

INNOVATIVE CLOTHING DESIGN FOR WOMEN DURING PREGNANCY

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Abstract: During pregnancy there is an evident change in the physical appearance of a woman's body. The most evident change is the substantial weight gain, increased abdominal region, torso and hip, and limbs thickening. Physical changes leads to the need of a wardrobe changing, especially in the fourth month of pregnancy.

Given these factors the question arises is to identify the transformations of body conformation and ensure a maximum comfort in developing clothing products for this category. Because it is a continuous transformation, the products must be designed to be adjustable and versatile, ensuring their usability for a long period of the pregnancy and even after birth. The paper presents the specific algorithms for body conformations during pregnancy and the patterns designed based on these algorithms with the proper modifications. The principle of designing clothes for pregnant women refers to the introduction of pregnancy-related size changes in the standard method of pattern design.

The research was conducted by INCDTP during the initial stage of a project, financed through national funds, consisting in a documentary study on morphologic indicators of women during the pregnancy period, the changes observe and their application in pattern design. Following the principles specific to the product group studied regarding comfort and style, INCDTP specialists have developed and produced a collection of clothing products for women during pregnancy.

Key words: Pregnancy, algorithms, proportions, morphological indices, pattern design, clothing, changes

1. INTRODUCTION

During pregnancy there is an evident change in the physical appearance of a woman's body. The most evident change is the substantial weight gain, increased abdominal region, torso and hip, and limbs thickening. Physical changes leads to the need of a wardrobe changing, especially in the fourth month of pregnancy. Given these factors the question arises is to identify the transformations of body conformation and ensure a maximum comfort in developing clothing products for this category.[1] Clothing products are divided into two categories in terms of support on the body: garments with support on shoulders and garments with support on waist. Because in designing patterns for both categories are used parameters that are changing during pregnancy, comes into sight the necessity to define algorithms for all products.[2]

The changes are observed in the circumferences. A woman is mature in the gestation period and for that reason their height does not change. During pregnancy, the changes of proportion are in the following regions: thoracic area, abdominal area, gluteal area, femoral area and arm area. The biggest change is in the abdominal region. During pregnancy, especially in the last months of pregnancy when the body suffers the greatest changes, both in terms of conformational and functional, the main function that must fulfill aspecific clothing item of this category is comfort.[3]

For clothing items adressed to pregnant women it is necessary to be given special attention to psychosensorial and social characteristics, which refers to the hue and harmony of colors, design, elegant tailoring, applying decorative elements (stitches, applications). [2]

2. STUDY ON WOMAN'S BODY CHANGES DURING PREGNANCY

Body changes during pregnancy were studied in medical literature and clothing design. There are four major changes: changes in body shape, body size, posture and weight. All of these modifications lead to the need of redesign patterns in order to obtain clothing items which comply to the new conformations. The current research conducted by INCDTP, is related to the analysis of physical changes during the maternity period that influences design patterns and to the redesign of patterns using specific algorithms for body conformations during pregnancy.[1]

2.1.Changes in body shape

Trimesters of pregnancy are divided into three stages of three months each. First trimester includes the first 12 weeks after conception. The second trimester starts from week 13 and lasts until week 28. Last quarter begins in week 28 of pregnancy until birth. During pregnancy women suffer rapid changes of shape and body size in a relatively short period of time. The first external physical changes happens after four months (Gersh & Gersh, 1981) and are visible in the upper body of the stomach. The proportions of a woman's body before pregnancy and at the end of pregnancy suffer the greatest changes (Figure 1). The changes are observed in the circumferences. A woman is mature in the gestation period and for that reason their height does not change. During pregnancy, the changes of proportion are in the following regions: thoracic area, abdominal area, gluteal area, femoral area and arm area. The biggest change is in the abdominal region.

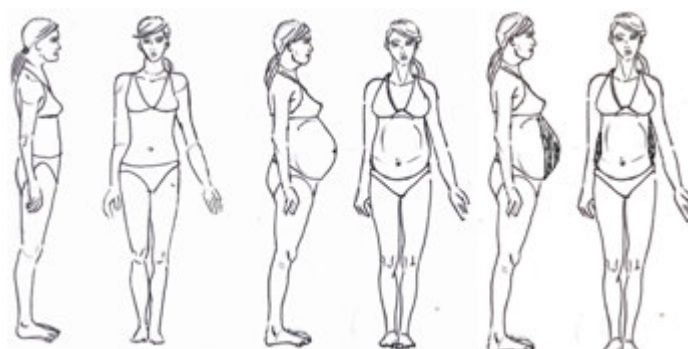


Fig.1: Comparison of the female body proportions before and at the end of pregnancy

2.2 Changes in body size

Most women will notice an increase from 20 to 26 centimeters around the waist during pregnancy (Sadler, 1974). Manley (1991) found that the largest changes of dimensions (10-12 cm) have occurred in the waistline and abdomen followed by bust and hips size. Abdominal prominent among pregnant women varies depending on the position of the fetus in the upper or lower abdomen. Bust size changes during pregnancy with an average of 5-8 cm circumference (figure 2).

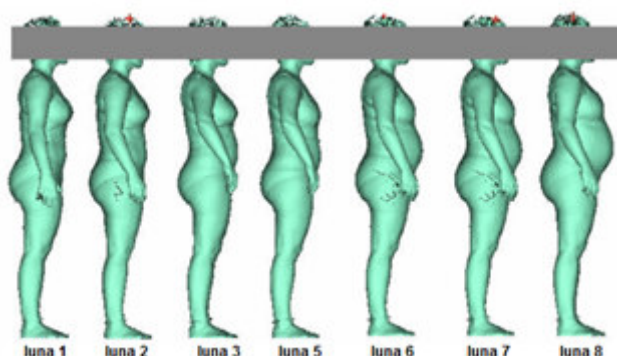


Fig. 2: Body changes of a pregnant woman

2.3 Changes of body posture

Regardless of the specifics of each woman's pregnancy, the body balance must be maintained, resulting in a temporary curvature of the spine. This curvature change the body posture tilting it backwards (Fite & Roberts, 1984). Nicholls and Grieve (1992) found that body posture goes through a major change, especially in the second and third trimester of pregnancy.

Numerous studies have shown that size and body posture changes affects the proper fit of the clothes (Goldsberry, Shim & Reich, 1996).

2.4 Weight Changes

Generally, the ideal excess weight that a woman should gain during 40 weeks of pregnancy is about 13 kg (Girandola, Khodiguian, Mittelmark & Wiswell, 1991). All these physical changes due to pregnancy requires a special attention to comfort, shape and size in designing clothing articles for the maternity period. Considering the variety of body shapes and sizes, physical changes occur differently for each pregnant woman. For example, pregnant women who have a low body mass index (BMI) tend to take more weight than those who have a high BMI. Also, depending on the position of the fetus, abdominal forms varies from person to person.[1]

3. SETTING ALGORITHMS TO DESIGN PATTERNS FOR BODY CONFORMATIONS DURING PREGNANCY

Establishing specific algorithms to design patterns for body conformations during pregnancy after a careful analysis of the dimensional differences after the measurements made on a sample of 30 pregnant women by researchers in the field. The necessary dimensions taken over are shown in Figure 3.[2]

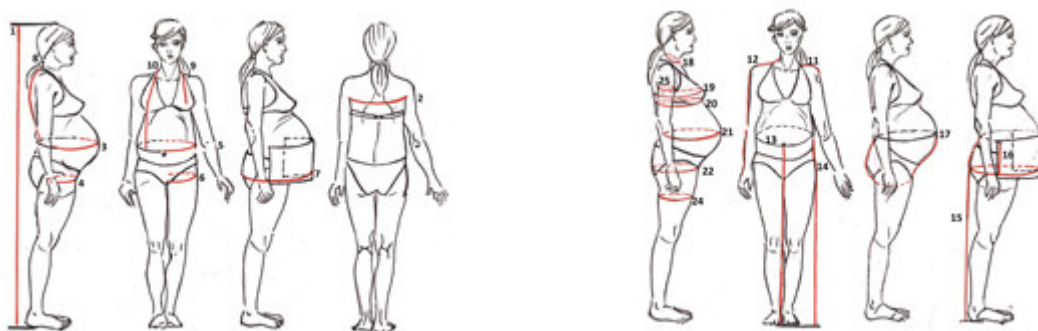


Fig. 3: Body measurements – measured during pregnancy

3.1. Pattern design for pregnant women

An important modification of the basic pattern design method is the addition of pregnancy allowances that are calculated as an average of the difference in measurements before and at the end of pregnancy (Figure 4). The difference in bust girth is 6,3% from the original bust girth. 6,3% is the pregnancy allowance added to total bust girth. The difference in hip girth is 5,25% from the original hip girth. 5,25% is the pregnancy allowance to total hip girth. The difference in waist girths is 37,04% from the original waist girth. This would be the addition to waist circumference, but it is difficult to add, since the change in waist size during pregnancy is not symmetrical for both parts of the blouse. Pattern design for the group with weight gain over 12 kg is described in the paper for comparison. The difference is in extending the first part, 30%, of the pregnancy allowance in the waistline. The omitting of the front and side darts and the loosening of the back centre line is the same, but the change is in the reduction of the back dart. Another change is in having a bigger extension of the front centre line within the bounds of the interval. [3]

Based on these changes, the patterns were redesigned during the initial stage of a project, financed through national funds conducted by INCDTP, using automatic software design patterns Gemini Cad, Made-to-Measure module for the following clothing products: blouse, trousers and skirt. (Fig.4, Fig. 5 and Fig. 6).[2]

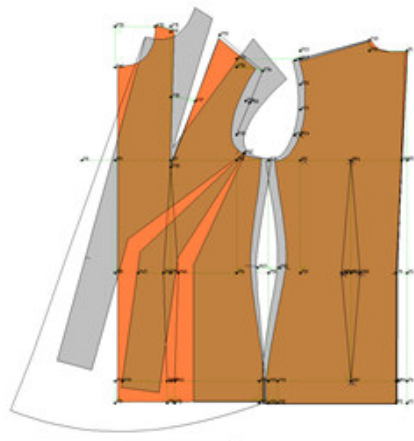


Fig. 4:. Final styling modification of a blouse pattern design for pregnant women

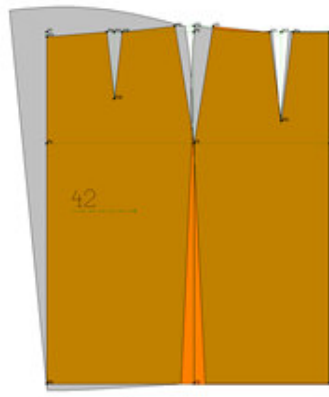


Fig. 5:. Final styling modification of a skirt pattern design for pregnant woman

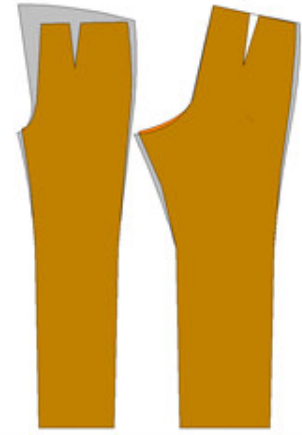


Fig. 6: Final styling modification of a trousers pattern design for pregnant women

4. DESIGNING AND MANUFACTURING CLOTHING PRODUCTS FOR WOMEN DURING PREGNANCY

4.1 Getting the comfort and style of clothing products for women during pregnancy

During pregnancy, especially in the last months of pregnancy when the body suffers the greatest changes, both in terms of conformational and functional, the main function that a clothing item specific to this category must fulfill is comfort. Comfort is an enjoyable state of physical, physiological and psychological harmony between man and the environment (Slater).

This objective can largely be achieved in case of clothing for pregnant women identifying the changes on the body and knowing the states of discomfort that appear with their installation. Comfortable wear has 3 components: thermo comfort, sensory comfort and psychological comfort.

Thermo comfort is determined by the interaction between body- clothes- environment and is achieved when warm and humid exchange between the body and the environment, through clothing structure, takes place under optimum conditions. Optimal conditions involve ensuring equilibrium of the body energy balance, while the temperature, humidity and air velocity must be within certain limits, considered comfortable for the body.

Sensory comfort defines the sensations perceived when wearing apparel (soft, velvety, silky, rough, scratchy, stings, etc.).

Psychological comfort defines the mental state of the wearer, dressed in a certain manner, style, and purpose, that fits his conformation and destination and which is consistent with the terms of the wearer, regarding the social and economic status, his work colleagues, friends, associates or other acquaintances. [4]

From the many requirements a garment for pregnant women must respond, the ensuring of dimensional correspondence with the body occupies an important place. It is also necessary the comfort in dressing and undressing, and the use of appropriate materials and systems for fitting and adjustment according to changes in conformation.[5]



Fig.7: Articles for pregnant with elements of the waist adjustment

4.2. The development of specific models for women during pregnancy

For clothing products addressed to pregnant women it is necessary to be given special attention to psychosensorial and social characteristics, which refers to the hue and harmony of colors, design, elegant tailoring, applying decorative elements (stitches, applications).

Optical illusion known in the art with the term "trompe l'oeil" technique constitutes a misleading visual perception by providing spatiality within a plane surface. Within a composition, the optical illusion may distort the perception of existing dimensions, emphasizing certain elements and features. On this principle is based the creation of a whole dress to attract attention from the deformation of the body, focusing on other areas such as the neck.[6]

Following the principles specific to the product group studied regarding the comfort and style, INCDTP specialists have developed and produced a collection of clothing products for women of during pregnancy. (Figure 8) [2]



Fig.8: INCDTP collection for women during pregnancy

5. CONCLUSIONS

In this paper were presented general aspects regarding the conformational changes that a pregnant woman body suffers, the need for physical comfort influenced by the need to redesign clothing and the necessity to make clothing patterns adapted to them.

It was presented an analysis of the morphological indicators necessary to design patterns: body size, proportions, posture and conformation. Also, it was shown the ways of taking body measurements and the main anthropometric dimensions required in pattern design.

It was presented a study regarding the female body changes during pregnancy. It was noticed 4 types of changes that influence the pattern design and the change of shape, dimensions, weight and body posture.

Specific algorithms were established to design patterns for body conformations during pregnancy. The principle of designing clothes for pregnant women refers to the introduction of pregnancy-related size changes in the standard method of pattern design. According with the typology and body measurements taken, circumference changes are due to pregnancy. Additions of pregnancy allowance are included in the calculation of pattern design and they are added to each measurement of the body except waist circumference. Changes due to pregnancy are not symmetrical in the waistline. The solution to this problem is to split the addition into several parts, front and back.

It was presented specific design algorithms for body conformations during pregnancy after establishing a connection between weight gain, size before pregnancy and during the last month of pregnancy. These algorithms are applicable for the type of clothing designed regardless of the size and conformation of the pregnant woman.

The research was conducted by INCDTP during the initial stage of a project, financed through national funds, consisting in a documentary study on morphologic indicators of women during the pregnancy period, the changes observe and their application in pattern design. The patterns were redesigned using automatic software design patterns Gemini Cad, Made-to-Measure module for the following clothing products: blouse, trousers and skirt.

Based on the specific algorithms for designing patterns and taking into account the principles of comfort and style specific to the product group studied, INCDTP specialists have developed and produced a collection of clothing products for women during pregnancy.

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