acne vulgaris by face-to-face consultations and teledermatology. Teledermatology showed 100% sensitivity, specificity, positive predictive value, negative predictive value, and accuracy. The agreement test between teledermatology and face-to-face consultations was 1, indicating favorable agreement.

Conclusion: There was no significant difference in the diagnosis of acne vulgaris through teledermatology and face-to-face consultations.

Keywords: acne vulgaris, face-to-face consultations, teledermatology.

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INTRODUCTION

Acne vulgaris is a common skin disorder in the pilosebaceous unit that is self-limited, especially in adolescents, both boys and girls.^{1,2} This skin disorder manifests in areas of the body with large and numerous sebaceous glands, such as the face, chest, back, and forearms.^{1,2,3}

The Global Burden of Disease Project estimated the prevalence of acne vulgaris at 9.4% globally and ranked it as the eighth most common disease globally.⁴ In Indonesia, the Indonesian Cosmetic Dermatology Study Group (KSDKI) in 2015 ranked acne vulgaris cases as the top three visitors to the Department of Dermatology and Venereology in Hospitals and Dermatology Clinics.⁵ Meanwhile, in Medan, Adam Malik

General Hospital reported the proportion of acne vulgaris incidence from January 2010 to December 2012 at 1.10%.⁶

There are four known pathogenesis for acne vulgaris: increased sebum production, follicular epidermal hyperproliferation, colonization of skin microflora, especially *Propionibacterium acnes* (currently referred to as *Cutibacterium acnes*), and the inflammatory process.^{1,5,7,8} Acne vulgaris may manifest in the form of inflammatory lesions and non-inflammatory lesions. The presence of papules pustules characterizes inflammatory lesions and nodules, while non-inflammatory lesions are marked by the presence of comedones (either open comedones (blackheads) or closed comedones (whiteheads)).^{1,9}

The COVID-19 pandemic has limited the care of dermatological patients in many ways.¹⁰ Telemedicine has become popular in recent years, and the COVID-19 pandemic has driven telehealth's widespread use and advancement.¹¹ Teledermatology was introduced into the literature by Perednia and Brown in 1995, was one of the first telemedicine services implemented in dermatology, followed by other medical specialties. Cell phones have overcome the limitations of image resolution seen on older devices, opening up a new field of mobile teledermatology, with approaches of the store and forward (SAF), live video conferencing (LVC), and hybrid. SAF teledermatology allows the transmission of images and text to the physician for examination. In contrast,

the LVC allows patients and physicians to meet virtually at the same time using a webcam or cell phone camera. Hybrid teledermatology combines both SAF and LVC approaches.^{12,13}

Store and forward (SAF) using digital cameras have recently succeeded in reducing outpatient waiting times, increasing patient service satisfaction, promising diagnostic reliability, with similar clinical outcomes when compared to face-to-face visits.¹⁴

A systematic review of 21 studies conducted in 2016 reported the diagnostic accuracy of face-to-face (FTF) consultations was slightly better (67%-85%, kappa = 0.90) compared to teledermatology (51%-85%, kappa = 0.41-0.63) in diagnosing skin cancer.¹⁵ Other studies have reported teledermatology to be more accurate than FTF consultations, possibly due to the increased resolution of cell phone cameras. A total of 391 patients had an agreement between face-to-face consultations and store and forward (91.05%, kappa = 0.906).¹⁶

Shrestha et al. presented a case report diagnosed through teledermatology. It became a valuable tool for providing specialized dermatological care to rural populations. It also helps train and educate health workers about skin diseases and the rational use of topical steroids.¹⁷

Telemedicine, especially teledermatology, is an alternative that can easily be used for data collection and doctor-patient communication, which provides many benefits for patients. This study aimed to compare the diagnosis of acne vulgaris through face-to-face consultations and teledermatology and determine its agreement.

METHOD

This study was an observational analytic study with a cross-sectional design conducted in the Dermatology and Venereology Clinic of North Sumatra University Hospital, Medan, from August 2020 to March 2021.

The subjects of this study were patients aged 18 years who were suspected of acne vulgaris and were willing to participate in the study by signing informed consent. Subjects will be excluded if they refuse to take documentation in facial photos using

the camera. The sample size in this study was 110 people.

This study has obtained approval from the Research Ethics Commission of the Faculty of Medicine, Universitas Sumatra Utara, with ethical clearance number 539/KEP/USU/2020.

All study subjects were subjected to history, physical examination, and direct dermatological examination (face-to-face consultations) by the resident. Five photos were captured in the forehead, chin, right cheek, left cheek, and the entire face using a Samsung Galaxy A7-branded cellular phone with a 24 MP rear camera. The pictures were captured at a close range (30 cm) and a distance of 30 cm (zoom out) using the features available on the mobile phone camera. The photos were then sent to the consultant and a photo of history through the WhatsApp application. The consultant diagnosed acne vulgaris by teledermatology. The diagnostic tests were carried out by calculating the sensitivity, specificity, positive, negative, accuracy, and agreement tests. The results were declared significant if p-value < 0.001.

RESULTS

The demographic characteristics of the study subjects by gender and age are described in Table 1. Of the 110 patients with suspected acne vulgaris, the majority were women (69.1%) and 18-22 years old (50%).

Diagnostic parameter values of sensitivity, specificity, positive predictive value, negative predictive value, and accuracy of teledermatology and direct examination (face-to-face consultations) in establishing the diagnosis of acne vulgaris are demonstrated in Table 2. All the diagnostic parameters were 100%.

The agreement test of the teledermatology and face-to-face consultations in establishing the diagnosis of acne vulgaris are illustrated in Table 3. Both diagnostic approaches shared similar results (concordant cells). Using the kappa test, a p-value < 0.001 and the kappa value = 1 were obtained, indicating a favorable agreement.

DISCUSSION

This study involved 110 patients with suspected acne vulgaris. The majority of study subjects were female (69.1%). A similar result was shown by Alsulaimani et al. (2020) in Saudi Arabia, reporting that most acne vulgaris patients were women (90.7%).¹⁸ This is also in line with the study conducted in Medan in 2019, demonstrating that more than 60% of acne vulgaris patients were female.^{19,20}

Hormonal factors are thought to be one of the causes of the high prevalence of acne vulgaris in women. Especially because the onset of puberty in women occurs earlier than in men, and acne vulgaris tends to be more persistent in women.^{1,21} Other factors that are thought to affect the incidence of acne vulgaris in women are the use of cosmetics on the face and the tendency of women to seek treatment immediately when experiencing cosmetic complaints.²²

In this study, most study subjects were teenagers to young adults. In most cases, acne vulgaris has become a significant issue since the onset of puberty, and its prevalence reaches a peak in mid to late adolescence. Dehydroepiandrosterone hormone is an important regulator of sebaceous gland activity, and its levels begin to increase when a person experiences puberty. Androgens will

Table 1. Demographic characteristics of study subjects.

Characteristics	N	%
Sex		
Men	34	30.9
Women	76	69.1
Age		
18 – 22 years	55	50
23 – 27 years	29	26.4
28 – 32 years	23	20.9
33 – 38 years	3	2.7
Total	110	100

Table 2. Diagnostic test parameters of face-to-face consultations and teledermatology in establishing the diagnosis of acne vulgaris.

		Face-to-Face Consultations		Total
		Acne Vulgaris (+)	Acne Vulgaris (-)	
Teledermatology	Acne Vulgaris (+)	105	0	105
	Acne Vulgaris (-)	0	5	5
		105	5	110

Table 3. The agreement test of the teledermatology and face to face consultations in diagnosing acne vulgaris.

		Face-to-Face Consultations		Total
		Acne vulgaris (+)	Acne vulgaris (-)	
Teledermatology	Acne vulgaris (+)	105 (95.5%)	0	105 (95.5%)
	Acne vulgaris (-)	0	5 (4.5%)	5 (4.5%)

$p < 0.001$; $kappa = 1$

Sensitivity	: $105/(105+0) \times 100\%$	= 100%.
Specificity	: $5/(0+5) \times 100\%$	= 100%.
Positive predictive value	: $105/(105+0) \times 100\%$	= 100%.
Negative predictive value	: $5/(0+5) \times 100\%$	= 100%.
Diagnostic accuracy	: $(105+5)/110 \times 100\%$	= 100%.

stimulate an increase in sebum production and predispose to sebaceous ductal hypercornification, thus facilitating comedo formation.^{23,24}

The results of this study indicate that teledermatology examination has 100% sensitivity, specificity, positive predictive value, negative predictive value, and accuracy. This is in line with a previous study conducted by Azraf et al. (2014) in Botswana regarding the reliability and validity of mobile teledermatology in patients with positive human immunodeficiency virus (HIV). The sensitivity and specificity for the ten primary diagnoses varied from 0-88% and 84%-100%, respectively. The results highlighted that the use of mobile teledermatology technology in HIV-positive patients in Botswana has significant potential to improve access to care.²⁵

Oliveira et al. reviewed recent data on teledermatology's accuracy, reliability, and clinical outcomes in Brazil. Of the 2,525 articles retrieved, 45 manuscripts (44 studies, 7,033 patients) were included in the review, 42 conducted in developed countries. The study was organized into three groups; clinical outcome ($n = 16$), diagnostic accuracy ($n = 9$), and diagnostic excellence ($n = 19$). Overall,

the teledermatology diagnosis was considerably accurate, with sensitivity and specificity values ranging from 73%-97% and 73%-83%, compared with direct diagnosis and without histopathological results.²⁶

A study conducted by Shin et al. (2014) in Korea demonstrated that diagnosis through teledermatology has high sensitivity and specificity for eczema, viral warts, and fungal infections, where the sensitivity values were 78%, 88%, and 61%, respectively. The specificity for these skin diseases was above 90% compared with direct diagnosis.²⁷

The kappa of the agreement test in this study was 1, indicating a good fit between teledermatology and face-to-face consultations in diagnosing acne vulgaris. It is supported by Singer et al. in California, who observed Network Oriented Research Assistant (NORA) technology to compare the digital photographic diagnosis of acne vulgaris with direct assessment resulting in a very good match.²⁸ Nami et al. (2015) in Austria reported that from 391 patients, the agreement between direct diagnosis (face to face) and teledermatology with the SAF was 91.05% (Cohen coefficient = 0.906).²⁹

This study highlighted teledermatology's high diagnostic values

and agreement in diagnosing acne vulgaris.

CONCLUSION

There was no significant difference between teledermatology and face-to-face consultations in diagnosing acne vulgaris. Teledermatology can be implemented in the diagnosis of acne vulgaris in daily practice.

AUTHOR CONTRIBUTION

All authors contributed equally to the research process and the writing of this article.

CONFLICT OF INTEREST

All authors declared that there is no conflict of interest regarding this article.

ETHICS APPROVAL

This study has obtained approval from the Research Ethics Commission of the Faculty of Medicine, Universitas Sumatra Utara, with ethical clearance number 539/KEP/USU/2020.

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