ABSTRACT

Introduction: Cellulite is one of many alterations in the physiology of the skin that obesity is linked to. Waist circumference measurement, in addition to body mass index (BMI), is another method for identifying obesity and assessing the risk of disease associated with body weight. The waist hip ratio (WHR), which is calculated by adding the measurements of the waist and hips, is a tool for identifying the kind of obesity. We sought to ascertain how the WHR index and PCSS related to cellulite.

Method: Based on inclusion and exclusion criteria, this study was an observational analytical study using a cross-sectional methodology with 40 female cellulite patients. Age and family background were noted. A measuring tape was used to determine the WHR index value. The PCSS scale is used to assess the severity of cellulite. Gamma correlation analysis was used to examine the link between the WHR index and PCSS; a relationship was considered significant if the p-value was less than 0.05.

Results: Cellulite occurs more frequently in women aged 26–35 years (37.5%) who have a family history of cellulite (82.5%) and WHR index values ≥ 0.85 (45%) with a mild degree of severity based on PCSS, totalling 20 people (50%). The findings of the study revealed a significantly positive association (p<0.05) with a very strong strength between the WHR index and PCSS (r=0.94).

Conclusion: The WHR index and the PCSS for cellulite have a very strong association.

Keywords: Cellulite, PCSS, WHR index, abdominal obesity.


INTRODUCTION

A bumpy or uneven skin texture is one of the ways that cellulite is frequently described. Given the similarity, cellulite is frequently called “cottage cheese” or “orange peel” due to the dimpling appearance it can take on the buttocks, thighs, or hips. Anatomically, the dermis and subcutaneous tissue both include fibrous connective tissue (CT), which is the primary cause of the skin alterations associated with cellulite. Areas with the most fat buildup, such as the buttocks, thighs, flanks, and belly, are where cellulite is most frequently found. Women frequently experience cellulite, which is mostly an aesthetic concern. Despite this, cellulite has not gotten much attention in the scientific community, with few publications.

The Photonumeric Cellulite Severity Scale (PCSS) is a validated, comprehensive, objective method for measuring the severity of cellulite by considering five clinical and morphological aspects involved in cellulite, namely: (A) number of dimple lesions, (B) dimple depth, (C) changes in appearance skin surface morphology, (D) degree of laxity, flaccidity, or sagging skin and (E) classification of cellulite by Nürnberger and Müller. It is simpler for the doctor to choose the best course of treatment for the patient because each of these factors is graded from 0 to 3 as mild, moderate, and severe.

Obesity is associated with several changes in the physiology of the skin, including cellulite. Cellulite and obesity occur due to the significant accumulation of fat cells under the dermis, so the layer of fat under the skin that initially changes slightly becomes very large, and the skin as a whole becomes very thick. The increase in subcutaneous fat tissue takes place without an inflammatory process, making the skin appear edematous, soft, cold, and pale without feeling fever, pain, or itching. In contrast to common obesity, cellulite only affects the skin in the thighs, hips, buttocks, stomach, upper arms, and upper back, accompanied by wrinkled skin like an orange peel. If the affected skin area is large enough, then at first glance, it looks like a mattress.

Body mass index (BMI), which describes obesity, is an estimate of the typical range for body fat mass rather than a measurement of it. Waist circumference measurement, in addition to BMI, can be used to assess the risk of disease associated with body weight. Waist circumference, which is measured with a measuring tape and can indicate body fat in the belly and hips, is closely related to BMI. A measurement of the waist-to-hip ratio, also known as the waist-hip ratio (WHR) index or waist-to-hip ratio, can be used to identify the type of obesity. Fat distribution can be ascertained by measuring waist circumference to hip circumference. Abdominal obesity parameters according to WHO the men's WHR index ≥ 0.90 and women's ≥ 0.85. This study was done to assess the relationship between the WHR index and PCSS on cellulite.

Received: 2023-03-11
Accepted: 2023-05-24
Published: 2023-06-19

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METHOD

Patient and study design
In this cross-sectional observational analytical study, 40 female cellulite patients between the ages of 18 and 45 participated. The informed consent was signed by each patient. Age and family background were noted. Subjects who were pregnant or nursing, those with diabetes mellitus, and those who had received estrogen, antithyroid, or corticosteroid medication during the previous six months were all excluded from the study. These participants got cellulite treatments or thigh and buttock surgeries within the past three months. After receiving approval from the Research Division of the Universitas Sumatera Utara Hospital and ethical clearance from the Universitas Sumatera Utara Research Ethics Commission (ethics number 320/EC/KEPK/USU/2022), this study was carried out.

Research procedure
The author, including the identity of the research subject, anamnesis, physical examination, and dermatological examination, carried out data recording. This study measured the patient’s age, family history, waist-hip ratio index, and degree of cellulite severity based on PCSS. The clinical diagnosis of cellulite was made at the Dermatology and Venereology Polyclinic, University of North Sumatra Hospital, Medan. The degree of cellulite severity and waist-hip ratio index was determined by samples that met the inclusion and exclusion criteria. The degree of cellulite severity was determined using PCSS. Measurements were made after the patient signed an informed consent. The waist-hip ratio was measured at 9-10 am, 2 hours after breakfast. The WHR index was calculated using a measuring tape in an upright standing position with clothing removed. The results of the WHR index measurement were abdominal obesity ≥0.85 and not abdominal obesity <0.85.

Statistical analysis
The collected data will be analyzed statistically with the help of statistical software. The data were presented as descriptive data to see the description of the study variables. The relationship between the waist-hip ratio index and photonumeric cellulite severity scale on cellulite was then analyzed using the Gamma correlation test. The correlation coefficient obtained will be used to measure the strength of the correlation between the two variables.

RESULTS
In this study, the majority of the age of subjects in this study were aged 26–35 years, with 15 subjects (37.5%), followed by the 36–45 age range with 14 subjects (35%) and 18–25 with 11 subjects (27.5%). The youngest is 18 years old, and the oldest is 44. The demographic characteristics of the subjects are shown in Table 1. In this study, most of the subjects had a family history of cellulite; 33 subjects (82.5%) and 7 subjects (17.5%) did not have a family history of cellulite (Table 2).

The distribution of cellulite patients in women based on the degree of severity classified based on the PCSS criteria showed that subjects with mild severity were 20 subjects (50%), moderate severity were 17 subjects (42.5%), and those with severe severity were 3 subjects (7.5%) as shown in Table 3. Table 4 shows the results of the WHR index examination showed abdominal obesity (≥ 0.85) as much as 45%, while not abdominal obesity (< 0.85) as much as 55%.

We then analyzed them using the Gamma correlation test showing a significant relationship between the WHR index and PCSS (p< 0.001). The resulting correlation value is 0.948, meaning a positive correlation with a very strong degree of strength between the WHR index and the PCSS. An increase will follow an increase in the WHR index value in the PCSS score (Table 5).

Table 1. Distribution of Cellulite Patients by Age

<table>
<thead>
<tr>
<th>Age (year)</th>
<th>Subject (n)</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>18–25</td>
<td>11</td>
<td>27.5</td>
</tr>
<tr>
<td>26–35</td>
<td>15</td>
<td>37.5</td>
</tr>
<tr>
<td>36–45</td>
<td>14</td>
<td>35</td>
</tr>
<tr>
<td>Total</td>
<td>40</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 2. Characteristics of Cellulite Subjects Based on Family History

<table>
<thead>
<tr>
<th>Family History</th>
<th>Subject (n)</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>33</td>
<td>82.5</td>
</tr>
<tr>
<td>No</td>
<td>7</td>
<td>17.5</td>
</tr>
<tr>
<td>Total</td>
<td>40</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 3. Degree of Cellulite Severity Based on PCSS

<table>
<thead>
<tr>
<th>PCSS</th>
<th>n</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild (1–5)</td>
<td>20</td>
<td>50</td>
</tr>
<tr>
<td>Moderate (6–10)</td>
<td>17</td>
<td>42.5</td>
</tr>
<tr>
<td>Severe (11–15)</td>
<td>3</td>
<td>7.5</td>
</tr>
<tr>
<td>Total</td>
<td>40</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 4. WHR Index Values on Cellulite Subjects

<table>
<thead>
<tr>
<th>WHR Index</th>
<th>n</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdominal obesity (≥ 0.85)</td>
<td>18</td>
<td>45</td>
</tr>
<tr>
<td>No abdominal obesity (&lt; 0.85)</td>
<td>22</td>
<td>55</td>
</tr>
<tr>
<td>Total</td>
<td>40</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 5. Relationship between WHR Index and PCSS on Cellulite

<table>
<thead>
<tr>
<th>WHR Index</th>
<th>Mild n (%)</th>
<th>Moderate n (%)</th>
<th>Severe n (%)</th>
<th>r</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdominal obesity</td>
<td>2 (11.1)</td>
<td>13 (72.2)</td>
<td>3 (16.7)</td>
<td>0.948</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>No abdominal obesity</td>
<td>18 (81.8)</td>
<td>4 (18.2)</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>20 (50)</td>
<td>17 (42.5)</td>
<td>3 (7.5)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
DISCUSSION

Cellulite can be found in approximately 80–90% of post-pubertal girls of all races. Cellulite becomes evident with age. Irregularities in contour (e.g., loss of elasticity and laxity), which develop as women age, result from increased skin laxity, which causes the subcutaneous adipose tissue to start to loosen. Cellulite appears as a result of increased fat cells protruding into the dermis.

Table 1 shows that most of the subjects in this study were aged 26–35 years, with 15 subjects (37.5%). These results are consistent with a study conducted by Hexsel et al. in Brazil, with the results obtained in the form of an average age of 32-year-old cellulite patients ranging from 18–45 years. Then, a study conducted by Indriayani S et al. in Medan found that cellulite patients were in the age range of 20–30 years by 62.5%. This is also following a study conducted by Fovina A et al. in Medan cellulite sufferers were found at the age of 26–33 years by 30%.

33 respondents (82.5%) of the study’s participants had a history of cellulite in their families. According to study by Draelos et al. in the United States, cellulite is genetically determined by the pattern of fat deposition. This is consistent with German studies by Scherwitz et al. who discovered that women age and accumulate fat in the same places as their moms.

Emanuele et al.’s study discovered a genetic component to cellulite: women with cellulite have polymorphisms in the hypoxia-inducible factor 1A (HIF1A) and angiotensin-converting enzyme (ACE) genes (rs1799752 and rs11549465, respectively). In women with cellulite who have subcutaneous adipose tissue, it reduced the expression of adiponectin mRNA. Women who have the D-ACE allele are more likely to develop cellulite because this condition is characterized by an increase in angiotensin II production in the subcutaneous adipose tissue, which leads to abnormalities in blood flow, promotes adipocyte hypertrophy, extracellular matrix deposition, and the development of a complex of subcutaneous fibrous tissues. Increased HIF1A encourages angiogenesis, fibrotic processes, and local inflammatory responses in adipose tissue.

According to research by Fovina A. et al., there is a correlation between HIF-1 levels and cellulite, which suggests that having high HIF-1 levels increases the risk of cellulite by 4.8 times.

Table 3 shows the distribution of cellulite patients in women based on the degree of severity classified based on the PCSS criteria showed that subjects with mild severity were 20 subjects (50%), moderate severity were 17 subjects (42.5%) and with severe severity were 3 subjects (7.5%). The study by Hexsel et al. in Brazil obtained initial validation, which showed good intra-class correlation and consistency for the thighs and buttocks. The study by De La et al. found that proof that in a population of Spanish women also showed good intra-observer reliability and consistency against PCSS. Stevens et al. in Australia analyzed the severity of cellulite in women using PCSS and obtained the results of a study on 20 subjects with mild severity of 5%, moderate severity of 80%, and severe severity of 15%.

This study shows that the WHR index examination showed abdominal obesity (≥ 0.85) as much as 45%. Research conducted by Sipahutar et al. in Medan on 202 female subjects found that most women had an abdominal obesity index WHR value (≥ 0.85) as much as 50%. Furthermore, research conducted by Sengar et al. in India found that the majority of women had a WHR index of abdominal obesity (≥ 0.85) is 55%.

Based on the Gamma correlation test, our result shows a significant relationship between the WHR index and PCSS (p <0.001). Piérad et al. state that cellulite does not come from an increase in BMI but can be affected by the WHR index.

According to study by M. Berlan et al., women’s hips, thighs, breasts, and abdomens regulate fat differently than men do. The herniation of adipocyte lobules caused by hypertrophy and hyperplasia inside the structural CT compartment in females is explained by this disparity. Anti-lipolytic alpha-2 receptors and numerous insulin receptors are mostly found in the trochanteric region, hips, buttocks, thighs, and femoral areas of women. Its anti-lipolytic properties and promotion of lipogenesis increase the adipose tissue deposition in this area, contributing to cellulite.

CONCLUSION

It was established that there is a positive link between a very strong WHR index and the PCSS for cellulite based on the full study method conducted about the relationship between waist-hip ratio index with scale of photonomic cellulite severity on cellulite. The positive link suggests that the more severe the PCSS of cellulite, the greater the waist-hip ratio index.

AUTHOR CONTRIBUTIONS

The writing of this manuscript and the advancement of the research were equally shared by all writers.

FUNDING

This study was self-funded because as it did not obtain any funding from any private or public institution.

ACKNOWLEDGEMENTS

We would like to convey our gratitude to the Director of the Cosmetic Division of the Department of Dermatology and Venereology at the University of Sumatra Utara Faculty of Medicine as well as the hospital.

DISCLOSURE

With relation to the publishing of this paper, the author reports no conflicts of interest.

REFERENCES