


# Clinical Features of Acne in Primary Care Patients Assessed Through Teledermatology

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## Abstract

**Introduction/Objectives:** Acne is present in about 90% of teenagers and 12% to 14% of adults. Face and trunk are the most affected areas. Lesions can result in postinflammatory hyperpigmentation and scarring, leading to reduced quality of life. Asynchronous teledermatology has been increasingly used around the world, facilitating patient access to dermatologists. Our objectives were to assess: (1) clinical features of acne patients according to gender, age, severity, site of lesions, excoriation, postinflammatory hyperpigmentation (PIH), and atrophic scar (AS) and (2) how many referrals to in-person consultations with dermatologists could be avoided using asynchronous teledermatology in primary care attention? **Methods:** We analyzed images, demographic and clinical data of 2459 acne patients assisted by teledermatology, with the aim to confirm the diagnoses, to classify acne severity according to grades I to IV, and to search for the presence of postinflammatory hyperpigmentation, atrophic scars, and/or excoriated acne (EA). We compared the clinical and biological data, looking for associations among them. **Results:** Acne severity and age were associated with the most common sequels: postinflammatory hyperpigmentation (mainly on the trunk and in females,  $P < .0001$ ) and atrophic scars (mainly on the face and in males,  $P < .0001$ ). We also observed different frequencies according to age and sex: 13 to 24 years in males ( $P = .0023$ ); and  $< 12$  ( $P = .0023$ ) and 25 to 64 years old ( $P < .0001$ ) for females; 68% of the patients had no need for in-person dermatologists' referral, being kept at primary care attention with proper diagnosis and treatment. **Conclusion:** Clinical features of acne and its sequels differ according to gender, age, site, and severity. The new findings of PIH associated with women and AS, with men, may help offer a more personalized management to patients. Teledermatology was suitable for the majority of the acne cases in primary care.

## Keywords

acne, teledermatology, atrophic scars, postinflammatory hyperpigmentation, excoriated acne

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## Introduction

Acne is a very common dermatological disease among teenagers, but it persists into or develops in adulthood in 12% to 14% of individuals. Face, back, and chest are the most affected areas.<sup>1</sup> Inflammatory lesions can result in hyperpigmentation postinflammatory (PIH) and permanent scarring that can be more severe the longer the treatment is postponed. Acne can cause decreased quality of life, anxiety, depression, and even suicide. The presence of scars is associated with substantial psychosocial stress and low self-esteem, particularly in adolescents.<sup>1,2</sup> There are few studies in the literature including large number of acne patients to analyze differences according to sex, age, severity, excoriation, and acne

sequels. This is important information that enables the physician to optimize acne treatment, avoiding its sequels and, consequently, the decrease in quality of life associated with them.

Teledermatology (TD) has been increasingly used around the world, especially during the pandemic COVID-19. There are mainly two types of TD: synchronous (real time) and

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asynchronous (when the image is stored to be analyzed at a later time).<sup>3</sup> Studies conducted with the TD asynchronous show benefit in the patient's access to specialists, accurate diagnosis, and reduction in the time elapsed to obtain the treatment, resulting in high patient satisfaction,<sup>4,5</sup> but there is still no information of the role that TD could have in acne patients of primary care attention.

The objectives of the study were to analyze the main clinical differences in acne patients presented in primary care attention according to sex, age, site, and acne severity, and to assess how many referrals to in-person consultations with dermatologists could be avoided using asynchronous TD.

## Methods

Cross-sectional study approved by the Ethics Committees of Hospital Israelita Albert Einstein (HIAE) and Municipal De São Paulo (SMS-SP) (CAAE: 97126618.6.3001.0086). Patient data were anonymized and informed consent was waived.

Images, demographic (gender, age), and clinical (evolution time, previous treatment, site of involvement, and referral) data of 2459 patients diagnosed with acne (ICD: L70) in the teledermatology project carried out by HIAE and SMS-SP from July 2017 to August 2018, in the city of São Paulo, were selected for a new dermatological evaluation, with the objectives to confirm the diagnosis, classify the severity of acne, verify the presence of post-inflammatory hyperpigmentation (PIH), atrophic scars, and signs of excoriated acne. When a patient's images showed more than 1 region affected by acne, the criteria used to choose the main location were: (1) location with the highest acne severity; (2) greater number of active lesions.

The severity of acne has been classified as following<sup>2</sup>:

Grade I (mild): predominance of open or closed comedones; few papules or pustules

Grade II (moderate): presence of papules or pustules

Grade III (moderate to severe): numerous papules or pustules and occasional inflammatory nodules

Grade IV (severe): numerous isolated or confluent inflammatory nodules

Scars were considered atrophic when the skin was depressed in relation to the regular surface of the skin.<sup>1</sup> The term "excoriated acne" has been used to describe excoriated lesions or self-inflicted scars by the compulsion to handle acne lesions.<sup>6</sup> In this study, we defined the condition as excoriated acne when more than 50% of the acne lesions present in the images presented excoriation.

The project has already been described in detail.<sup>5</sup> Briefly, the city of São Paulo had 57832 individuals previously referred by GPs waiting for an appointment with a dermatologist in the public sector in 2017, which, on average,

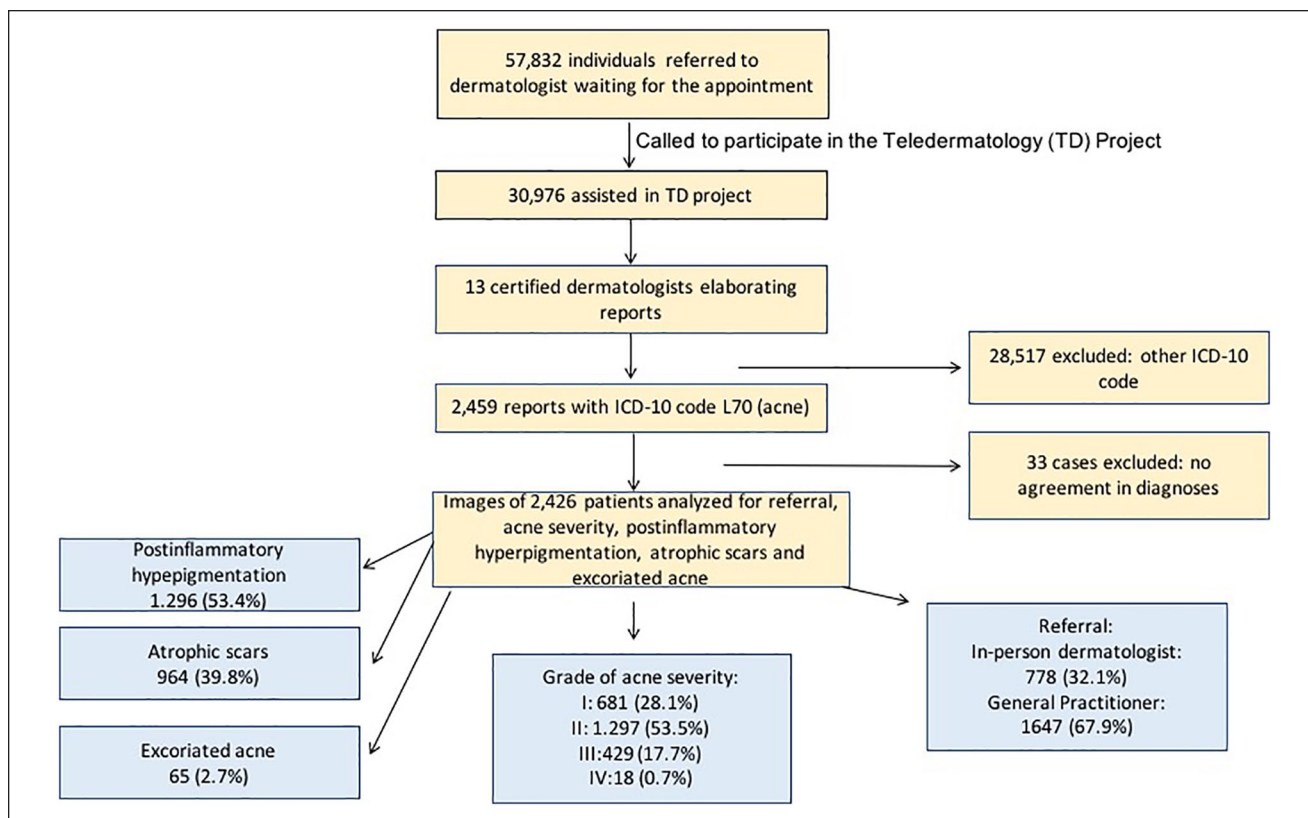
would take 6.7 months. In order to reduce the waiting time and speed up the flow of care for the most severe, surgical, or complex cases, TD was implemented. A mobile app was developed in which the demographic and clinical patient data, along with images of lesions, were uploaded to a secure online platform. Patients in the waiting list were called by telephone to go to one of the 3 places designated, for data and image collection by nursing technicians, using a cell phone camera. They were instructed to take 3 photographs of each lesion or affected area (50 and 15 cm away, and a side view intended to give an idea of the volume of the lesion). By accessing the platform, the 13 certified dermatologists had initially to decide if the photos were appropriate to make a report or not (bad photo). In the latter case, the patient was automatically referred to the in-person dermatologist (IPD). In the first case, teledermatologists should produce reports with one of the 3 referral options: (1) directly to biopsy (with subsequent appointment with an IPD); (2) IPD; or (3) general practitioner (GP), the main clinical hypotheses, suggestions of treatment or exams to perform, and comments.

For statistical calculations, we use the test chi-square with Yates correction in the program computer GraphPad Prism 6.0. A *P* value <.05 was considered statistically significant.

## Results

Among the 57832 individuals waiting for dermatologists' evaluation, 30976 participated in the TD project, 68% female and 32% male. Acne diagnosis was the second most frequent ( $n=2459$ ; 7.9% of the total; 8% of women and 7.7% of men), only after melanocytic nevus.<sup>5</sup> Of the 2459 initial acne diagnoses, 2426 (99%) cases were in agreement with the second evaluator dermatologist (MGB). Few cases were ruled out due to diagnostic disagreement ( $n=33$ ; 1%). Patients' flow and main results of the study can be seen in Figure 1. Regarding referrals, 778 (32.1%) patients were referred to in-person dermatologists and 1647 (67.9%) were kept with their GP. PIH was found in 1296 (53.4%) patients, AS in 964 (39.8%), and AE in 65 (2.7%) (Figure 1). All patients were compared based on clinical (severity, site, PIH, AS, AE, time of onset, previous treatment, and referral) and biological (age, sex) data in Tables 1 and 4. Then, we divided the patients by sex when looking for association between site and age (Table 2) and site and severity (Table 3).

Most patients with acne were adolescents and young adults, and less frequently, adults >25 years old. Distribution between the sexes, however, differed significantly. Acne in patients up to 12 years old and 25 to 64 years old was associated with females and between 13 and 24 years old, with males. Female sex was associated with acne in children (<13 years old) and adults >24 years old, less severe acne and PIH.



**Figure 1.** Flow of acne patients included in the study and main results obtained.

Regarding the site of involvement, face was the most affected region, with more than 85% of cases, showing no difference between genders. On the trunk, we see a predominance in male individuals. The time of the disease onset until the date of the teleconsultation was >3 years in most cases, with only a minority of cases <1 year. The vast majority had never treated acne before the teleconsultation (86%).

Grade II acne was the most frequent, in more than 50% of cases, followed by grades I and III. Grade I acne was significantly more frequent in women, and grades II and III, in men. Excoriated acne was infrequent, in only 2.7%, with no gender differences.

The most frequent sequelae of acne were PIH, affecting more than half of the patients and associated with the female sex, while atrophic scar, present in about 40%, was associated with the male sex.

Age was associated with time of disease onset, PIH, and atrophic scars for both sexes. In men, it was also related to trunk site and, in women, to excoriated acne.

Acne severity was associated with age up to 65 years old in women and only up to 12 years old in male sex (grade I). For both sexes, as severity increased, so did HIP and atrophic scars. Excoriated acne was inversely related to acne

severity in women. As for location, acne grades I, III, and IV were more frequent on face and grade II, on trunk.

Table 4 shows that PIH is associated to the trunk and atrophic scars, to the face. Excoriated acne in men was related to the face, while for women it showed no difference.

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## Discussion

Acne was the second most frequent skin disorder, showing its importance in health care. One study in a public Brazilian secondary care center showed acne as the fourth most frequent complaint in dermatologists' office.<sup>7</sup>

We found that 2/3 of the patients were not referred to an in-person dermatologist. Instead, their general practitioners received diagnosis and treatment from the teledermatologist

**Table 1.** Distribution of Clinical Data in Acne Patients According to Sex.

Characteristics	Female n (%)	Male n (%)	Total n (%)	P value
<b>Age (years)</b>				
0-12	68 (4.1)	12 (1.6)	80 (3.3)	.0023*
13-24	1015 (60.8)	615 (81.4)	1630 (67.2)	<.0001*
25-64	584 (34.9)	128 (16.9)	712 (29.3)	<.0001*
65+	3 (0.2)	1 (0.1)	4 (0.2)	.0926
<b>Site</b>				
Head and neck	1471 (88.1)	617 (81.6)	2088 (86.1)	.2521
Trunk	198 (11.9)	136 (18.0)	334 (13.8)	<.0001*
Limbs	1 (0.0)	3 (0.4)	4 (0.1)	.0926
<b>Time of onset</b>				
<1 year	312 (18.7)	122 (16.1)	434 (17.9)	.1449
1-3 years	421 (25.2)	223 (29.5)	644 (26.5)	.0303*
>3 years	937 (56.1)	411 (54.4)	1348 (55.6)	.4497
<b>Previous treatment</b>				
Yes	221 (13.2)	106 (14.0)	327 (13.5)	.6441
No	1449 (86.8)	650 (86.0)	2099 (86.5)	.6441
<b>Acne severity (Grade)</b>				
I	527 (31.5)	154 (20.4)	681 (28.1)	<.0001*
II	871 (52.2)	426 (56.4)	1297 (53.5)	<.0001*
III	267 (16.0)	162 (21.5)	429 (17.7)	.0014*
IV	5 (0.3)	13 (1.7)	18 (0.7)	.0004*
<b>Excoriated acne (EA)</b>				
Yes	55 (3.3)	10 (1.3)	65 (2.7)	.0081*
No	1615 (96.7)	746 (98.7)	2360 (97.3)	.0081*
<b>Postinflammatory hyperpigmentation (PIH)</b>				
Yes	946 (56.6)	350 (46.3)	1296 (53.4)	<.0001*
No	724 (43.4)	406 (53.7)	1130 (46.6)	<.0001*
<b>Atrophic scar (AS)</b>				
Yes	612 (36.6)	352 (46.6)	964 (39.8)	<.0001*
No	1058 (63.4)	404 (53.4)	1461 (60.2)	<.0001*
<b>Referral</b>				
Biopsy	1 (0.1)	0 (0.06)	1 (0.0)	1
IPD	491 (29.4)	287 (38.0)	778 (32.1)	<.0001*
GP	1178 (70.5)	469 (62.0)	1647 (67.9)	<.0001*

Abbreviations: IPD, in-person dermatologist; GP, general practitioner.

\* $P < .05$  is statistically significant.

to manage the patients. The evidence to date confirms that the asynchronous TD can, quickly and conveniently, be an effective tool to screen and manage frequent skin conditions in the population.<sup>8</sup> It can also save resources, working days, and transport of patients, in addition to providing training for general practitioners, who will gain experience in handling these cases. The diagnostic agreement of TD with the in-person dermatologist proved to be very satisfactory in recent publications.<sup>9,10</sup> Other studies have already been done using TD for acne follow-up with promising results.<sup>11</sup> A recent study showed 92.3% satisfaction of acne monitoring by TD.<sup>12</sup>

Most of the patients had never received previous treatment and the time of onset of the disease until the teleconsultation was more than 3 years. These results indicate that

acne was a neglected disease in this population. Maybe our GPs are less prone to treat acne, because they might lack the knowledge of how to do it, or they might not be aware of how this disease can impact quality of life. We believe that they would benefit greatly for the educational aspect that TD can have throughout time. The lack of adequate care may explain, in part, the high rate of postinflammatory hyperpigmentation and atrophic scarring found in the study. Although these lesions do not threaten the individual's physical integrity, acne and its sequelae are responsible for a marked decrease in quality of life.<sup>13,14</sup>

Some interesting differences between sexes were encountered. In our study, acne was associated with women >24 years, which was seen in previous studies,<sup>15,16</sup> while men are more affected as adolescents and young adults,

**Table 2.** Distribution of Clinical Data in Acne Patients According to Age.

Characteristics	Age (years)				Total (%)	P value
	0-12	13-24	25-64	≥65		
Time of onset						
< 1 year	34 (42.5)	283 (17.4)	116 (16.3)	1 (25.0)	434 (17.9)	<.0001*
1-3 years	33 (41.3)	476 (29.2)	134 (18.8)	1 (25.0)	644 (26.5)	<.0001*
>3 years	13 (16.2)	871 (53.4)	462 (64.9)	2 (50.0)	1348 (55.6)	<.0001*
Postinflammatory hyperpigmentation (PIH)						
Female	21 (30.9)	567 (55.9)	357 (61.1)	1 (33.3)	946 (39.0)	<.0001*
Male	1 (8.3)	278 (45.2)	70 (54.7)	1 (100)	350 (14.4)	.0073*
Female patients' site						
Head/neck	64 (94.1)	882 (86.9)	522 (89.4)	3 (100)	1471 (60.6)	.4768
Trunk	4 (5.9)	132 (13.0)	62 (10.6)	0 (0.0)	198 (8.2)	.4768
Limbs	0 (0.0)	1 (33.3)	0 (0.0)	0 (0.0)	1 (0.0)	.4768
Male patients' site						
Head/neck	12 (100)	524 (85.2)	81 (63.3)	0 (0.0)	617 (25.4)	<.0001*
Trunk	0 (0.0)	89 (14.5)	46 (35.9)	1 (100)	136 (5.6)	<.0001*
Limbs	0 (0.0)	2 (0.3)	1 (0.8)	0 (0.0)	3 (0.1)	.8941
Atrophic scars						
Female	3 (4.4)	335 (33.0)	273 (46.7)	1 (33.3)	612 (25.2)	<.0001*
Male	0 (0.0)	287 (46.7)	65 (50.8)	0 (0.0)	352 (14.5)	.0066*
Excoriated acne						
Female	0 (0.0)	25 (2.5)	30 (5.1)	0 (0.0)	55 (2.3)	.0126*
Male	0 (0.0)	8 (1.3)	2 (1.6)	0 (0.0)	10 (0.4)	.9721

\* $P < .05$  is statistically significant.

differently from 1 study with 1384 patients had found no difference between genders in acne age.<sup>17</sup> The predominance of acne on the face is well known, both in daily practice and in the literature, and this was also the case in this study. The association seen between acne on the trunk of male patients corroborates previously reported results.<sup>17</sup> As for the severity of acne, we found that grade I acne was more frequent in children and on the face, and grades II and III, in individuals 13 to 64 years old, in accordance to another study indicated that, up to 13 years old, acne was mainly grade I and, after that, inflammatory acne became more common.<sup>18</sup> The association between male sex and acne severity has also been showed by another researchers.<sup>17</sup> This fact should help explain another two findings of this study: that men are more frequently referred to IPD, and the association with atrophic scars. Another possible explanation for the first finding is that the males do not bother as much as women when presenting mild acne, and, therefore, they do not demand as many referrals for dermatologists. Excoriated acne, historically associated with female sex since its description in French literature by Brocq (1898) and later, in English, by Adamson (1915)<sup>19</sup> did not show difference between sexes in our study.

PIH can affect all skin types, but in the US, it was more common in blacks (65.3%), Hispanics (52.7%), and Asians (47.4%) with acne.<sup>20</sup> We did not retrieve data on race to

address this question, but our study showed a prevalence of 53.4%, which is consistent with the international literature. Our results showed PIH association with acne severity, location on the trunk, female sex, and age (in women), while atrophic scars were statistically more frequent in men, on the face and with greater acne severity. Another article also correlated the presence of atrophic scars to acne grade.<sup>21</sup> The associations of PIH with the female sex and the presence of atrophic scars with the male, as well as new findings, generate questions for further studies: can female hormones facilitate the hyperpigmentation in women, similar to what occurs in melasma? Are atrophic scars in men just a consequence of the more severe acne that affects them, or are they due to some sex-specific factor that is still unknown? Also, this new information might be useful for GPs and dermatologists to manage patients differently. For example, male patients, as more subject to atrophic scars, should be treated more aggressively, perhaps with a lower threshold for oral isotretinoin. On the other hand, female patients, as they are prone to postinflammatory hyperpigmentation, might benefit for treatments that combine bleacher substances with their regular anti-acne care, besides the regular use of appropriated sunblock.

The study has some limitations. First, it is important to note that TD does not intend to replace in-person visits, but rather assist to screen the cases. TD has some limitations

**Table 3.** Distribution of Clinical Data in Acne Patients According to Severity.

Characteristics	Acne severity (Grades) n (%)				Total (%)	P value
	1	2	3	4		
<b>Female</b>						
0-12	47 (69.1)	2 (30.9)	0 (0.0)	0 (0.0)	68 (2.8)	<.0001*
13-24	329 (32.4)	551 (54.3)	132 (13.0)	3 (0.3)	1015 (41.8)	.0006*
25-64	149 (25.6)	298 (51.0)	135 (23.1)	2 (0.3)	584 (24.1)	<.0001*
65+	2 (66.7)	1 (33.3)	0 (0.0)	0 (0.0)	3 (0.1)	.9691
<b>Male</b>						
0-12	10 (83.3)	2 (16.7)	0 (0.0)	0 (0.0)	12 (0.5)	<.0001*
13-24	122 (19.9)	350 (57.0)	131 (21.3)	11 (1.8)	614 (25.3)	.8591
25-64	22 (17.2)	73 (57.0)	31 (24.2)	2 (1.6)	128 (5.3)	.7151
65+	0 (0.0)	1 (100)	0 (0.0)	0 (0.0)	1 (0.0)	.8558
<b>Postinflammatory hyperpigmentation (PIH)</b>						
Female	189 (35.9)	599 (68.8)	154 (57.7)	4 (80.0)	946 (39.0)	<.0001*
Male	42 (27.3)	225 (52.8)	76 (46.9)	7 (53.8)	350 (14.4)	<.0001*
<b>Female patients' site</b>						
Head/neck	507 (96.2)	714 (82.0)	245 (91.8)	5 (100)	1471 (60.6)	<.0001*
Trunk	20 (3.8)	15 (17.9)	22 (8.2)	0 (0.0)	198 (8.2)	<.0001*
Limbs	0 (0.0)	1 (0.1)	0 (0.0)	0 (0.0)	1 (0.0)	.8211
<b>Male patients' site</b>						
Head/neck	148 (96.1)	326 (76.5)	132 (81.5)	10 (76.9)	616 (25.5)	<.0001*
Trunk	5 (3.2)	100 (23.5)	28 (17.3)	3 (23.1)	136 (5.6)	<.0001*
Limbs	1 (0.7)	0 (0.0)	2 (1.2)	0 (0.0)	3 (0.1)	.818
<b>Atrophic scar</b>						
Female	60 (11.4)	333 (38.2)	216 (80.9)	3 (60.0)	612 (25.2)	<.0001*
Male	25 (16.2)	179 (42.0)	136 (84.0)	12 (92.3)	352 (14.5)	<.0001*
<b>Excoriated acne</b>						
Female	32 (6.1)	21 (2.4)	2 (0.7)	0 (0.0)	55 (2.3)	<.0001*
Male	4 (2.6)	4 (0.9)	2 (1.2)	0 (0.0)	10 (0.4)	.4613

\*P < .05 is statistically significant.

**Table 4.** Distribution of Clinical Data in Acne Patients According to the Site.

Characteristics	SITE			Total n (%)	P value
	Head/neck n (%)	Trunk n (%)	Limbs n (%)		
<b>Excoriated acne (EA)</b>					
Female	51 (3.5)	4 (2.0)	0 (0.0)	55 (2.3)	.5540
Male	6 (1.0)	2 (1.5)	2 (66.7)	10 (0.4)	<.0001*
<b>Postinflammatory hyperpigmentation (PIH)</b>					
Female	786 (53.4)	159 (80.3)	1 (100)	946 (39.0)	<.0001*
Male	235 (38.1)	113 (83.1)	2 (66.7)	350 (14.4)	<.0001*
<b>Atrophic scar (AS)</b>					
Female	576 (39.2)	35 (17.7)	1 (100)	612 (25.2)	<.0001*
Male	311 (50.4)	39 (28.7)	2 (66.7)	352 (14.5)	<.0001*

\*P < .05 is statistically significant.

inherent to it. The fact that we receive multiple photos of different parts of the body and not examine the individual as a whole, makes the diagnosis more challenging. In addition, some important impressions that would help corroborate the diagnosis or management, such as to feel the texture of

the skin and palpation of lesions, cannot be performed. About this matter, in a previous study, the impossibility to palpate the lesion was classified as having a mild or moderate degree of interference in the teledermatologists' work.<sup>22</sup> The current study is a "snapshot" of the acne patients, at

that time, in 1 city, and many of the patients with milder forms of acne might not have been referred to the dermatologist by the GP, and, therefore, would not be on the waiting list used to call the patients. Even if they were on the list, they could have improved spontaneously, they could have sought another type of service, such as over-the-counter products or popular clinics, or in spite of the acne, are not bothered to attend the teleconsultation, creating a bias in the study. Another possibility of bias is that some patients could have refused to participate in the Teledermatology project because it was not the standard way of care.

In conclusion, we found many interesting differences in the acne presentation according to sex, age, severity, and site that can be helpful to optimize the management of the disease, avoiding possible sequelae that could lead to a decreased patient quality of life and that asynchronous TD can be helpful to manage acne patients in primary care settings.

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### IRB

Study approved by both Ethics Committees: Hospital Israelita Albert Einstein and Prefeitura Municipal de São Paulo (Municipal Government) (CAAE:97126618.6.3001.0086).

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