

# Characteristics and Clinical Features of Patients with Lipedema in Saudi Arabia: A Cross-sectional Comprehensive Assessment

Khalid Alosaimi, MBBS  
candidate\*  
Hatan Mortada, MBBS†‡  
Feras Alshomer, MBBS, MSc,  
SB-Plast§

**Background:** Lower limb swelling presents a diagnostic challenge with diverse causes, including well-known issues like venous insufficiency and lymphedema, and less-understood conditions like lipedema. Lipedema, involving abnormal fat accumulation in the lower extremities, is frequently misdiagnosed, posing challenges for affected individuals. This research aimed to report and analyze the clinical features of patients presenting with the complaint of lipedema.

**Methods:** A retrospective cross-sectional study was conducted in Saudi Arabia from April to November 2023, involving adult patients from a specialized clinic in lipedema and lymphedema management. Data were collected through clinical evaluation and a comprehensive data collection sheet.

**Results:** In a cohort of 115 female patients (mean age: 38.58), the most common age for disease onset was around 20–29 years. Physical examinations revealed symmetric enlargement (88%), collar sign (43%), orthostatic nonpitting edema (49%), and telangiectasia (64%). Varicose veins were present in 36%, Stemmer signs in 2%, and foot edema in 13%. Clinical diagnosis with lipedema occurred in 71%, with grade 2 (31%) as the most common severity and type 3 (47%) as the prevalent disease type.

**Conclusions:** The current study, the first of its kind in the Middle East and specifically in Saudi Arabia, emphasizes the urgency of increased awareness and intervention due to a high underdiagnosis rate in lipedema. The observed complexity in symptoms and correlations between severity, lymphatic impairment, and body mass index underscore lipedema's multifaceted nature. Future research should explore regional and cultural influences and conduct larger studies to validate and recognize various lipedema features. (*Plast Reconstr Surg Glob Open* 2024; 12:e6173; doi: 10.1097/GOX.0000000000006173; Published online 18 September 2024.)

## INTRODUCTION

Lower limb swelling is a common clinical manifestation that can result from various underlying conditions,

ranging from benign to serious medical issues. It often presents a diagnostic challenge due to the diverse etiologies associated with this symptom.<sup>1</sup> Although some causes, such as venous insufficiency and lymphedema, are well established, others, like lipedema, remain underdiagnosed and poorly understood.<sup>2</sup>

Lipedema is a prevalent condition characterized by abnormal fat accumulation in the lower extremities, resulting in significant lower limb swelling. It affects a substantial number of adult women worldwide, with estimates suggesting up to 11% of women are impacted.<sup>3</sup> The defining features of lipedema include symmetrical and bilateral fat tissue accumulation in the legs, disproportionate leg swelling compared with the upper body, palpable nodular masses, easy bruising, and pain exacerbated by pressure.<sup>4</sup>

From the \*College of Medicine, King Saud University, Riyadh; †Division of Plastic Surgery, Department of Surgery, King Saud University Medical City, King Saud University, Riyadh, Saudi Arabia; ‡Department of Plastic Surgery and Burn Unit, King Saud Medical City, Riyadh, Saudi Arabia; and §Division of Plastic Surgery, Department of Surgery, King Abdulaziz Medical City, Ministry of National Guard—Health Affairs (MNG-HA), King Abdullah International Medical Research Center (KAIMRC), Riyadh, Saudi Arabia.

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In addition to lipedema, several related subcutaneous adipofascial disorders should be considered in the differential diagnosis of lower limb swelling. These include familial multiple lipomatosis, angiolipomatosis, Dercum disease, and multiple symmetric lipomatosis, each of which may present with similar symptoms, further complicating the diagnostic landscape.<sup>5</sup>

Even though lipedema is assumed to be a widespread illness, it is significantly underdiagnosed and sometimes confused with obesity or lymphedema due to overlapping symptoms.<sup>6</sup> The etiology of this disease is poorly understood, and only a small percentage of doctors are aware of the set of signs and symptoms that may be used to correctly diagnose it. As a result, women with lipedema are forced to navigate the maze of medical enigma and endure criticism from friends, family, doctors, and strangers alike.<sup>6</sup>

Distinguishing lipedema from lymphedema clinically can be challenging, particularly in later stages when the two conditions coexist. Therefore, it is crucial to consider signs such as skin thickening and a positive Stemmer sign (inability to pinch the skin of the proximal phalanx of the second or third toe, a sensitive predictor for primary and secondary lymphedema), which are typical of lymphedema, as well as, conversely, the existence of pain with pressure, nonpitting edema, and a positive collar/cuff sign (distal thickening of subcutaneous fat with a slender instep), which are characteristics of lipedema.<sup>7-9</sup>

Early detection allows patients to benefit from conservative treatments, such as physical therapy and compression clothing, which can help delay the progression of severe lipedema and alleviate its debilitating symptoms.<sup>6</sup> Therefore, there is a pressing need to comprehensively characterize and identify distinctive features of lipedema to improve detection, facilitate prompt diagnosis, and initiate appropriate therapies to minimize symptoms.<sup>10</sup>

Unfortunately, there is a scarcity of studies investigating the clinical features and patterns of patients presenting with lipedema, especially in the Middle East, including Saudi Arabia. Consequently, this study's primary objective is to report on the clinical features of patients who initially reported lower limb swelling, later diagnosed with lipedema, in addition to distinguishing the clinical characteristics that set lipedema apart from conditions with similar presentations.

## METHODS AND MATERIALS

### Patient Selection and Study Design

This retrospective cross-sectional study investigated the demographic, clinical, and disease-related characteristics of women presumed to have lipedema and presenting with lower limb swelling in Saudi Arabia from April to November 2023. Data were collected from adult Saudi women who visited a specialized lipedema and lymphedema clinic. A structured data collection sheet was used to extract demographic details, clinical histories, and symptoms (See appendix, Supplemental Digital Content 1, which displays the data collection sheet. <http://links.lww.com/PRSGO/D515>). Inclusion criteria were adults

### Takeaways

**Question:** How can we better understand and diagnose lipedema in women presenting with lower limb swelling?

**Findings:** In our retrospective cross-sectional study, we examined demographics, clinical characteristics, and disease-related aspects of women with presumed lipedema. Notably, a significant proportion had not been previously diagnosed, indicating underrecognition. The collar sign correlated with advanced lipedema stages, whereas its absence suggested milder disease. Additionally, familial predispositions and a lower diabetes prevalence were observed.

**Meaning:** Early recognition of lipedema's varied symptoms, familial predispositions, and clinical signs like the collar sign is crucial for timely diagnosis and intervention, highlighting the need for heightened awareness and future research.

with lower limb swelling as the chief complaint; exclusions were known secondary causes of swelling and nonconsenting participants.

### Ethical Considerations

The study adhered to ethical guidelines following the principles outlined in the Declaration of Helsinki. Ethical approval was obtained from the institutional review board and Research Ethics Committee. Informed consent was secured from all participants.

### Data Collection

Data were obtained using a well-constructed data collection sheet, developed by the authors in alignment with previous studies and the existing literature on lower limb swelling assessment. (Supplemental Digital Content 1, <http://links.lww.com/PRSGO/D515>.) Each participant underwent evaluation using the constructed data collection sheet by a specialized healthcare professional in the clinic.

The sheet recorded demographic and clinical information [age, body mass index (BMI), medical conditions, surgical interventions, weight loss management], disease onset and progression [diagnosis, family history, pain characteristics, thrombosis history, physical activity, effectiveness of manual lymphatic drainage (MLD) and compression stockings], and patient-reported signs (lack of volume reduction with weight loss, easy bruising, telangiectasia, pain with limb compression, heaviness, hypothermic skin, hypersensitivity, increased volume with prolonged standing, inability to wear compression bandages, improvement with extremity elevation, and changes in symptoms in relation to the menstrual cycle).

The upcoming "Clinical Signs and Characteristics" section describes findings from physical examinations, detailing the collar sign, edema distribution, telangiectasia, varicose veins, Stemmer sign, and foot edema. The diagnosis of lipedema, when achieved, was also documented. For patients in whom the diagnosis of lipedema

## GRADES OF LIPEDEMA

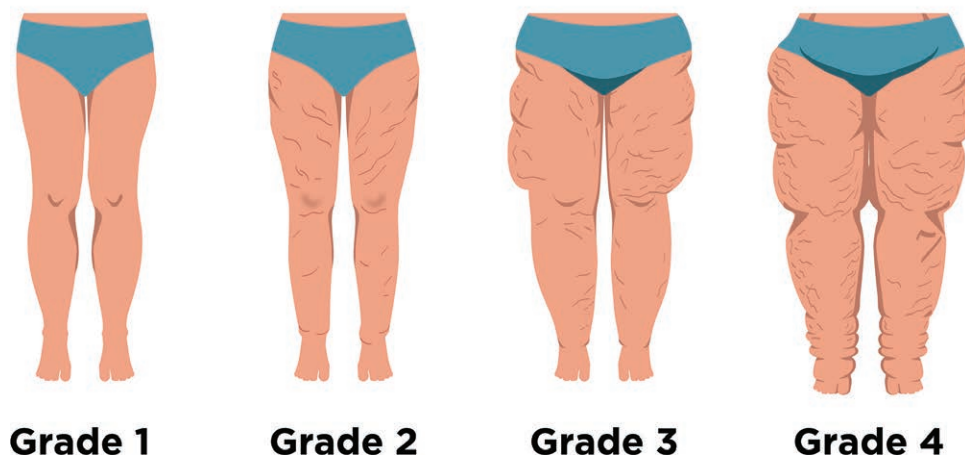


Fig. 1. An illustration depicting the grading for lipedema severity.

## TYPES OF LIPEDEMA

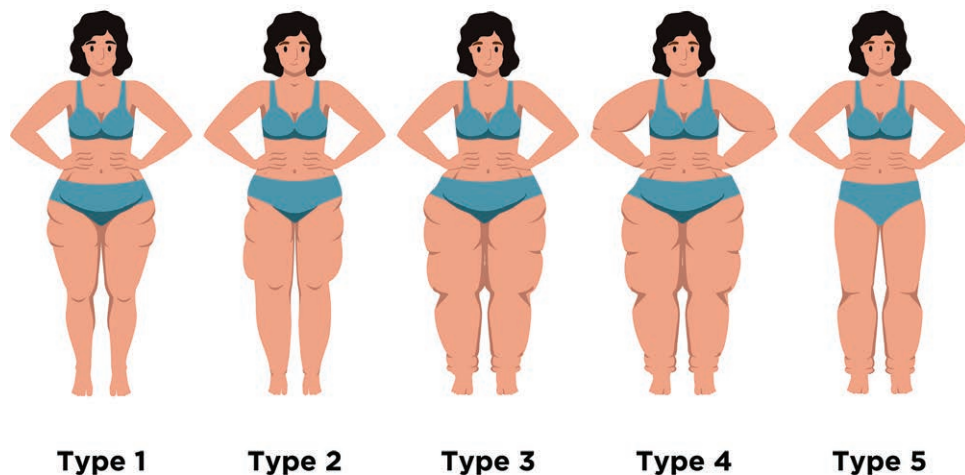


Fig. 2. An illustration depicting the types of lipedema.

was made, further investigations were conducted to rule out other causes of lower limb swelling, such as chronic venous insufficiency or lymphedema. These patients were excluded from the disease grades and types assessment.

The final section, disease grades and types, comprehensively assessed lipedema severity and extent. The grading system comprises four grades<sup>11</sup>: grade 1 is characterized by small palpable nodules and a smooth skin surface, grade 2 involves larger palpable nodules with an irregular skin surface, and grade 3 features larger nodules that are disfiguring with an irregular surface. Grade 4, known as lipo-lymphedema, represents the progression of lipedema to secondary lymphedema (Fig. 1). The classification system categorizes the extent of involvement,<sup>12</sup> where type 1

signifies involvement around the hip area, type 2 extends from the hips to the knees, type 3 encompasses the lower limb from the hips to the ankles, type 4 involves the arms and other areas, and type 5 exclusively involves the legs (Fig. 2).

### Statistical Analysis

Descriptive statistics were used to summarize demographic and clinical characteristics. Associations between variables were explored using appropriate statistical tests. The results were presented in a clear and comprehensible format to contribute valuable insights into the characteristics and clinical features of patients with lipedema-related lower limb swelling.

**Table 1. Demographics and Basic Characteristics (n = 115)**

Characteristics	N (%)
Trials of weight reduction interventions	
Medical only	6 (5%)
Surgical only	33 (28.6%)
Diet only	41 (35.6%)
Combination	11 (9.5%)
No trial of weight reduction	24 (21%)
Previous medical condition	
Hypothyroidism	19 (16%)
Migraine	7 (6%)
Varicose veins	12 (10%)
Diabetes Mellitus	2 (1.3%)
Medically free	49 (42.6%)
Other conditions	28 (24.3%)
Previous surgical intervention	
Sleeve gastrectomy	35 (30%)
Liposuction thighs/legs	21 (18%)
Cesarean section	20 (17%)
Abdominoplasty	12 (10%)
Cholecystectomy	12 (10%)
Surgically free	38 (33%)
Marital status	
Married	69 (60%)
Single	46 (40%)
Previous pregnancy	
Yes	81 (70%)
No	34 (30%)
Smoking	
Smoker	20 (17%)
Nonsmoker	95 (83%)
Allergies	
Has allergy	12 (10%)
No known allergies	103 (90%)

## RESULTS

### Demographics and Basic Characteristics

A total of 115 adult Saudi female patients were included in this study. The mean age was 38.58±9.15 years (range 20–66 years). The majority were obese, with a mean BMI of 30.5 kg per m<sup>2</sup> (range 21.3–41.4 kg/m<sup>2</sup>). The most common medical conditions were hypothyroidism (16%), varicose veins (10%), migraine (6%), and diabetes (1.3%). Participants pursued various weight loss interventions, including diet modification (35.6%); weight loss surgical intervention (28.6%), predominantly sleeve gastrectomy procedure; medication (5%); or a combination of these methods (9.5%). Reviewing surgical histories, sleeve gastrectomy emerged as the most frequent prior surgical procedure (30%), followed by liposuction of thighs/legs (18%), cesarean section (17%), abdominoplasty (10%), and cholecystectomy (10%). Notably, a substantial portion of participants (33%) had no history of prior surgery. Most participants were married (60%); 30% had never been pregnant; and among those who had, 13% had four pregnancies. The majority were nonsmokers (83%) and reported no known allergies (90%; Table 1).

### Disease Onset, Duration, and Progression

About 23% were previously diagnosed with lipedema. First signs of increased fatty tissue were noted at ages 20–29 (43%) and 30–39 (24%). The most common age groups for first signs of increased fatty tissue were around 20–29 years (43%) and 30–39 years (24%). Additionally, the onset of increased fatty tissue was frequently noticed by patients during life events such as puberty (49%), and pregnancy (22%), which were perceived as triggering events. Interestingly, post massive weight loss in (22%) of the patients was the time at which they noticed an abnormality with increased fatty tissue resistant to weight loss that was perceived as a notice to seek further attention. Initial affected sites included legs only (45%), whole lower limb (31%), or thighs only (19%). Nearly half (46%) had a family history, mostly affecting mothers or sisters. Over half (57%) had current pain, with an average severity of 6 of 10. The most common pain triggers were walking (28% of the cohort), activity/exertion (17%), and spontaneous pain (15%). Very few (7%) used analgesic medications for lipedema pain. Most (91%) had no thrombosis history. Of those with thrombosis, lower extremity DVT (4%) and PE (3%) were most common. Most patients reported being physically active (63%) with no activity limitations (69%). The majority (82%) had not tried MLD. Of those who tried MLD, 71% found it helpful for lipedema-related symptoms. The most commonly reported symptoms were lack of volume reduction with weight loss (78% of patients), easy bruising (77%), telangiectasia (74%), pain with limb compression (71%), and a feeling of heaviness in the limbs (67%). (See table, Supplemental Digital Content 2, which displays disease onset, duration and progression. <http://links.lww.com/PRSGO/D516>.)

### Clinical Signs and Characteristics

On physical examination, Symmetric enlargement of limbs was seen in 88% of patients, whereas asymmetric enlargement was seen in 12%. The collar sign was observed in 49 patients (43%). Nonpitting orthostatic edema was present in 56 patients (49%). Telangiectasia was present in 64%, and varicose veins in 36%. The Stemmer sign was positive in only 2% of patients. Foot edema was present in 13%, mostly nonpitting orthostatic edema with negative toe involvement, whereas 87% had no foot edema. Lipedema was clinically diagnosed in 82 patients (71%), whereas 33 patients (29%) were not diagnosed. Among the subset of 23% with a prior lipedema diagnosis (26 patients), 15% (4 patients) were mislabeled as having lipedema (Table 2).

### Disease Grades and Types

In terms of grading, grade 1 was assigned to 16 patients (14%), grade 2 to 36 patients (31%), grade 3 to 31 patients (27%), and grade 4 lipo-lymphedema was observed in five patients (4%), (Fig. 1). Regarding disease types, type 2 was identified in four patients (3%), type 3 in 54 patients (47%), type 4 in three patients (3%), and type 5 in 23 patients (20%), (Fig. 2, Table 3).

**Table 2. Clinical Signs and Characteristics (n = 115)**

Characteristics	N (%)
Symmetrical enlargement on inspection	
Present	101 (88%)
Absent	14 (12%)
Pain on pressure	
Present	55 (48%)
Absent	60 (52%)
Collar sign	
Present	49 (43%)
Absent	66 (57%)
Edema	
Nonpitting edema present	56 (49%)
No edema	59 (51%)
Telangiectasia or spider veins	
Present	74 (64%)
Absent	41 (36%)
Varicose veins	
Present	41 (36%)
Absent	74 (64%)
Stemmer sign	
Present	2 (2%)
Absent	113 (98%)
Foot edema	
Present	15 (13%)
Nonpitting hydrostatic edema	10 (9%)
Pitting edema	5 (4%)
Absent	100 (87%)
Lipedema diagnosis was made	
Yes	82 (71%)
No	33 (29%)

**Table 3. Disease Grades and Types (n=115)**

Grades of Lipedema	N (%)
Grade 1	16 (14%)
Grade 2	36 (31%)
Grade 3	31 (27%)
Grade 4 (lipolymphedema)	5 (4%)
Types of Lipedema	N (%)
Type 1	0 (0%)
Type 2	4 (3%)
Type 3	54 (47%)
Type 4	3 (3%)
Type 5	23 (20%)

## DISCUSSION

Addressing lower limb swelling requires a comprehensive consideration of potential etiologies. Discriminating between these causes demands careful attention to both patient history and thorough physical examination.<sup>13</sup> This is particularly critical for conditions like lipedema, where an accurate diagnosis is crucial. The current study aimed to report the demographics, characteristics, and clinical manifestations of lipedema in 115 adult female patients with lower limb swelling. The mean participant age was 38.58 years, with a predominant obesity profile. Notably, 77% of participants had not been previously diagnosed with lipedema, highlighting a significant gap in early detection. Literature indicates that about 33.7%

of patients undergo multiple evaluations to confirm their diagnosis, underscoring the challenges in recognizing this condition.<sup>14</sup> These statistics clearly depict the different phases of the diagnostic journey for lipedema, emphasizing the need for improved diagnostic strategies and educational efforts to better recognize and confirm the disease in clinical settings. Additionally, in the present research, 29% of participants were not clinically suspected to have lipedema, underscoring the diagnostic intricacies associated with this condition. This observation mirrors a trend identified in the aforementioned study, where 32.9% remained undiagnosed, collectively emphasizing the challenges in identifying and addressing lipedema within the medical community.<sup>14</sup>

In the current study, it was observed that 46% of participants reported a family history of similar swelling, predominantly in mothers and sisters. This finding aligns with the results from Carballeira Braña and Poveda Castillo, where 52.1% of participants had a verified family history of lipedema.<sup>14</sup> Furthermore, the study by Wold et al at Mayo Clinic found that 16% of participants had a family member with “large legs.”<sup>15</sup> These studies collectively emphasize the significant role of familial factors in the development of lipedema. Notably, 22% of the cohort reported that their lower limb swelling was only noticed following massive weight loss, initially attributing their limb enlargement to increased weight and BMI; however, when they experienced significant weight loss, the enlargement persisted, prompting a reconsideration of the initial diagnosis. This persistence of fatty lumps after weight loss highlighted the potential for lipedema as a diagnosis, underscoring a critical issue: both patients and healthcare providers may lack proper recognition of lipedema. Therefore, increased BMI should not be confused with lipedema, as the latter can be distinguished by associated symptoms such as pain, discomfort, and specific soft tissue changes not present in general lipodystrophy.

The current study's observation highlights that 57% of the cohort reported having pain related to lipedema, emphasizing the complex clinical presentation of this condition. This is consistent with the findings from the Mayo Clinic study by Wold et al, where 40% of participants complained of lower extremity pain, and the study by Carballeira Braña and Poveda Castillo in Spain, where 55.5% reported spontaneous pain.<sup>14,15</sup> The congruence of these findings emphasizes how common pain is and how important a role it plays in the clinical profile of lipedema patients.

Unexpectedly, the present study revealed a notably low prevalence of diabetes in the cohort at 1.3%, a significant contrast to the estimated local prevalence of diabetes in Saudi Arabia at 18.7%.<sup>16</sup> This finding aligns with observations from the study by Carballeira Braña and Poveda Castillo, where the observed prevalence of diabetes was 0.8% in Spanish women, contrasting with the overall prevalence of diabetes at 6.06%.<sup>14,17</sup> The observed discrepancy in diabetes prevalence between the general population and individuals with lipedema in both studies suggests a potential correlation between lipedema and a lower risk of diabetes.<sup>18</sup> Furthermore, a different study that examined

a different cohort with lipedema diagnosis discovered a diabetes mellitus proportion of just 4.7%, supporting the notion of a correlation between lipedema and a reduced risk of diabetes.<sup>19</sup> This is in harmony with evidence indicating that gynoid fat, as observed in lipedema, is negatively correlated with insulin resistance after accounting for total fat, as contrasting with abdominal fat.<sup>18,20</sup>

In the present study, the collar sign was observed in 43% of patients, providing insights into lipedema progression. Among those with the collar sign, 80% were classified as grade 2 or above, indicating advanced stages. In contrast, 68% of patients without the collar sign were categorized as grade 1 or none, suggesting milder severity. These findings highlight the collar sign's relevance as a potential indicator of disease progression. Furthermore, foot edema was identified in 13% of cases. Most instances involved nonpitting orthostatic edema with negative involvement of the toes, suggesting a gravitational influence. However, a notable subset, constituting 4% of cases, exhibited foot edema with pitting characteristics, indicating potential lymphatic impairment, and were associated with grade 4 lipedema, linking pitting foot edema with advanced stages of lipedema. This differentiation in edema types underscores the heterogeneity within the lipedema spectrum. In addition, the current investigation revealed grade 2 as the most prevalent severity, encompassing 31% of the cohort, whereas grade 4 lipolymphedema was identified in only 4%. Within this 4% subgroup diagnosed with lipo-lymphedema, a distinctive clinical profile emerged. All cases exhibited pitting foot edema, and almost half displayed a positive Stemmer sign. This subgroup also demonstrated a higher mean BMI, estimated at 43.4, ranging from 38.2 to 51.6. These findings collectively underscore a correlation between more severe lipedema manifestations, lymphatic impairment, and an increased BMI, providing valuable insights into the intricate interplay of these factors in the clinical presentation of lipedema. Moreover, the most common form of lipedema observed in our study cohort in Saudi Arabia was type 3, with significant involvement from the hips to the ankles. This type was particularly prevalent in grades 2 and 3, indicating a moderate to severe presentation with larger, irregular nodules here in our region.

This study underscores the need for increased awareness among healthcare professionals for early diagnosis and intervention. The high prevalence of undiagnosed cases highlights the necessity for standardized diagnostic criteria and improved medical education. Plastic surgeons face significant challenges in managing lipedema, extending beyond diagnosis to effective treatment. Differentiating lipedema from conditions like lymphedema or obesity is crucial for determining the appropriate surgical approach.<sup>21</sup> Procedures such as lymph-sparing liposuction require precision and a deep understanding of the pathological nature of lipedema fat.<sup>22</sup> This technique demands meticulous execution to avoid exacerbating the condition through trauma to the lymphatic vessels. Moreover, postoperative care involves complex wound management and ensuring patient compliance with compression therapy. Additionally, the psychological

impact on patients necessitates a balanced approach integrating clinical treatment with empathetic support and education.<sup>23</sup> This comprehensive strategy highlights the multifaceted role of plastic surgeons in addressing this often-misunderstood disease.

As this is the first-of-its-kind study in the Middle East, specifically in Saudi Arabia, we recommend future research to further investigate the prevalence, clinical manifestations, and cultural influences on lipedema in this region. Expanding on this foundation will refine diagnostic approaches and management strategies, benefiting diverse populations. Although this study was conducted in a single tertiary care center, it is important to note that the facility serves as a referral center for a diverse population from various regions across Saudi Arabia. This characteristic partly mitigates the limitation of a single-center study by incorporating a broader geographic representation into our cohort. In recognition of the limitations inherent in a single-center study, we advocate for future research directions that involve expanding the study to encompass multiple centers across different regions of Saudi Arabia. Such an expansion would enhance the representativeness of the data. Despite providing valuable insights, the study's retrospective design and lack of a control group highlight the need for future research with controlled designs to enhance robustness, validity, and reliability.

## CONCLUSIONS

In conclusion, the current study sheds light on critical aspects of lipedema, underscoring the urgent need for heightened awareness and intervention. The high underdiagnosis rate emphasizes the importance of recognizing varied symptom presentations and familial predispositions for timely and accurate diagnosis. The unexpectedly low prevalence of diabetes raises intriguing questions about potential associations with lipedema, warranting further exploration. The observed complexity in symptoms and the correlations between severity, lymphatic impairment, and BMI highlight the multifaceted nature of lipedema. Moving forward, future research should delve into regional nuances and cultural influences on lipedema prevalence and manifestations to authenticate and appreciate the diverse facets of this condition.

**Feras Alshomer, MBBs, MSc, SB-Plast**

Division of Plastic Surgery, Department of Surgery

King Abdulaziz Medical City

Ministry of National Guard—Health Affairs

Riyadh, Saudi Arabia

E-mail: [dr.fshomer@gmail.com](mailto:dr.fshomer@gmail.com)

Twitter: @feras\_shomer

Instagram: @feras\_alshomer

## DISCLOSURE

*The authors have no financial interest to declare in relation to the content of this article.*

## REFERENCES

- Ciocon JO, Fernandez BB, Ciocon DG. Leg edema: clinical clues to the differential diagnosis. *Geriatrics*. 1993;48:34–40, 45.

2. Fife CE, Maus EA, Carter MJ. Lipedema: a frequently misdiagnosed and misunderstood fatty deposition syndrome. *Adv Skin Wound Care*. 2010;23:81–92; quiz 93.
3. Földi M, Földi E, Strössenreuther RHK, et al. *Földi's Textbook of Lymphology: For Physicians and Lymphedema Therapists*. 3rd ed. Munich: Elsevier Urban & Fischer; 2012.
4. Herbst KL. Rare adipose disorders (RADs) masquerading as obesity. *Acta Pharmacol Sin*. 2012;33:155–172.
5. Herbst KL. Subcutaneous adipose tissue diseases: dercum disease, lipedema, familial multiple lipomatosis, and madelung disease. In: Feingold KR, Anawalt B, Blackman MR, et al., eds. *Endotext*. South Dartmouth, Mass.: MDText.com, Inc.; 2019. <https://www.ncbi.nlm.nih.gov/books/NBK552156/>. Updated December 14, 2019. Accessed April 14, 2024.
6. Buck DW, Herbst KL. Lipedema: a relatively common disease with extremely common misconceptions. *Plast Reconstr Surg Glob Open*. 2016;4:e1043.
7. Buso G, Depairon M, Tomson D, et al. Lipedema: a call to action! *Obesity (Silver Spring, Md.)*. 2019;27:1567–1576.
8. Caruana M. Lipedema: a commonly misdiagnosed fat disorder. *Plast Surg Nurs*. 2020;40:106–109.
9. Goss JA, Greene AK. Sensitivity and specificity of the stemmer sign for lymphedema: a clinical lymphoscintigraphic study. *Plast Reconstr Surg Glob Open*. 2019;7:e2295.
10. Shavit E, Wollina U, Alavi A. Lipoedema is not lymphoedema: a review of current literature. *Int Wound J*. 2018;15:921–928.
11. Herbst K, Mirkovskaya L, Bharhagava A, et al. Lipedema fat and signs and symptoms of illness, increase with advancing stage. *Arch Med*. 2015;7:1–8.
12. Munguia N, Herbst KL. Lipedema: abnormal female fat that just won't go away. Overview with treatment suggestions. *Pathways Mag*. 2016:5–8.
13. Gasparis AP, Kim PS, Dean SM, et al. Diagnostic approach to lower limb edema. *Phlebology*. 2020;35:650–655.
14. Carballeira Braña A, Poveda Castillo J. The advanced care study: current status of lipedema in Spain, a descriptive cross-sectional study. *Int J Environ Res Public Health*. 2023;20:6647.
15. Wold LE, Hines EA, Jr, Allen EV. Lipedema of the legs: a syndrome characterized by fat legs and edema. *Ann Intern Med*. 1951;34:1243–1250.
16. International Diabetes Federation. *IDF Diabetes Atlas*. 10th ed. Brussels: International Diabetes Federation; 2021. Available at: <https://diabetesatlas.org/atlas/tenth-edition/>. Accessed December 5, 2023.
17. Menéndez Torre EL, Ares Blanco J, Conde Barreiro S, et al. Prevalencia de diabetes mellitus en 2016 en España según la Base de Datos Clínicos de Atención Primaria (BDCAP). *Endocrinología, Diabetes y Nutrición*. 2021;68:109–115.
18. Torre YSD, Wadea R, Rosas V, et al. Lipedema: friend and foe. *Horm Mol Biol Clin Investig*. 2018;33:76–85.
19. Ghods M, Georgiou I, Schmidt J, et al. Disease progression and comorbidities in lipedema patients: a 10-year retrospective analysis. *Dermatol Ther*. 2020;33:e14534.
20. Pinnick KE, Nicholson G, Manolopoulos KN, et al; MolPAGE Consortium. Distinct developmental profile of lower-body adipose tissue defines resistance against obesity-associated metabolic complications. *Diabetes*. 2014;63:3785–3797.
21. Anne Warren Peled A, Kappos E. Lipedema: diagnostic and management challenges. *Int J Womens Health*. 2016;8:389–395.
22. Kruppa P, Georgiou I, Biermann N, et al. Lipedema—pathogenesis, diagnosis, and treatment options. *Dtsch Arztebl Int*. 2020;117:396–403.
23. Clarke C, Kirby JN, Smidt T, et al. Stages of lipoedema: experiences of physical and mental health and health care. *Qual Life Res*. 2023;32:127–137.