

Sposób cytowania / Cite Tomczyk J, Malara B. Assessment of the public's knowledge of cellulite and its reduction methods. *Aesth Cosmetol Med.* 2023;12(3):115-122. <https://doi.org/10.52336/acm.2023.015>

Assessment of the public's knowledge of cellulite and its reduction methods

Ocena poziomu wiedzy społeczeństwa na temat cellulitu i metod jego redukcji

ABSTRACT

Cellulite, commonly known as “orange peel”, is a common skin defect occurring especially among women.

Based on a survey, this study aimed to estimate the population of people struggling with cellulite. As the aetiopathogenesis of cellulite is complex (hormones, genetic factors, physical activity, diet), the respondents' lifestyles and their influence on the development of skin lesions were also analysed.

The public's knowledge of the characteristics of cellulite and its prevention is quite high but needs to be further improved. In the treatment of cellulite, regularity and a holistic approach including the use of cosmetic procedures supported by an appropriate diet and lifestyle are crucial.

Keywords: cellulite, lipodystrophy, cellulite reduction, anti-cellulite treatments, survey

STRESZCZENIE

Cellulit, potocznie nazywany „skórką pomarańczową”, jest powszechnie występującym defektem skóry zwłaszcza wśród kobiet.

W oparciu o badania ankietowe, celem pracy była próba oszacowania liczby osób zmagających się z cellulitem. W związku z tym, że etiopatogeneza cellulitu jest złożona (hormony, czynniki genetyczne, aktywność fizyczna, dieta) przeanalizowano także styl życia respondentów i jego wpływ na rozwój zmian.

Wiedza społeczeństwa na temat charakterystyki cellulitu oraz jego profilaktyki jest dość dobra, lecz wymaga w dalszym ciągu poszerzenia. W terapii cellulitu ważne są regularność oraz holistyczne podejście uwzględniające korzystanie z usług gabinetów kosmetycznych wsparte odpowiednią dietą i stylem życia.

Słowa kluczowe: cellulit, lipodystrofia, redukcja cellulitu, zabiegi antycellulitowe, ankieta

INTRODUCTION

Cellulite (lipodystrophy) is an adipose tissue disorder involving oedematous-fibrotic changes in the subcutaneous tissue. The problem is estimated to affect approximately 85-98% of women of different age ranges, while cellulite in men is very rare [1, 2]. The skin in the area affected by lipodystrophy is dry, lacking in elasticity, undulating and uneven, hence its comparison to an orange peel. Cellulite is not just an aesthetic defect of the skin. It contributes to disturbances in blood and lymph flow, which in turn leads to tissue hypoxia and swelling. The irregularities and

depressions observed on the skin are caused by an insufficient supply of nutrients to the tissues and metabolic disorders. It is worth noting that *cellulitis* is not an interchangeable name/synonym for the term cellulite, it refers to inflammation of the connective tissue caused by pathogens. Areas predisposed to cellulite in women include the thighs, buttocks, hips, abdomen, and shoulders, i.e. the areas with the highest concentration of adipose tissue, while in men the lesions are located, among others, on the neck and abdomen [3, 4].



CELLULITE

The unequivocal aetiopathogenesis of cellulite is not sufficiently understood, and it is known that many factors influence the occurrence of this condition. The main factors predisposing cellulite include gender, hormones, genetic factors, physical inactivity, inadequate diet, rich in processed foods, genetic diseases and medications [5]. The development of cellulite is also influenced by co-morbidities related to, among other things, endocrine disorders, changes in the microcirculation and impairment of the lymphatic system.

Due to its various features and characteristics, cellulite can be classified by:

- lesion severity based on clinical presentation: scale I-IV;
- the type of structure in terms of its substrate: aqueous or lipid;
- form: hard, flaccid, oedematous, mixed;
- the stage of the lesions according to the histopathology: scale I-IV [4, 6, 9].

A very important element of cellulite therapy is a regular treatment to improve microcirculation and stimulate lipolysis. Depending on its form, degree of progression and financial possibilities, the following treatments are the most frequently proposed: lymphatic drainage, electrostimulation, carboxytherapy, cryolipolysis, laser therapy, cavitation liposuction (ultrasound), manual and vacuum massage, needle mesotherapy, radiofrequency (radio waves), treatment with the so-called 'anti-cellulite iron', peelings [1,3,10-13].

THE AIM OF THE STUDY

The aim of the study was to assess the public's knowledge of cellulite, and methods of cellulite reduction and to estimate the number of people struggling with cellulite.

MATERIAL AND METHOD

A self-administered questionnaire was prepared on 28 November 2022 in an online Google form and a paper version was used as the material for the study. Participation in the survey was anonymous and voluntary. The survey questionnaire consisted of 27 questions assessing the respondents' level of knowledge about cellulite and contemporary methods of cellulite reduction. The questions in the survey were single or multiple-choice. The survey was conducted among both adult women and men in different age groups: under 25, 25-35, 36-45, 46-55, 56-65 and over 65. All questionnaires were completed correctly.

The first part of the questions concerned gender, age, education, residence and work mode, i.e., questions about socio-demographic characteristics. In the next part of the questionnaire, respondents were asked to provide their range of BMI (*body mass index*) values and the degree and location of cellulite. Respondents were also asked to provide information

on their physical activity and diet. The questionnaire then asked about the respondents' knowledge of lipodystrophy, factors contributing to its formation, body-shaping treatments and ingredients in anti-cellulite preparations. The criterion for assessing respondents' knowledge was the correctness of the questionnaire's answer choices in terms of content, based on the latest literature. The final part of the questionnaire investigated the frequency of use of cellulite-reducing treatments at the beauty salon.

RESULTS

A total of 140 people took part in the survey, including 114 women (81.4% of respondents) and 26 men (18.6% of respondents). The largest group, as many as 37.1% of respondents, were adults under 25 years of age, followed by those in the 25-35 age range (23.6% of respondents). In contrast, the smallest group among respondents was the over-65 years old (16.4% of respondents). When analysing the age of respondents and gender, it can be seen that the female gender predominated in each age group. Men constituted a smaller study group, with a predominant age of under 25 years (34.6%).

Respondents were asked to indicate on the questionnaire whether they had cellulite and the degree of cellulite according to the clinical scale (I to IV). A significant proportion of people (80%) declared that they struggled with cellulite. The absence of cellulite was declared by 20% of respondents. The majority of women surveyed (93%) had cellulite, while among all men, 30% of respondents declared having cellulite. Grade I, i.e., "cellulite is only visible when the skin is significantly pressed, the skin is apparently smooth", was marked by a total of 25.7% of respondents (including 28.9% of women and 11.5% of men). In contrast, grade II, "cellulite is visible when the skin is compressed, muscles are tightened or when standing, the skin is less elastic when lying down appears smooth" was marked by a total of 47.1% of respondents (including 55.3% of women and 11.5% of men). Grade III, "cellulite lesions are visible in any position, in addition to lumps and soreness when touching" was marked by 8.8% of respondents, including women alone. Grade IV, "typical cellulite lesions are visible on the skin, thickening formed by the combination of many micro lumps, visible in any body position" did not occur among respondents (Figure 1).

Analysing, in turn, the severity of cellulite according to the age of the respondents, it can be seen that all respondents aged up to 65 years most frequently stated that they suffered from grade II and grade I cellulite. Grade III cellulite was the least frequent in this group. On the other hand, when analysing the responses of those aged 65 and over, the vast majority of respondents declared that they had no cellulite

and grade III cellulite. Not a single person taking part in the study had grade IV cellulite (Figure 2).

Respondents were also asked to provide a range of values for their BMI (*body mass index*). Based on the results, the relationship

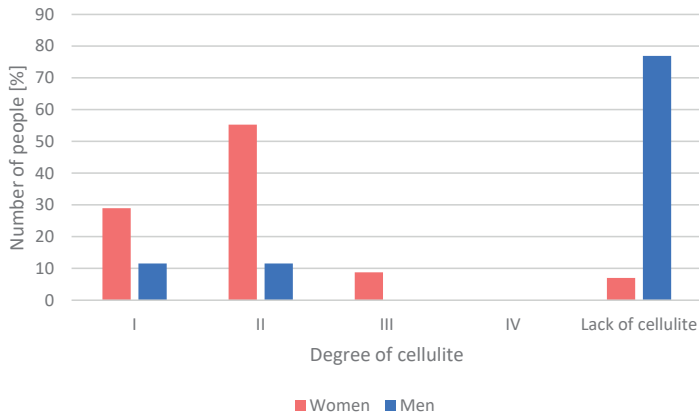


Figure 1 Cellulite severity by gender
Source: own elaboration

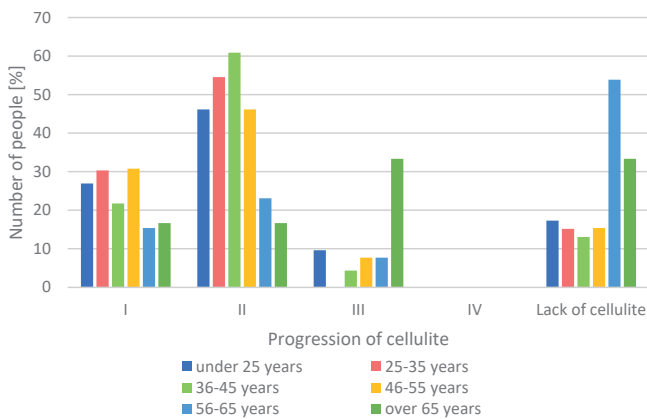


Figure 2 Cellulite severity by age of respondents
Source: own elaboration

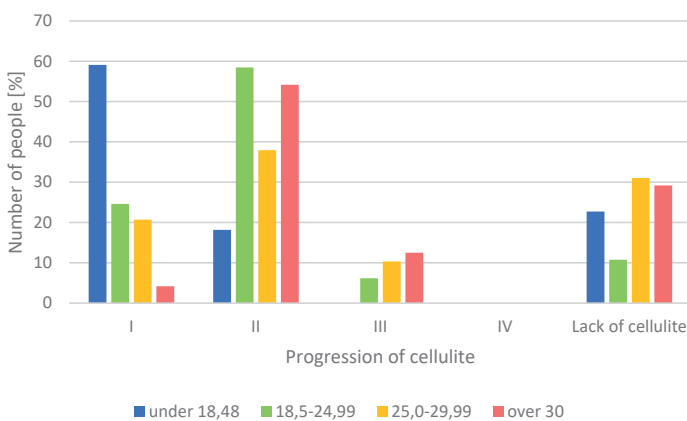


Fig. 3. Relationship between cellulite severity and respondents' BMI value
Source: own study

between BMI and cellulite severity was examined. BMI was also analysed according to the gender of the respondents. Women respondents most often declared that their BMI was between 18.5 and 24.99 (40.7% of respondents) and below 18.49 (15% of respondents). The largest group of male respondents answered that their BMI was in the range 25.0-29.99 (7.1% of respondents) and 18.5-24.99 (5.7% of respondents). Those with a very low BMI (below 18.49) were underweight, with Grade I cellulite predominating in this group (59.1%). A total of 22.7% of the respondents marked the absence of cellulite (a large part of this group were women- 83.3%). In contrast, no underweight person selected grade III cellulite, and grade IV cellulite did not occur in anyone among all respondents.

In contrast, respondents with a normal body weight according to the BMI scale (18.5-24.99) were most likely to describe their cellulite as grade II (58.5%). Grade III cellulite was the least frequent in this group (6.2%). Overweight respondents (BMI 25.0-29.99) mainly struggled with type II cellulite (37.9%), type III cellulite in this group accounted for 10%. 31% of overweight respondents had no cellulite (a large proportion of this group were men- 88.9%). The last group of respondents consisted of people with obesity of I, II and III degree according to BMI (above 30.0), in whom lipodystrophy of stage II severity (54.2%) predominated (Figure 3).

Respondents were asked about the location of cellulite on their body. The most common locations of lipodystrophy among respondents were the thighs (88.4%) and buttocks (66.9%). The hips (17%) and abdomen (13.4%) were chosen by far fewer respondents. In contrast, the majority of respondents were least likely to have cellulite on their arms (6.3%). Women most often declared that their cellulite covered their thighs (47%), buttocks (37.5%) and hips (8.7%). In men, on the other hand, lipodystrophy was mainly located on the buttocks (37.5%), thighs (25%) and abdomen (25%) (Figure 4).

How the level of cellulite severity affected respondents' feelings of discomfort was also analysed. Those with stage I cellulite mostly declared that they had no discomfort in their daily life (66.7%). From the analysis of the collected material, those with stage II (21.2%) and stage III (44.4%) cellulite were significantly more likely to feel discomfort from having cellulite than those with stage I cellulite (2.8%) (Figure 5).

In the following questions, respondents were asked to specify the frequency with which they practise sports, eat sweets and eat fast food (e.g. burgers, casseroles, pizza). In the physical activity question, respondents most frequently chose the answer "several times a week" (28.6%), while the least frequent option was "every day" (7.9%). On the other hand, when analysing the physical activity of the respondents in relation to the degree of cellulite, it can be seen that those without cellulite are the most likely to exercise several times a week (39.3%). On the other hand, those classifying their cellulite in stage III most often exercise rarely (30%) or not at all (30%) (Table 1).

In contrast, the majority of respondents declared consuming sweets "several times a week" (38.6%) and "every day" (29.3%). Only 1% of respondents did not consume sweets. The frequency of sweet consumption was also analysed in relation to the stage of cellulite severity. Those with no cellulite were most likely to consume confectionery daily (32.1%) or several times a week (32.1%). In contrast, respondents struggling with stage III cellulite mainly consumed sweets a few times a week (40%). Respondents admitted that they consumed fast food meals rarely (32.9%) or "several times a month" (31.4%). Considering the frequency of consumption of processed foods in relation to the severity of cellulite, it can be seen that respondents without cellulite ate these types of meal rarely (39.3%) or not at all (21.4%). Of all respondents, no one ate fast food every day (Figure 6, Table 1).

Respondents were also asked about the amount of water they drank per day. The analysis of the collected material showed that more than 41% of the respondents drank less than 1.5 litres of water per day. 36.4% of respondents drank 1.5-2 litres of water per day, while 8.6% of respondents drank 2 litres of water per day. A further 13.6% drank more than 2 litres of water every day. In turn, when analysing the severity of cellulite in relation to the amount of water drunk per day, it can be seen that those without cellulite drank the most water per day (more than 2 litres per day) (23%). In contrast, respondents with stage III cellulite drank the least litres of water per day (50%) (Figure 7).

The survey form also included questions to test respondents' knowledge of cellulite. More than half of all respondents (58.6%) indicated that cellulite is an adipose tissue disorder and consists of oedematous-fibrotic changes in the subcutaneous

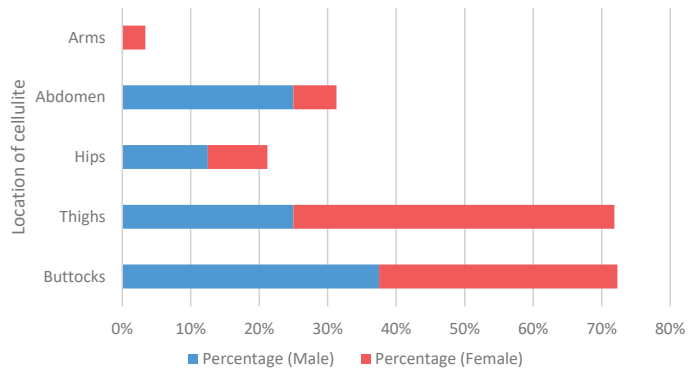


Figure 4 Locations of cellulite among respondents

Source: own elaboration

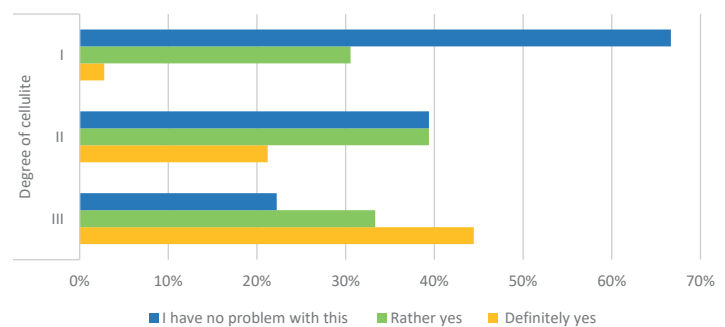


Figure 5 Relationship between cellulite severity and respondents' feelings of discomfort

Source: own elaboration

Table 1 Frequency of sports, sweets and fast food consumption by respondents in relation to cellulite severity

		Degree of cellulite				Number of people [%]
		III	II	I	No cellulite	
Physical activity	Daily	10.0%	1.5%	18.5%	14.3%	
	Once a week	10.0%	13.8%	22.2%	10.7%	
	Several times a week	10.0%	27.7%	3.7%	39.3%	
	Several times a month	10.0%	20.0%	3.7%	7.1%	
	Less frequently	30.0%	15.4%	22.2%	7.1%	
	Not at all	30.0%	21.5%	29.6%	21.4%	
Consumption of sweets	Daily	10.0%	25.0%	27.8%	32.1%	
	Once a week	10.0%	16.7%	11.1%	10.7%	
	Several times a week	40.0%	46.7%	36.1%	32.1%	
	Several times a month	20.0%	10.0%	19.4%	7.1%	
	Less frequently	20.0%	1.7%	5.6%	14.3%	
	Not at all	0.0%	0.0%	0.0%	3.6%	
Eating fast food	Daily	0.0%	0.0%	0.0%	0.0%	
	Once a week	10.0%	25.8%	22.2%	14.3%	
	Several times a week	10.0%	6.1%	5.6%	10.7%	
	Several times a month	40.0%	34.8%	36.1%	14.3%	
	Less frequently	40.0%	28.8%	33.3%	39.3%	
	Not at all	0.0%	4.5%	2.8%	21.4%	

Source: own elaboration

tissue. Slightly fewer, 25.7% of respondents could not identify the correct definition of cellulite from the answers given. A small percentage of respondents (9.3%) defined cellulite as a condition of muscle tissue. 6.4% of respondents said that cellulite is a condition of

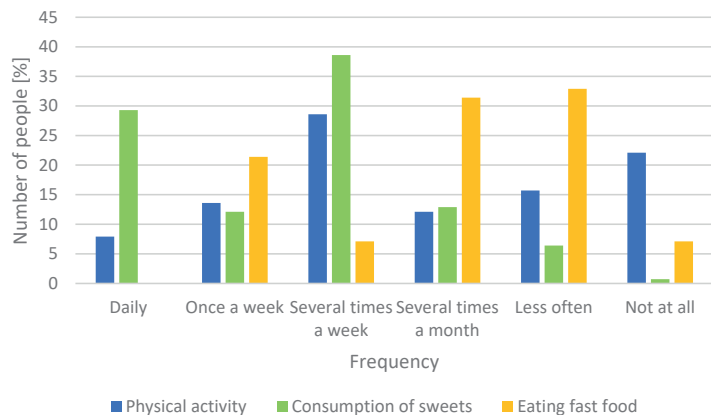


Figure 6: Frequency of sports, sweets and fast food consumption by respondents

Source: own elaboration

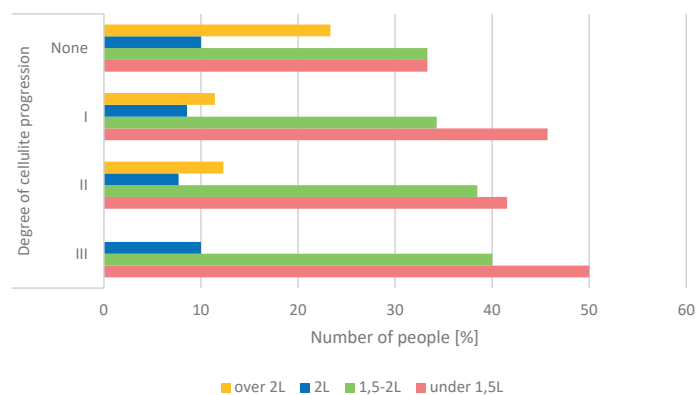


Figure 7: Ratio between the amount of water drunk per day by respondents and the severity of cellulite

Source: own study

Table 2: Summary of the most frequently chosen anti-cellulite treatments by respondents

Type of anti-cellulite treatment	Answers	Percentage of responses
Endermology	5	17.2%
Cryolipolysis	4	13.8%
Carboxytherapy	2	6.9%
Cavitation liposuction	4	13.8%
Needle/micro-needle mesotherapy	2	6.9%
Anti-cellulite massage	6	20.7%
Body wrapping/bandaging	2	6.9%
Electrostimulation	2	6.9%
Radiofrequency (RF)	2	6.9%
Laser therapy	0	0.0%
Total	29	100%

Source: own elaboration

adipose tissue and is manifested by erythematous and papular changes of the subcutaneous tissue. In contrast, the next survey question asked respondents whether the terms cellulite and *cellulitis* meant the same condition. 15% of respondents said that the terms were synonymous and described the same skin defect. As many as 42.9% of respondents held the opposite opinion, while 41.4% had no knowledge.

Respondents in the next multiple-choice question were asked to indicate which factors they thought contributed to the formation of cellulite. The percentage of total responses accounted for by the factor selected by respondents was then investigated. 15.2% were genetic factors, 17% gender, 16.7% hormones, 19.2% diet, 16.9% physical activity, 12.5% co-morbidities. 2.5% of respondents were unable to indicate which factors influence the development of lipodystrophy.

The next questions posed to the respondents concerned the use of anti-cellulite treatments at the beauty salon. The results indicated that only 9.3% of respondents (women only) had used treatments to reduce lipodystrophy, while the vast majority (90.7%) had not attended this type of treatment. Respondents were asked to select the treatments they had used to reduce cellulite. After analysing what percentage of all possible answers represented a particular type of treatment, it can be seen that respondents most frequently used anti-cellulite massage (20.7%), endermology (17.2%) and cryolipolysis (13.8%). No one used laser therapy among all respondents (table 2).

Respondents were also asked how often they attended selected anti-cellulite treatments. More than half of people (53.8%) rarely used this type of treatment, 23.1% of respondents ticked the answer once a month and the same number (23.1%) answered several times a year.

The cited data report that 38.5% of respondents noticed a definite improvement in their skin condition (elimination of cellulite) after anti-cellulite treatments. In contrast, 23.1% of respondents tended to notice a reduction in cellulite. 13.1% of respondents found it difficult to had a clear opinion on this issue. On the other hand, as many as 15.4% did not notice a reduction in cellulite after the treatments.

Respondents who did not attend anti-cellulite treatments at a beauty salon were asked why they did not use such services. It was determined that what percentage of all replies were provided as a cause for not attending treatment. The analysis of

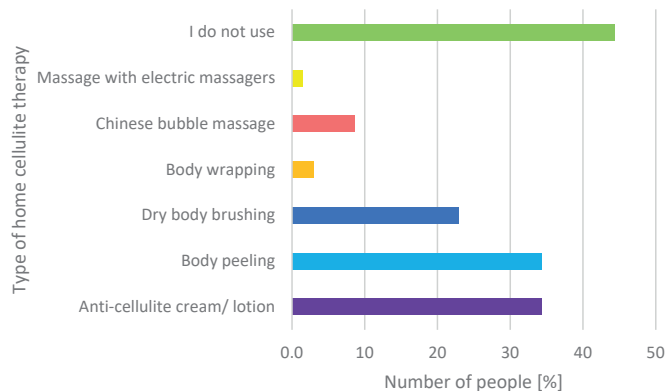


Figure 8 Types of home cellulite treatments used by respondents
Source: own elaboration

Table 3 Respondents' reasons for not attending anti-cellulite treatments

Reasons for not attending anti-cellulite treatments	Answer	Percentage of responses
Treatments too expensive	45	31.9%
Lack of time	28	19.9%
No such need	64	45.4%
Lack of interesting treatments in nearby beauty salons	4	2.8%
Total	141	100%

Source: own elaboration

the data showed that 45.4% of the respondents had no need for cellulite-reducing treatments. On the other hand, 31.9% avoided treatment centres due to the high price of the treatments. On the other hand, 19.9% of respondents did not use body shaping treatments due to a lack of free time. Only 2.8% of respondents cited the reason: "lack of interesting treatments in nearby beauty salons" (table 3).

Another part of the questions from the survey form concerned the use of home therapies to reduce cellulite. Of all the responses, the most common choices were anti-cellulite cream/ lotion (34.3%), body scrub (34.3%) and dry body brushing (22.9%). In contrast, the majority of respondents were least likely to use electric massagers (1.4%), body wrapping (2.9%) and Chinese bubble massage (8.6%). A large proportion of people (44.3%) admitted that they do not use home anti-cellulite therapy (Figure 8). The results indicate that only 6.4% of the respondents used home cellulite reduction measures regularly, while 47.1% of the respondents did so irregularly.

In order to assess respondents' satisfaction with the use of home cellulite reduction methods, a question was included in the survey regarding the improvement in skin condition after home treatments. Respondents were given a choice of four response options: definitely yes, rather yes, no, don't know. Responses indicated that the vast majority of respondents noticed an improvement in their skin condition (53.7%), a further 19.5% of respondents did not perceive a reduction in cellulite and 48.8% "don't know" if cellulite was reduced after using home therapy.

DISCUSSION

The study analysed an assessment of the public's knowledge of cellulite and methods to reduce it, and estimated the number of people struggling with cellulite. It was also important to find out about the physical activity and diet of the people surveyed.

The analysis of the material taken shows that cellulite was present in the majority of women (93%), while it was much

less common in men (30%). This confirms previous reports of gender differences in the incidence of lipodystrophy described in scientific publications by, among others, Piotrowska et al. 2021 and also G. Arora et al. 2021. Cellulite affects almost all women after puberty, whereas few men have lesions characteristic of lipodystrophy [14, 15].

A detailed analysis of the results of our study shows that cellulite was most common in men and women at grade II and grade I. No grade IV cellulite was observed in any of the individuals, allowing us to conclude that there is no need for medical treatment in these individuals to reduce lipodystrophy. The respondents should seek advice from a cosmetologist and use professional anti-cellulite treatments to shape their figures.

After analysing the results obtained from the questionnaires, it was noted that cellulite in respondents was most frequently located on the thighs and buttocks, while it was least frequently located on the arms. The research indicates that these are the areas of adipocyte clusters responsible for fat accumulation, which leads to the formation of micro-tumours and cellulite formation.

Based on the data, it can be concluded that lipodystrophy contributes to increased psychological discomfort and reduced quality of life in the subjects. This is confirmed by the results of a 2014 study in a group of 70 women by Migasiewicz et al. which unequivocally shows that feelings of discomfort increase with increasing cellulite severity [16].

Physical activity and nutrition were also addressed in this study. The majority of respondents too rarely play sports, with only 7.9% of respondents exercising daily. In contrast, almost all respondents consume sweets, with only 1% of respondents having none in their diet. Fast food is popular among respondents, as much as 31.4% eat it several times a month. An unhealthy diet and too little physical activity contribute to the development of cellulite. It has long been reported in the literature that an improperly balanced diet, lack of exercise

and proper hydration contribute to the development of cellulite [1,3].

Our own research showed that the knowledge of cellulite among the majority of respondents was quite high (according to the adopted criteria– on the basis of factual knowledge according to the latest literature). More than half of the respondents were able to indicate the correct definition of lipodystrophy. On the other hand, as many as 41.4% of respondents did not know whether the terms cellulite and *cellulitis* meant the same condition. This requires the spread of knowledge regarding the streptozotocin-induced dermatological disease.

In general, it can be concluded that the respondents are able to list the factors influencing the formation of cellulite. Their knowledge of the chosen body shaping procedure– cavitation liposuction, is sufficient in more than half of the respondents. Although a large percentage of those surveyed have adequate knowledge of cellulite, the public needs to be further educated about the characteristics of cellulite, its prevention and anti-cellulite treatments. As a thorough analysis of the results showed, a small percentage of respondents (9.3%) had used cosmetology clinics for cellulite reduction. Anti-cellulite massage, negative pressure massage and cryolipolysis were popular among respondents attending treatments. The majority of respondents declared a lack of satisfactory results from anti-cellulite therapy, which was probably due to a lack of regularity in attending their chosen treatments. In order to obtain satisfactory results in reducing cellulite lesions, it is necessary to attend body shaping treatments in a series selected individually to the client's needs and with appropriate time intervals, e.g. endermology in a series of 10-15 treatments, every 2-3 days. Without regularity and appropriate frequency, no treatments will bring the expected results. Research carried out by female graduates of the UITM in Warsaw shows that female respondents using anti-cellulite massages in a series (min. 2) mostly noticed an improvement in their skin condition and cellulite reduction.

Respondents who attended cellulite-eliminating massages (e.g. endermology, Chinese bubble) in a series of 10 treatments noticed satisfactory results [17].

The answers that respondents gave on why they do not use anti-cellulite treatments indicate that most respondents do not feel the need to use this type of procedure. A large number of people do not use the services of cosmetic surgeries due to high prices and lack of sufficient free time. It can be assumed that a reduction in the prices of services, as well as increased marketing of the effectiveness of anti-cellulite treatments, could contribute to a multiplication of clients in beauty parlours. Analysing the results of the questionnaire, it can be seen that a significant percentage of respondents did not use adequate home care or did, but without the recommended

regularity. On the other hand, more than half of those who used anti-cellulite cosmetic preparations noticed satisfactory results of the therapy, which allows us to conclude that regular home care makes it possible to reduce or completely reduce the 'orange peel'. People with cellulite should attend anti-cellulite treatments adapted to the severity of their cellulite and follow their cosmetologist's recommendations for home care.

CONCLUSIONS

Based on the questionnaire survey, it can be concluded that knowledge of the characteristics of cellulite and its prevention among the public is quite good, but still needs to be improved. Cellulite is much more common among women than men. Stage I and II cellulite predominate in modern society. Cellulite is most commonly located on the thighs and buttocks, while it is least common on the arms. Research shows that as the stage of cellulite increases, so does the feeling of psychological discomfort. Adequate drinking of water throughout the day (about 2 litres) and frequent physical activity (several times a week) can be an important part of cellulite prevention. A small number of people use or have used irregularly the services offered by beauty parlours.

SUMMARY

The results of the survey indicate that cellulite is a common skin defect, mainly among women. In order to prevent its exacerbation, cellulite prevention methods should be promoted, such as proper diet, hydration, physical activity and increased knowledge of cellulite. In the treatment of cellulite, regularity and a holistic approach including the use of beauty parlours supported by a proper diet and lifestyle are important. Such measures help to reduce cellulite and maintain firm and supple skin.

REFERENCES / LITERATURA

1. Bojarska-Hurnik S. Lipodystrofia - przyczyny i możliwości terapeutyczne. *Kosmetologia Estetyczna*. 2019;5(8):623-630.
2. Tokarska K, Tokarski S, Woźniacka A, et al. Cellulite: a cosmetic or systemic tissue? Contemporary views on the etiopathogenesis of cellulite. *Adv Dermatol Allergol*. 2018;35(5):442-446.
3. Janda K, Tomikowska A. Cellulit - przyczyny, profilaktyka, leczenie. *Roczniki Pomorskiej Akademii Medycznej w Szczecinie*. 2014;60(1):29-38.
4. Marwicka J, Niemyska K, Cieślicka O. Cellulit przegląd zabiegów kosmetycznych. *Kosmetologia Estetyczna*. 2015;3(4):301-308.
5. Szczepańska P, Zakrzewski L, Michalska A, et al. Przyczyny występowania cellulitu. *Farm Pol*. 2020;76(12):686-691.
6. Gemza K, Surgiel-Gemza A. Wielokierunkowe działanie zabiegu karboksyterapii w walce z mechanizmami wywołującymi cellulit. *Kosmetologia Estetyczna*. 2018;3(7):317-322.
7. Kononowicz W. Tkanka podskórna. Charakterystyka oraz metody niwelowania i zastosowania tkanki tłuszczowej w kosmetologii i medycynie estetycznej. *Aesth Cosmetol Med*. 2020;9(4):353-362.

8. Domagalska M. Wpływ liposukcji ultradźwiękowej na redukcję cellulitu. Dieta jako element terapii. *Aesth Cosmetol Med.* 2021;10(3):157-166. <https://doi.org/10.52336/acm.2021.10.3.09>
9. Frandofert M, Goździalska A, Jaśkiewicz J. Lipodystrofia jako problem czasów współczesnych. In: Goździalska A, Jaśkiewicz J, eds. *Współczesne Kierunki w Medycynie Prewencyjnej*. Kraków: Oficyna Wydawnicza AFM; 2013:103-112.
10. Skiba M, Urbańska M, Kus K, et al. Ocena skuteczności i kosztów terapii antycellulitowej przeprowadzonej w gabinecie kosmetycznych. *Polski Przegląd Nauk o Zdrowiu.* 2018;3(56):322-327.
11. Yu V, Juhász MLV, Mesinkovska NA. Subcutaneous Radiofrequency Microneedling for the Treatment of Thing Skin Laxity Caused by Weight Loss: A Case Study. *J Clin Aesthet Dermatol.* 2019;12(6):60-62.
12. Migasiewicz A, Bauer J, Cizek A, et al. Zastosowanie niskich temperatur w dermatologii i kosmetologii. *Kosmetologia Estetyczna.* 2018;7(1):53-55.
13. DiBernado B, Sasaki G, Katz B, et al. A Multicenter Study for Cellulite Treatment Using a 1440-nm Nd:YAG Wavelength Laser with Side-Firing Fiber. *Aesthet Surg J.* 2016;36(3):335-343.
14. Arora G, Patil A, Hooshanginezhad Z, et al. Cellulite: presentation and managment, *J Cosmet Dermatol.* 2021;21(4):1393-1401.
15. Piotrowska A, Czerwińska-Ledwig O. Analiza działania jednorazowego zabiegu wibroterapii na wybrane cechy skóry, skład i obwody ciała kobiet z lipodystrofią. *Aesth Cosmetol Med.* 2021;10(2):79-85. <https://doi.org/10.52336/acm.2021.10.2.07>
16. Migasiewicz A, Sobańska A, Dereń E, et al. Komputerowo wspomagana ocena skuteczności terapii cellulitu na podstawie obrazowania termograficznego. *Acta Bio-Optica et Informatica Medica.* 2017;2(23):87-95.
17. Kurpiewska E, Sadzińska E, Wedman A. Skuteczność masażu w redukcji cellulitu, *Studenckie Zeszyty Naukowe - Kosmetologia Wyższa Szkoła Inżynierii i Zdrowia w Warszawie.* 2016;1(1):119-136.

received / otrzymano: 12.05.2023 | corrected / poprawiono: 19.05.2023 | accepted / zaakceptowano: 30.05.2023