

## A pilot study of new scoring system severity of striae distensae



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### ABSTRACT

**Background:** Striae distensae (SD) is a common skin disorder in the form of linear atrophy, which arises due to stretching and is one of the most common cosmetic problems. There is no scoring system to assess the severity of striae distensae that is easy to use, non-invasive, and consistent and can be used to evaluate SD treatment. This study formulated and validated a scoring system to assess the severity of striae distensae.

**Methods:** This study was a descriptive observational study with a cross sectional approach involving 30 female health workers at the Universitas Sumatra Utara Hospital. Assessment of SD severity in six regions using four parameters.

**Results:** A scoring system for the severity of striae distensae has been formulated, named the INA score, to assess the severity of SD in six regions; mammae, axilla, abdomen, femur, gluteus and poplitea using four parameters; the number of lines, the size of the longest striae distensae line, color, and itchy. The results of the validation test are statistically valid ( $r\text{-value} > 0.361$ ), and the reliability test is found to be reliable (Cronbach's Alpha  $> 0.361$ ).

**Conclusion:** The formulation of a valid and reliable scoring system, named the INA score, has been obtained to assess the severity of striae distensae measured at six locations and four parameters.

**Keywords:** striae distensae, severity, INA score.

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### INTRODUCTION

Striae distensae (SD) is a linear violaceous, erythematous, or hypopigmented scar tissue on the skin accompanied by epidermal atrophy that occurs due to tissue over-stretching. Striae distensae is reported as one of the most common skin changes and a frequent cosmetic problem. The prevalence ranges from 50% to 80% and 11% to 88%. Striae distensae mostly occurs in puberty (6% - 86%) and obesity (43%).<sup>1-7</sup>

Striae distensae can arise from several causes, including rapid changes in body weight, adolescent growth, use of corticosteroids, Cushing's syndrome, and commonly appearing on the buttocks, thighs, knees, lumbosacral region, breasts and upper arms in men. The mechanism associated with the formation of SD is not completely understood, but this disorder is the result of connective tissue discontinuity, which leads to atrophy of the dermis. There are many factors, including hormones (especially

corticosteroids), mechanical stress, to genetic predisposition.<sup>8,9</sup>

In the clinical practice of dermatology, a relevant and consistent scoring system is needed to assess the severity of a disease. There is no validated scoring system for the clinical evaluation of SD. However, two scoring systems are often used to assess striae gravidarum (SG), named the Atwal score (based on the number and color of lesions on the abdomen, waist, breasts, and thighs/buttocks) and Davey (based on the number of lesions on the abdomen). Atwal and Davey's score assessment is more specific to the assessment of striae gravidarum because it is limited to the location of striae that are often found in gravida patients.<sup>8,10,11</sup>

The scoring system can be used as a guide for selecting effective therapy for striae distensae. The scoring system requires standardization, consistency and validation. We formulate a new scoring system named the Imam, Nelva, Alviera (INA) striae distensae severity.

### METHODS

This study is a descriptive observational with a cross sectional approach involving 30 female health workers at the Universitas Sumatera Utara Hospital. The inclusion criteria were female, 18 years old, had striae distensae, never or not pregnant, willing to participate in the study and signed informed consent. Exclusion criteria were subjects with Cushing's syndrome or Marfan's syndrome, using oral or topical steroids or previous use of oral or topical steroids for more than six months before the onset of SD, now using or having a history of hormone therapy.

Subjects who met the inclusion and exclusion criteria were included in the study; then a full body examination was performed to see the striae distensae in the mammae, axilla, abdomen, femur, gluteus and poplitea based on the number of lines, the size of the longest striae distensae line, color, itchy. Documentation and calculation of striae distensae scores. The data collected was then analyzed by statistical tests.

## RESULTS

This study assesses the severity of striae distensae in several locations in the body, the mammae, axilla, abdomen, femur, gluteus and poplitea. Assessment of striae distensae includes the number of lines, the size of the longest striae distensae line, color, and the presence or absence of itching. The analysis of the validity of the research was carried out by correlating the results of the examination of the striae distensae value of each location with the total score, which was the sum of the values of each striae distensae location of each parameter. The validity test in this study uses the correlation value (*r*), provided that if the correlation value is bigger than the *r* table value (= 0.361) at  $\alpha = 5\%$ , and  $df = 28$ , then it is declared valid and if the correlation value (*r*) < *r* table then declared invalid. Question items that have a correlation value  $> 0.361$  then the question item can be declared valid because it has met the criteria. [Table 1](#) is the result of the validity test in the mammae region.

The results of the validity test in [table 1](#) with the results of the examination of striae distensae in the mammae region show that the four parameters show valid results. The four parameters have a calculated *r* value above 0.361, then all parameters of the results of the striae distensae examination are declared valid. [Table 2](#) shows the result of the validity test in the axilla region.

The four parameters show valid results based on the results of the validity test in [Table 2](#) with the results of the examination of striae distensae in the axilla region. The four parameters have a calculated *r* value above 0.361, then all parameters of the results of the striae distensae examination are declared valid. [Table 3](#) is the result of the validity test in the abdomen region.

The four parameters show valid results based on the validity test in [Table 3](#) with the results of examining striae distensae in the abdomen region. The four parameters have a calculated *r* value above 0.361, then all parameters of the results of the striae distensae examination are declared valid. [Table 4](#) is the result of the validity test in the femoral region.

The validity test results in [Table 4](#) with the examination of striae distensae in the femoral region show that the four

**Table 1. Validity Test of Striae Distensae Examination in the Mammae Region**

No	Parameter	r Value	r Table	Significance	
1	Number of lines	0,965	0,361	<0,001	Valid
2	The size of the longest line	0,976	0,361	<0,001	Valid
3	Color	0,978	0,361	<0,001	Valid
4	Itchy	0,494	0,361	<0,001	Valid

**Table 2. Validity Test of Striae Distensae Examination in the Axilla Region**

No	Parameter	r Value	r Table	Significance	
1	Number of lines	0,990	0,361	<0,001	Valid
2	The size of the longest line	0,976	0,361	<0,001	Valid
3	Color	0,996	0,361	<0,001	Valid
4	Itchy	0,555	0,361	<0,001	Valid

**Table 3. Validity Test of Striae Distensae Examination in the Abdomen Region**

No	Parameter	r Value	r Table	Significance	
1	Number of lines	0,991	0,361	<0,001	Valid
2	The size of the longest line	0,998	0,361	<0,001	Valid
3	Color	0,998	0,361	<0,001	Valid
4	Itchy	0,998	0,361	<0,001	Valid

**Table 4. Validity Test of Striae Distensae Examination in the Femoralis Region**

No	Parameter	r Value	r Table	Significance	
1	Number of lines	0,823	0,361	<0,001	Valid
2	The size of the longest line	0,696	0,361	<0,001	Valid
3	Color	0,849	0,361	<0,001	Valid
4	Itchy	0,458	0,361	<0,001	Valid

**Table 5. Validity Test of Striae Distensae Examination in the Gluteus Region**

No	Parameter	r Value	r Table	Significance	
1	Number of lines	0,687	0,361	<0,001	Valid
2	The size of the longest line	0,824	0,361	<0,001	Valid
3	Color	0,824	0,361	<0,001	Valid
4	Itchy	0,733	0,361	<0,001	Valid

**Table 6. Validity Test of Striae Distensae Examination in the Popliteal Region**

No	Parameter	r Value	r Table	Significance	
1	Number of lines	0,970	0,361	<0,001	Valid
2	The size of the longest line	0,985	0,361	<0,001	Valid
3	Color	0,989	0,361	<0,001	Valid
4	Itchy	0,805	0,361	<0,001	Valid

parameters show valid results. The four parameters have a calculated *r* value above 0.361, then all parameters of the results of the striae distensae examination are declared valid. [Table 5](#) is the result of the validity test in the gluteus region.

The validity test results in [Table 5](#), with the results of the examination of striae distensae in the gluteus region, show that the four parameters show valid results. The

four parameters have a calculated *r* value above 0.361, then all parameters of the results of the striae distensae examination are declared valid. [Table 6](#) is the result of the validity test in the popliteal region.

The results of the validity test in [Table 6](#) with the results of the examination of striae distensae in the popliteal region show that the four parameters show valid results. The four parameters have a calculated *r* value

above 0.361, then all parameters of the results of the striae distensae examination are declared valid.

**Table 7** shows the reliability test results for examining striae distensae in the mammae, axilla, abdomen, femur, gluteus, and popliteal regions. Reliability tests can be used to determine the measuring instrument's consistency and whether the instrument remains consistent if the measurement is repeated. A measuring instrument is reliable if it produces the same result despite being measured many times. Before testing the reliability of the data, the validity of the data was tested. This is because the data to be measured must be valid and proceed with data reliability testing. However, if the measured data is not valid, it is not necessary to test the reliability of the data.

The result of the calculation of the reliability test of Cronbach's Alpha method (*r* count) showed the parameters assessed at each location. The reliability test for the results of the striae distensae examination in all regions showed the Cronbach's Alpha value above 0.361; it can be concluded that all the results of the striae distensae examination in all locations were reliable. Formulating a new score to assess the severity of striae distensae at the location of the mammary, axillary, abdomen, femur, gluteus and poplitea named the Imam, Nelva, Alviera score (INA score) as shown in **Table 8**.

After testing the validity and reliability, the severity of striae distensae in each region can be measured using a Likert scale. The total score was divided into mild, moderate, and severe based on a Likert scale. The highest total score per region was 9. The degrees of severity obtained that could be calculated per region were mild (score<3), moderate (score 3-6), and severe (score>6). The following is a table of INA scores based on each region.

Aspects of measuring the severity of striae distensae can be totaled from each region to obtain a total score for the entire region. The total score for all regions was divided on a Likert scale into mild, moderate, and severe. The degree of severity obtained that can be calculated based on the whole region is mild (score<21), moderate (score 21-40) and severe (score>40). The following is a

**Table 7. Reliability Test Results of Striae Distensae Examination in Six Regions**

No	Region	Cronbach's Alpha	r Table	Number of Items	
1	Mammae	0,881	0,361	4	Reliable
2	Axilla	0,893	0,361	4	Reliable
3	Abdomen	0,923	0,361	4	Reliable
4	Femoralis	0,920	0,361	4	Reliable
5	Gluteus	0,663	0,361	4	Reliable
6	Popliteal	0,926	0,361	4	Reliable

**Table 8. INA scores to assess the severity of striae distensae.**

Location: Mammae, axilla, abdomen, femoralis, gluteus, poplitea.					
No.	Parameter	Score			
		0	1	2	3
1.	Number of lines	0	<5	5-10	>10
2.	The size of the longest line	-	<2cm	2-5cm	>5cm
3.	Color	-	<i>Striae rubra</i>	<i>Striae alba</i>	-
4.	Itchy	No itchy	Itchy	-	-

**Table 9. Categories of the severity of striae distensae scores.**

Severity (Total Score)	Total score based on each region	Total score for the entire region
Mild	<3	<21
Moderate	3-6	21-40
Severe	>6	>40

table for calculating the severity of striae distensae scores, categorized into mild, moderate and severe based on each region and the total of all regions (**Table 9**).

## DISCUSSION

Striae distensae is one of the most common skin changes and aesthetic problems. Striae distensae are characterized as atrophic scars, which are initially reddish or even purple and tend to fade and turn white over time gradually.<sup>12</sup> Until now, there is only a score to assess the severity of striae gravidarum; there is no scoring system to assess the severity striae distensae.

In this study, it was found that the results of the validation test in the six regions and four parameters obtained valid results. The INA score is a specific score for assessing the severity of striae distensae. In contrast, the pre-existing Atwal and Davey scores are more specific for striae gravidarum. The INA score was examined in six regions: mammary, axillary, abdomen, femur, gluteus, and popliteal. In the Atwal score, four locations of the most common predilection for striae gravidarum were assessed: the abdomen, breasts, waist, and

thighs/buttocks. In contrast, Davey's score only covered the abdominal area.<sup>12-14</sup>

The diagnosis of striae distensae is done by seeing whether there are linear lines on the body. In the early phase of striae distensae, a purplish or pink linear scar line can be found with a length of several centimeters in the predilection area, such as in the abdomen, brachii, femur, and lumbosacral regions called striae rubra. However, after a while, the line can atrophy and shrink. These lines will turn white and are known as striae alba. In this study, the assessment parameters of striae distensae are the number of lines, the size of the longest striae distensae line, color, and presence or absence of itching. At the same time, the Atwal score uses the number of striae and erythema parameters, while the Davey score system only counts the number of striae.<sup>10,15,16</sup>

There are various methods for determining the type and severity of striae distensae and the most effective therapy, but none have been standardized or validated. In this study, the INA score was valid and reliable for use in assessing the severity of striae distensae. Investigations can be performed on SD patients to help

establish the diagnosis through non-invasive imaging techniques, while invasive examinations such as tissue biopsies are not recommended in SD patients. Several examinations can be carried out using a 3-dimensional (3D) camera, dermoscopy, reflectance confocal microscopy, and epiluminescence colorimetry.<sup>4,17,18</sup>

## CONCLUSION

A new scoring system named the INA score has been validated and reliable to assess the severity of striae distensae.

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## AUTHOR CONTRIBUTION

All authors have contributed to this research process, including preparation, data gathering, analysis, drafting, and approval to publish this manuscript.

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## CONFLICT OF INTEREST

The authors declare no conflict of interest regarding the publication of this article.

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