



RESEARCH ON EXAMINING THE REQUIREMENTS FOR SHOES FOR FEMALE DIABETIC IN VIETNAM

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Abstract:

This article presents the studying results of surveying 301 female diabetics about the request of their shoes into: shoe type, shoe kind and shape, the dimension and shapes of shoe's details, the bottoming assembly method, the materials and the comfort of the shoes. The study results show that: popular shoes for female diabetics are open shoes, low-necked with Velcro, low heel from 20mm to 25mm, high toe spring from 10mm to 15 mm, and large, high and oval toe part. Materials usually chosen are: The shoe uppers part mainly from leather; shoe upper lining and insole from antibacterial fabric, sole from porous materials such as foam rubber, EVA foam, PU foam. Most diabetic women surveyed selected following criteria: soft shoes, elastic, fit feet to create comfort while moving. The study results are the base to build the requirement about structure and materials for designing and making special shoes for female diabetics in Vietnam.

Keywords: Diabetics, diabetics shoe, diabetics female shoe.

1. The rationale

Diabetes usually causes a lot of complications which are foot pain, foot calluses, foot distortion, foot or leg amputation, and foot ulcers [5]. Shoes are vital for diabetics which helps prolong the life expectancy of diabetics. However, the unreasonable use of shoes (a bad fit) also causes foot ulcers. Researches in the world show that: the proportion of foot ulcers caused by shoe trauma makes up 54,0% [5,7]. Currently, in the world, there haven't got criteria (distinct requirements) for shoes for diabetics. Two types of shoes which are usually used for diabetics are: shoes which are designed according to the patients' feet and deep and wide shoes which are mass-produced [4].

In our country, the number of people who have diabetes is increasing quickly [4, 5]. According to our study, [1] most of the shoe products for diabetics are imported. Almost all of the health care service suppliers lack information and do not have a comprehensive understanding on shoes for diabetics' feet; thus, the prescription of using shoes as a supplemental method for foot treatment and care is not effective [4,6]. Therefore, the survey research on the opinions of female diabetics about the requirements for shoes for Vietnam's diabetics is necessary. The survey result is the foundation to build up the requirements for structure and materials which are suitable to female diabetics' shoes as well as to design the shape of shoes and produce high quality shoes for diabetics.

2. Experimental research

2.1. Objects

This study focuses on surveying the opinions of type II female diabetics aged from 40 to 65 about the requirements for shoes because people of these ages are easy to suffer from diabetes and they usually use shoes.

2.2. Methods

Using direct interview method: the interviewees listen to the questions and interact directly with the interviewers; therefore, the interviewer may use long and complicated questions, meanwhile, they can explain the specific content of each question so that the informants will not misunderstand the questions.

2.4. The location and the number of survey papers

Hung Yen is a typical province in the North Delta and is located in the centre of the North of Vietnam. The study is conducted at My Hao medical centre, Hung Yen province. This is also the place where the research group has conducted a survey of the shape and size of the diabetics' feet [2].

In order to ensure the typification and the reality for the research, the number of survey samples is calculated as the formula below [3]:

$$n = \frac{N}{1 + N(e)^2} \quad (1)$$

in which: n – is the number of survey numbers which needs determining, patients; N - is the total

number, patients; e - is standard error, %. According to formula (1), with standard error which is often used in study is $\pm 5\%$, the total number of female diabetics in My Hao medical centre is 500, $n=222$ patients. Hence, in order to ensure the reality as well as the typification of samples, it is necessary to survey the opinions of at least 222 female diabetics. However, this study has surveyed the opinions of 301 female diabetics.

3. Results and discussion

3.1. Summarization of the diabetics' opinions on the features of shoes

Below are some types of shoes which this study has brought out to collect the opinions of female diabetics

Table 1. *Types of shoes chosen for the survey purpose*

| Shoe types | Image |
|------------|-----------------------------------------------------------------------------------|
| Sandal |  |

| | |
|------------------------------|-------------------------------------------------------------------------------------|
| Open shoe |  |
| Boat shoe |  |
| Low-necked shoes with velcro |  |
| Loafer |  |
| High-necked shoes |  |
| Lace-ups |  |

The survey results of the patients' opinions on shoe types and shoe kinds are shown in Table 2.

Table 2. The survey results of the female diabetics' opinions on shoe types and shoe kinds

| Type of shoes | Sandal (%) | Open-Shoes (%) | Boat Shoes (%) | Low-necked shoes (%) | High-necked shoes (%) | Loafer (%) |
|---------------|-----------------|---------------------------|--------------------------|--------------------------|-----------------------|------------|
| | 9,6 | 65,4 | 6,0 | 18,9 | 0 | 0 |
| Kind of shoes | Derby shoes (%) | Lace-ups with elastic (%) | Lace-ups with velcro (%) | Lace-ups with zipper (%) | | |
| | | 56,5 | 43,5 | 0 | | |

Table 2 shows that: 65,4% of the female diabetics choose open shoes, especially no one chooses loafer and high-necked shoes. This result is reasonable since our country climate is hot and humid; thus, open shoes – shoes which do not cover the whole feet - may serve the purpose of protecting the feet, make the feet always airy and not hot as well as wet due to sweat. Most of the patients choose lace-ups with elastic and lace-

ups with velcro. These two types of shoes keep the feet firm and the velcro allows the patients to put on and put off the shoes conveniently, which is extremely suitable to diabetics, especially the elderly. Moreover, using velcro allows to adjust and keep the shoes on the patients' feet; therefore, they are extremely appropriate to diabetics' feet which are usually arthritic.

Table 3. *The survey results of the female diabetics' opinions on colors, the ring for shoe neck and tongue and the form of shoe cap toe*

| Color of shoes | Black (%) | Brown (%) | Mix (%) | Others (%) |
|----------------|-----------|----------------|------------|------------|
| | 61,8 | 19,3 | 18,9 | 0 |
| Shoe neck | Soft (%) | Elasticity (%) | Normal (%) | |
| | 27,9 | 60,1 | 12,0 | |
| Shoe tongue | Soft (%) | Elasticity (%) | Normal (%) | |
| | 20,3 | 67,4 | 12,3 | |

| Form of shoe cap toe | Wide (Oval) (%) | Wide (Square) (%) | Medium (Oval) (%) | Medium (Square) (%) |
|----------------------|-----------------|-------------------|-------------------|---------------------|
| | | 0,3 | 16,6 | 0 |

Table 3 indicates that 61,8% of the patients choose black shoes, 19,3 % of the patients choose brown shoes. These are popular colours used for shoes, particularly for the elderly. The upper edge of the ring for shoe neck and tongue are parts which strongly affect the feet and are easy to harm to the feet. The survey results shown in table 4 that most of the patients (67,4%) choose soft and elastic ring for shoe neck and tongue. For diabetics, nerve injury and blood circulation reduction of feet increase the

risk of a variety of complications on feet. Soft and elastic criteria are necessary for ring of shoe neck and tongue in order to create the comfort, avoid causing injury to patients. The results testifies that 83.1% of the patients choose round and wide toe cap shoes. Wide toe cap allows toes to be able to move well and not be pressed in the shoes. The wide cap toe also means that last cap toe is short; therefore, it is more convenient to move compared to long toe cap shoes.

Table 4. *The survey results of the female diabetics' opinion on the height of shoe heel, height of rocker sole and thickness of shoe heel*

| Height of shoe heel | Flat shoes (%) | 10mm (%) | 15mm (%) | 20mm (%) | 25mm (%) | 30mm (%) |
|------------------------|----------------|----------|----------|------------|----------|----------|
| | 15,6 | 7,0 | 0,3 | 21,3 | 48,2 | 7,6 |
| Height of rocker sole | 0mm(%) | 5mm(%) | 10mm(%) | 15mm(%) | 20mm (%) | 25mm (%) |
| | 6,0 | 6,0 | 37,2 | 50,8 | 0 | 0 |
| Thickness of shoe heel | 5mm(%) | 8mm(%) | 10mm(%) | Others (%) | | |
| | | 16,6 | 51,8 | 21,6 | | |

Table 4 indicates that 48,2% of the patients choose the height of shoe heel 25 mm, 21,3% of the patients choose that of shoe heel 20mm. Nevertheless, short heel shoes often have wide and flat sole which create a firm foundation for the patients when moving. The short heel also helps to distribute pressure evenly on the surface of the foot sole, avoid concentrating pressure totally on the foot sole which may cause ulcers.

The survey result shows that, 50,8% of the patients choose the height of rocker sole 15mm, 37,2% of the patients choose that of rocker sole 10mm. This result is extremely reasonable since with short heel shoes, the increase of the height of rocker sole will make patients feel convenient for movement as their feet toe joints are not bent thanks to the increase of foot roll, which reduces the pressure of rocker sole on toe joints in order to avoid ulcers for patients. Especially, that the height of rocker sole is large also makes toes not to be pressed and creates a room inside so as to use a variety of thick and resilient linings. Further, the table shows that 51,8% of the patients choose the thickness of the shoe heel 10mm, only 10% of the patients select that of the shoe heel 5mm. The height of the heel is short, whereas the thickness of the heel is large so as to ensure the aesthetics for users, especially females. However, it is necessary

to choose suitable materials in order that the shoes are light enough for the diabetics to use.

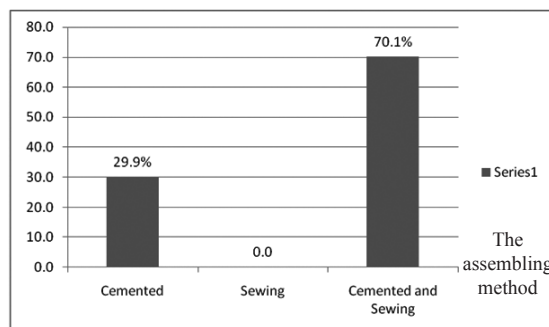


Fig.1. *The survey results of the female diabetics' opinions of the methods for assembling the shoe*

The results from Figure 1 testify that 70.1% of the patients choose the method of cemented and stitching. Nowadays, this is also the most widely used method to assemble shoe heels, creating high durability when using. Nevertheless, it is essential to use appropriate sewing line structure and sewing position in order to ensure the softness and flexibility of shoes, reducing the friction between the shoes and the diabetics when moving so as to avoid harming the patients' feet.

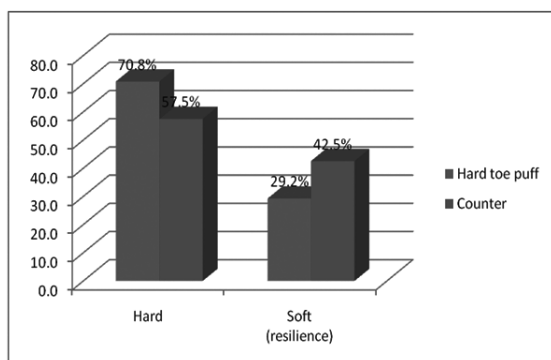


Fig. 2. The survey result of the female diabetics' opinions on hard toe puff and counter

The results from Figure 2 indicates that, 70,8% of the patients choose hard toe cap and 57,5% of the patients select hard heel. Hard toe caps and hard heels make the shoes firm and more stable in terms of the shape of the shoes. Moreover, shoes for diabetics must function as a tool to protect

the patients' feet from being hit by the outside environment. Hard toe caps and hard heels will help the shoes to perform this function well.

3.2. The survey results of the female opinions of the materials to make parts of shoes

The results of the opinions of the patients on the materials used to make shoe toe caps presented in chart 11 indicates that: 73,4% of the patients choose tanned leather, 12,3% select knitted fabrics, 14% choose all types of materials and no one are keen on woven fabrics. Leather materials with good features such as excluding water, but allow air and water vapour to pass through the cross of the upper. This is also referred to as water absorption and water - vapor permeability, human skin friendly and meet the demand for production technology namely stretch, resilience, shape stability. In order to make toe caps for diabetics, producer often use full grain leather and split leather.

Table 5. The survey results of the female diabetics' opinion on the materials for making upper shoes, lining upper, insole and sole

| | | | | | | |
|--------------|--------------------|------------------|---------------------------------------|----------------------------|--------------------------------|------------|
| Upper | Leather (%) | Woven 5%) | Knitted (%) | Mix (%) | Others (%) | |
| | 73,4 | 0 | 12,3 | 14,3 | 0 | |
| Lining upper | Leather (%) | Woven (%) | Knitted (padded foam) (%) | Antibacteria (%) | Antibacteria (padded foam) (%) | Others (%) |
| | 3,3 | 0 | 6,3 | 52,2 | 38,2 | 0 |
| Insole | Leather + Foam (%) | Woven + Foam (%) | Knitted + Foam (%) | Antibacteria + Foam (%) | Others (%) | |
| | 9,0 | 0 | 11,6 | 79,4,6 | 0 | |
| Sole | Leather (%) | Foam Rubber (%) | Foam Ethylene Vinyl Acetate (EVA) (%) | Foam Polyurethane (PU) (%) | Others (%) | |
| | 0 | 31,6 | 20,6 | 47,8 | 0 | |

In the condition of hot and humid climate in Vietnam, it is important to ensure hygiene and ecology when using shoes, especially shoes for diabetics. Diabetics pay much attention to these criteria, 52,2% of the patients choose antibacteria fabrics to make toe cap lining, 79,4% of the patients select antibacteria fabrics plus foam to make shoe lining.

The ulcer propotion of feet and space between toes (the parts which do not suffer from high pressure) of the diabetics in our country is rather high, which may relate to feet hygiene (the effect of bacteria when feet are wet due to sweat). Therefore, the process of researching and using antibacteria and deodorant materials to make upper shoes and lining upper shoes need paying much attention. Using resilient shoe heels help reduce stir and increase the softness of insole. Moreover,

resilience heels also help to distribute pressure evenly on the sole of the feet, avoid focusing local pressure on the feet- the main reason which causes feet ulcers. Therefore, lining can be used to combine with antibacterial fabric materials plus foam to increase the application of shoes for diabetics.

The table 5 shows that 47,8% of the patients choose PU foam to make shoe heels, 31,6% of the patients select foam rubber, 20,6% prefer EVA foam, no one takes tanned leather. Materials chosen to make sole are soft and resilient ones.

The rubber heel is highly strong and able to well rub against the surface, but its disadvantage is too heavy. Although the foam rubber heel is soft, its shape is not beautiful. Mixed shoe heels made of EVA are relatively soft and flexible, which increases the convenience for shoes. The advantage

of PU heels is that they are rather soft owing to foam structure which is found in advance; however, the drawback of them is that they are much more expensive than rubber heels, worse than rubber heels in term of flexibility and more aging than rubber heels. Soft and foam materials help reduce shake for feet; therefore, it is suitable to make shoe heels for diabetics.

3.3. The survey results of female diabetics' opinions on the convenience of shoes

In order to design shoes for diabetics, apart from factors namely materials, technology, the convenience is extremely important. Shoes should be fit and soft with the feet shape so as to reduce pressure for patients when moving.

Figure 3 shows that 90% of the patients require shoes which have small hardness when being bent (or the necessary force to bend the toe

joints of the shoes when moving is as small as possible); 62,8% of the patients want the toe cap to be soft. Shoes should be soft and that do not have thick seam, creases to avoid harming to the feet skin and strongly pressing on feet when moving (bending).

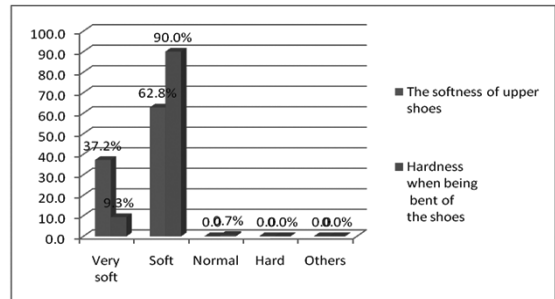


Fig.3. The survey results of the female diabetics' opinions on the softness of upper shoes and the hardness when being bent of the shoes

Table 6. The survey results of the female diabetics' opinions on the hardness of the materials to make sole, the shoe lining's features and the fitness of shoes

| Hardness of the materials to make sole | Very soft, resilience (%) | Soft, resilience (%) | Normal (%) | Hard (%) | Others (%) |
|----------------------------------------|---------------------------|----------------------|-----------------|------------|------------|
| | 49,8 | 50,2 | 0 | 0 | 0 |
| Insole's features | Rough (%) | Smooth (%) | Normal (%) | Others (%) | |
| | 0 | 15,3 | 84,7 | 0 | |
| Fitness of shoes | Tight (%) | Normal (%) | Litle Large (%) | Others (%) | |
| | | 62,1 | 37,9 | 0 | |

The results on chart table 6 indicates that 50,2% of the patients require the shoe heel materials to be soft; 49,8% of the patients want them to be extremely soft. The shoe heel is the interface of feet and shoes; thus, it plays a very important role in reducing pressure on parts of the feet sole. That the heel is soft and resilient will help to reduce pressure better and distribute pressure more evenly than hard and flat heels, creating comfortable feelings for the users. There are up to 84,7% of the patients who suppose that the insole surface should be normal, 15,3% of the patients choose smooth insole. Insole ensure that the pressure is distributed evenly on the feet sole, reduce shake (having smoothness) for the feet, support the feet. Therefore, Insole should be studied and designed suitably to the features of the shoe sole surface in order to increae the contact surface on the surface so as to reduce pressure when the body's weight affects the feet. The results shows that 62,1% of the patients want the fitness of the shoes to be normal which means that the shoes should fit the feet well. 37,9% of the patients

require the shoes to be a bit larger which means that the shoes should not fit the feet tightly. These opinions are also in accordance with warnings [6] for diabetics' shoes: shoes should fit well with feet, the shoe toe caps should be high and wide in order to avoid pressing locally and totally on the feet, damaging skin, blood vessels and nerves or grazing.

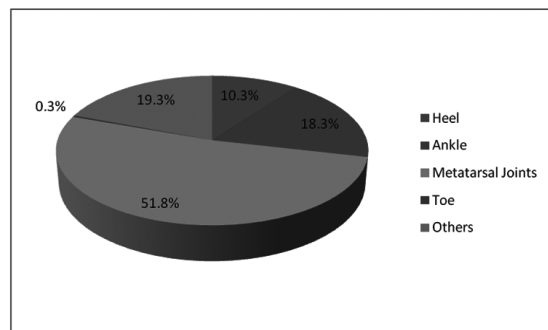


Fig.4. The survey results of the female diabetics' opinions on the place where shoes harm the feet

The survey results shown on Figure 4 indicates that shoes harm the toe joints of the patients (51,8%) the patient's ankles (18,3%), heels (19,3%), toes (10,3%), and other positions (0,3%). The forefoot is lightly covered and is the most mutually affected place with shoes (due to bending the toe joints of the feet when moving or changing the size of feet when bending). Therefore, the damaged part of the foot due to wearing shoes makes up the highest proportion.

4. Conclusion

The survey results of the requirements for our country female diabetics' shoes show that: popular shoes for female diabetics are open shoes, low-necked with Velcro, low heel from 20mm to 25mm,

high toe spring from 10mm to 15 mm, and large, high and oval toe part. Materials usually chosen are: The shoe uppers part mainly from leather, shoe upper lining and insole from antibacterial fabric, sole from porous materials such as foam rubber, EVA foam, PU foam. Most diabetic women surveyed selected following criteria: soft shoes, elastic, fit feet to create comfort while moving. So far, in Vietnam as well as in the world, there haven't got any criteria for diabetics' shoes. The results obtained from this study serve as the basis for building requirements for diabetics, aiming at designing and inventing specialized types of shoes, meeting the demand for shoe use of the patients, which are suitable to the socioeconomic conditions of our country.

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NGHIÊN CỨU KHẢO SÁT YÊU CẦU ĐỐI VỚI GIÀY CHO NỮ BỆNH NHÂN TIỂU ĐƯỜNG TẠI VIỆT NAM

Tóm tắt:

Bài báo trình bày kết quả nghiên cứu khảo sát ý kiến của 301 nữ bệnh nhân tiểu đường về yêu cầu đối với giày cho bệnh nhân: Loại, kiểu và hình dáng giày, hình dạng và kích thước các chi tiết, các phương pháp ráp nối các chi tiết giày; loại nguyên vật liệu làm các chi tiết giày; tính tiện nghi của giày. Kết quả cho thấy, nữ bệnh nhân tiểu đường thường chọn loại giày thuyền, giày hồ hoặc giày thấp cổ có quai cài kết hợp với băng nhám, có gót thấp từ 20mm đến 25mm, độ cao nâng mũi phom từ 10 mm đến 15mm, mũi giày rộng và lượn tròn. Vật liệu được lựa chọn chủ yếu là da thuộc làm phần mũi giày, lót mũi giày và lót giày từ vải kháng khuẩn, để giày lựa chọn là vật liệu xốp, đàn hồi như cao su xốp, EVA xốp, PU xốp. Hầu hết nữ bệnh nhân tiểu đường được khảo sát đều lựa chọn tiêu chí giày mềm, đàn hồi, vừa vặn bàn chân tạo sự thoải mái khi vận động. Kết quả khảo sát là cơ sở để xây dựng yêu cầu về cấu trúc và nguyên vật liệu để thiết kế, sản xuất giày cho nữ bệnh nhân tiểu đường nước ta.

Từ khóa: Bệnh tiểu đường, giày tiểu đường, bệnh nhân tiểu đường.