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REHABILITATION OF WOMEN AFTER CAESAREAN SECTION AND PREVENTION OF MUSCLE DIASTASIS IN WOMEN RECENTLY CONFINED

I.K. Churpiy[1] , M.H. Aravitska[3] , Yu.S. Kuravska [1] , L.A. Pylypiv[4], M.V. Zelinska[1], M.I. Hutsol[1], M.A. Pachkiv[2]

[1] *Ivano-Frankivsk National Medical University, Department of Physical Therapy and Occupational Therapy, Ivano-Frankivsk, Ukraine*
[2]*Ivano-Frankivsk National Medical University, Department of Medical Informatics, Medical and Biological Physics, Ivano-Frankivsk, Ukraine*
[3] *Vasyl Stefanyk Precarpathian National University, Department of Physical Therapy, Occupational Therapy, Ivano-Frankivsk, Ukraine*
[4] *KNP " Lysetsk Hospital" of the Lysetsk Settlement Council, Ivano-Frankivsk, Ukraine*
ORCID ID: 0000-0003-1735-9418, e- mail: ch.igor.if@gmail.com
ORCID ID: 0000-0003-2000-823X, e-mail: aravmed@i.ua
ORCID ID: 0000-0002-1338-0757, e-mail: zxcvbnm2580@ukr.net
ORCID ID: 0009-0000-2523-8670, e- mail: lesyapylypiv1979@gmail.com
ORCID ID: 0009-0008-8623-4743, e-mail: mzelinska@ifnmu.edu.ua
ORCID ID: 0009-0003-7033-3070, e-mail: mgutsol@ifnmu.edu.ua
ORCID ID: 0000-0002-4040-3934, e-mail: mshufnarovich@ifnmu.edu.ua

Abstract. The article presents the results of the developed rehabilitation program for women after cesarean section, which was characterized by the presence of complaints related to physical limitations of movements due to weakness, pain, suppression of the psycho-emotional state, signs of weakness of the muscles of the pelvic floor and the muscles of the anterior abdominal wall and their diastasis.

Depression of the psycho-emotional state of women of all groups was assessed according to the results of the Edinburgh questionnaire Postnatal Depression Scale. The results of the questionnaire indicated the risk of postpartum depression. Deterioration of the quality of life after childbirth, determined by the SF -36 questionnaire, characterized her condition as low; women who underwent caesarean section, according to the Physical scales health, Role - Physical, General Health, Vitality showed a worse result than those who underwent vaginal birth. In the late postpartum period were observed signs dorsopathies, which are in the majority women were determined still in period pregnancy.

Deterioration of the physical condition of women in the postpartum period is determined by Functional parameters Movement Screen , which demonstrate physical capabilities from the standpoint of their practical application in movements close to everyday activities. The condition of women everyone groups was characterized decrease physical performance (according to PWC $_{170}$ and maximum consumption oxygen).

The presented program of physical therapy for women after caesarean section, taking into account the presence of physical and psycho-emotional disorders, developed on the basis of the results of determining the psycho-emotional state of women, their quality of life, assessment of physical condition and physical capacity, the presence of signs of dorsopathy and pelvic floor muscle dysfunction, has a comprehensive nature and includes the following elements, which are justified from the standpoint of physiological postpartum recovery and the features of the lifestyle of women in the late postpartum period: therapeutic exercises of various orientations, functional training, massage, orthosis of the abdominal cavity, kinesiological taping, teaching women complexes of therapeutic exercises. The complex nature of the developed physical therapy program is that it provides an impact on women's health from the standpoint of changes in all domains of the ICF - acceleration of the recovery of the physiological postpartum period at the "Structure and Function" level, improvement in the performance of activities taking into account the presence of a postoperative scar and changes caused by pregnancy ("Activity"), improving the quality of life of women and their health from the standpoint of motherhood (child care) and the need to perform activities of daily life and professional activity.

Keywords: diastasis of rectus abdominis muscles, caesarean section, rehabilitation interventions, postpartum period, physical therapy, rehabilitation.

Introduction. Pregnancy, childbirth and the postpartum period are difficult and responsible periods in the life of every woman.

The period when a mother's body goes into a recovery phase after giving birth is known as the postnatal or postpartum period.

Recovery begins after the birth of the fetus and is most intense during the first 6-8 weeks.

In addition to the division widely accepted in Ukraine into early (up to 24 hours) and late (up to 6-8 weeks) postpartum periods [1], it should be taken into account that physiological changes in a woman's body last much longer. Therefore, in this process, researchers tentatively distinguish three phases: the first (acute) - the first 24 hours after childbirth; the second (subacute) - 24 hours - 7 days after childbirth; third (late) – 7 days - 6 weeks (according to some data, up to 6 months) [2, 3]. The

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third phase, which is late, associated with the recovery of the tone of the main muscles and connective tissue, proceeds more slowly than the acute and subacute phases.

In the postpartum period, in addition to the need for care and feeding of the child, changes due to this sleep and rest regime, the metabolic and psycho-emotional load increases, the pressure on the adaptive capabilities of the regulatory systems of the woman's body against the background of restructuring and restoration of structural and hormonal components [3].

Therefore, the problem of improving the recovery of women's health after childbirth against the background of a low birth rate and a high level of complications of pregnancy and childbirth requires the introduction of new medical knowledge and technologies into practical rehabilitation and obstetrics, in particular physical therapy methods, the use of which has a beneficial effect on the course of the postpartum period [4].

At the same time, the use of physical therapy among the thematic contingent of women is insufficiently covered in professional literary and scientific sources [5, 6], especially from the standpoint of long-term observation and a comprehensive approach, which proves the insufficient state of practical development of this issue in Ukraine in accordance with the modern needs of society. which determines the relevance of the presented work.

The duration of the late phase depends on the recovery of muscle tone and connective tissue in the postpartum period. Physiological changes occurring in the late phase are, as a rule, very gradual and inconspicuous: increased elasticity of ligaments, which can persist for 4-5 months after childbirth; risk of thromboembolism due to increased blood coagulation factors; length and separation of rectus abdominis muscles - diastasis; weakened musculature of the pelvic floor, including weakened muscles of the perineum, muscle abnormalities and weakness of the muscle that lifts the anus; enuresis; prolapse of pelvic organs; pelvic floor neuropathy; fecal incontinence and flatulence; swelling of the extremities - hands, feet and ankles; excessive weight gain; pain in the lower back [7].

The purpose of the work. The goal is to develop a complex long-term program of physical therapy aimed at improving functional capabilities and improving the quality of life of women in the postpartum period.

Materials and methods. The following indicators were quantitatively evaluated: psycho-emotional state (Edinburgh scale of postpartum depression), quality of life (SF-36), methods of determining physical condition: a long period of changed motor stereotype during pregnancy and its rapid change during the postpartum period caused changes in the physical condition of women. Given that a number of researchers have proven a significant beneficial effect of functional training on the development of physical qualities of a person [8], and functional training should be carried out on the basis of establishing motor performance, a number of *Functional* tests were used to assess it *Movement Screen (FMS)*. FMS includes seven basic movement patterns, the quality of which was evaluated on a scale from 0 (non-performance) to 3 (optimal performance technique) points: deep squatting (Deep Squat); a step through the barrier (Hurdle Step); linear lunge (In Line Lunge); shoulder mobility (Shoulder Mobility); active lifting of the straight leg (Active Straight Leg Raise); trunk stability when arms are extended; circular stability (Rotary Stability) [9]. The calculation of points for three exercises (4, 6, 7) gave grounds to consider the test as passed or failed. If the woman did not perform part of the test, the total score was equal to 0.

Results and their discussion. The work was performed on the basis of the medical practice "Center of restorative medicine and rehabilitation "Aravmed", in 2019-2023. The comparison group (CP) consisted of 47 women (aged 26.3±1.3 years), who had vaginal births (VB) performed according to the clinical protocol "Physiological childbirth" [10]; the dynamics of their condition demonstrated the natural recovery of the body after childbirth.

The main group consisted of 65 women who were delivered abdominally according to the clinical protocol "Caesarean section" [11], who were divided into two subgroups by a blind randomized method.

The main group 1 (MG1) consisted of 32 women aged 25.8±0.9 years, who were given general recommendations for self-care in the postpartum period after KR (maintenance of hygiene, restriction of motor activity due to the presence of a postoperative scar, etc.). In order to support and improve the condition of women in the long term, they were also familiarized with the recommendations of the WHO regarding healthy nutrition [12] and normal levels of physical activity [13]; the dynamics of their condition demonstrated the natural recovery of the body after abdominal labor .

The main group 2 (MG2) consisted of 33 women aged 26.1±1.5 years, for whom a FT program was developed, the effectiveness of which is presented in this study.

The subjective condition of women after discharge from the maternity hospital during the initial examination, both after vaginal and abdominal delivery, was characterized by a number of complaints that indicated physical and mental changes (Table 1).

Table 1

Complaints of women after childbirth (M±SD)

Complaints of women	CP, n=47	MG1, n=32	MG2, n=33
physical difficulties during self-care	63.8	100*	93.9*
physical difficulties during child care	70.2	100*	100*
physical discomfort at rest	38.3	78.1*	81.8*
depressed mood	42.6	65.6*	66.7*
fast fatigue	74.5	93.8*	87.9*
signs of PFM weakness	66	62.5	63.6

Notes: * – $p<0.05$ – statistically significant difference between the corresponding parameters of CP and MG;
● – $p<0.05$ – a statistically significant difference between the corresponding parameters of MG1 and MG2. PFM - pelvic floor muscles

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So, the analysis of complaints showed that after giving birth, women, regardless of the way of childbirth, experienced suppression of their psycho-emotional state. Our research confirmed that after giving birth, the condition of women indicated a high risk of postpartum depression in all groups, which was determined by the EPDS questionnaire (due to the detection of a high percentage of women with signs of depression), which was due to hormonal changes, unpleasant sensations during childbirth, etc. (Table. 2).

The postpartum QOL study showed a deterioration in the SF-36 questionnaire scales. The physical component of health (Physical health) in all women after childbirth showed an expectedly low level.

Results of determination of physical condition indicators. The state of motor performance of women in PP, regardless of the path of childbirth , was characterized by relatively low FMS indicators (Table 3).

Table 2

Psychoemotional state of women after childbirth according to EPDS (M±SD)

EPDS, points	Primary examination
CP, n=47	8.13±0.59
MG1, n=32	8.56±0.65
MG2, n=33	7.48±0.52

Notes: * – p<0.05 – statistically significant difference between the corresponding parameters of CP and MG;
● – p<0.05 – a statistically significant difference between the corresponding parameters of MG1 and MG2.

Table 3

FMS parameters of women in PPV after VP and KR (M±SD)

FMS test	CP (n=47)	MG1 (n=32)	MG2 (n=33)
deep squat	1.47±0.12	1.16±0.13*	1.52±0.12 ●
step over the barrier	2.02±0.11	1.84±0.13	2.15±0.11
linear lunge	1.72±0.11	1.34±0.13*	1.73±0.11 ●
shoulder mobility	1.77±0.12	1.69±0.12	1.88±0.11
active lifting of the straight leg	1.55±0.12	1.50±0.12	1.76±0.10 ●
stability of the trunk when extending the arms	1.55±0.12	1.63±0.12	1.91±0.12* ●
circular stability	1.68±0.12	1.59±0.14	1.85±0.13

Notes: * – p<0.05 – statistically significant difference between the corresponding parameters of CP and MG;
● – p<0.05 – a statistically significant difference between the corresponding parameters of MG1 and MG2.

This was due to a long period of reduced physical activity, changes in the biomechanics of the body, morpho -functional postpartum reorganization of the body against the background of increased psychological and physical stress due to a change in social role, child care, lactation, which is reflected in the FMS results. The analysis of the dynamics of the structural distribution of the obtained results showed the following trends. During the performance of the FMS test exercises during the initial examination, some women could not perform certain tasks of the test, explaining this by discomfort, unpleasant sensations in the abdomen and pelvis, which caused fear and forced them to stop moving. Obviously, this was associated with low mobility of the scar, structural restructuring of soft tissues, signs of dorsopathy, detraining both in general and as a result of pregnancy and the postpartum period.

Peculiarities of the physical state of women in the postpartum period were determined by the anamnesis of a motor stereotype changed during pregnancy and (for MG women) by the presence of a postoperative scar of the abdominal cavity. In particular, this was manifested in the reduced parameters of physical performance according to the results of the PWC $_{170\ test.}$ At the end of the PPV, the results of the PWC $_{170}$ in MG1 women were at a low level, and CP and MG2 were at a level below the average.

The results of determination of MSCs, which characterize aerobic power and cardiorespiratory reserves, were at a low level in all groups of women in PP.

The above-mentioned changes in the body of women after cesarean section revealed at this stage of the study, which reflect impaired functioning, limitations of vital activity and health in all domains of the ICF, were the argument and basis for the development of a comprehensive program of physical therapy aimed at correcting the physical and psycho-emotional state of women.

General principles of creating a physical therapy program for women in the postpartum period.

When developing a long-term program of physical therapy for women, we were guided by the results of conducted questionnaires and clinical and physiological examinations. They are the basis for the conclusion that the examined women need intervention in their state of health in order to improve it.

The existing guidelines and protocols actually do not pay attention to the postpartum recovery of women's physical condition. It contains only general recommendations regarding future pregnancies in terms of the strength of the uterine scar and the features of contraception in the postpartum period. General recommendations without specifying the recovery of the physical state are also provided to women within the clinical protocol "Physiological childbirth" [104]. We did not find any other standardized recommendations, in particular, rehabilitative ones, regarding the management of women in PP during the analysis of literature data.

Therefore, when developing the physical therapy program, we took into account the methodological

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principles of creating multi-directional rehabilitation programs regarding the various aspects of the recovery of women in the postpartum period that we diagnosed [5, 14].

- Preparation for work.

For their correction, the following tools were used within the framework of the developed physical therapy program:

– kinesitherapy (therapeutic exercises, functional training);
– abdominal massage (for the prevention of the sebaceous process around the postoperative seam) and general;
– orthosis of the abdominal wall;
– kinesiological taping of the abdomen and back;
– education (training) of women.

Format of interventions: face-to-face (in a rehabilitation facility), independent classes, telerehabilitation (online video communication mode, control and answers to current questions using messengers).

The tasks of the physical therapy program were:

- prevention of sebaceous process of the abdominal cavity;
- improvement of mood, psychological state, reduction of anxiety and risk of postpartum depression;
- improving the function of internal organs and general fitness; reducing the risk of chronic diseases;
- normalization of the function of organs and muscles of the pelvic floor;
- prevention and correction of postpartum diastasis of abdominal muscles;
- improvement of the quality of life taking into account physiological and pathological changes in the body of women after childbirth, lactation, lifestyle changes taking into account contextual factors;
- return to usual household and professional activity with a high level of work capacity and psycho-emotional state.

The FT process was formed according to the consistent definition and achievement of individual short- and long-term rehabilitation goals formulated in the SMART format.

The logic and sequence of the applied measures were determined by the peculiarities of the physiological processes in women's bodies that occurred during pregnancy and PP.

As a result of stretching of the ligamentous apparatus of the internal genital organs, relaxation of the abdominal press, pelvic floor and vagina in the early and at the beginning of the late stage of PP, great mobility of the uterus and vagina is noted. After childbirth, the uterus gradually involutes (the epithelium of the mucous membrane, the structure of the myometrium is restored), but the epithelization of the placental site proceeds much more slowly than the rest of the inner surface of the uterus. Therefore, early excessive loads can harm the healing processes of internal wound surfaces, as a result of the stretching and loosening of the ligamentous apparatus, the uterus and vaginal walls can drop (which causes the sparing of the motor regime and the limitation of movements of the pelvic floor muscles (PFM), abdominal wall and trunk).

The groups of muscles that were overstretched by the static weight, which gradually increased, were the muscles of the pelvic floor and the anterior abdominal wall. Accordingly, the weakness of PFM manifested itself in the form of signs of their weakness (ie, violation of the supporting and closing function of the output channels of the pelvic organs (vagina, urethra, rectum)). The use of TV for PFM (in particular, Kegel exercises), abdomen, thighs, buttocks, lower back, contributed to the toning and strengthening of stretched muscles and the prevention of diastasis of the abdominal muscles.

Weakness of the muscles of the abdominal cavity was manifested by a high risk or presence of diastasis of the white line of the abdomen, sagging of the front abdominal wall, atonic phenomena on the part of the organs of the abdominal cavity. In the program developed by us, this was corrected by orthosis (bandaging) of the abdominal cavity, kinesiology taping of the white line of the abdomen and the front abdominal wall, TV for the muscles of the front abdominal wall, trunk, and lower limbs.

As a result of stretching of the ligamentous apparatus of the internal genital organs, relaxation of the abdominal press, pelvic floor and vagina, great mobility of the uterus and vagina is noted. The lethargy of the abdominal integuments, reduced tone of the muscles of the anterior abdominal wall lead to sagging of the abdomen and changes in the position of internal organs and intra-abdominal pressure, increasing the load on the pelvic organs and on the PFM [6].

Orthosis of the abdominal cavity in postpartum period (PP) in women after CC was prescribed for the purpose of:

- reduction of excessive stretching of the postoperative scar due to CC;
- support of an overstretched anterior abdominal wall;
- prevention of diastasis of the white line of the abdomen;
- support and unloading of the lumbar spine;
- prevention of prolapse of internal organs;
- facilitation of activities of daily life due to reduction of pain and discomfort.

Contraindications to wearing a postpartum bandage were: discomfort in the area of the postoperative seam, inflammation of the scar, contact dermatitis, allergy to orthosis materials , flatulence, and flatulence. These contraindications are relative and temporary, were corrected by changing the mode of wearing the bandage, correcting the diet, adequate care of the scar, changing the orthosis.

The main conditions of wearing were comfortable sensations in the area of the seam and the abdominal cavity.

To correct postpartum changes, several options of postpartum bandages were used, depending on the woman's personal wishes: universal (suitable for the period of pregnancy, the belt is fixed with fittings in the upper and lower parts of the abdomen); in the form of a wide tape (suitable for the postoperative period, contributes to the prevention of hernias of the postoperative seam); bandage in the form of panties with fixation on the waist and hips (comfortable to wear, invisible under clothes).

All products corresponded to the anthropometric parameters of women (corresponding to the standard sizes of orthoses).

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Wearing orthoses was recommended from early PP, if the woman did not have uncomfortable feelings of irritation of the postoperative seam. The latest time to start wearing an orthosis was 10-14 days (removal of postoperative skin sutures, the incomplete healing of which prevented wearing an orthosis).

It is not recommended to pull the orthosis too much, so as not to cause pain and not to injure the internal organs. The duration of wearing was up to 6 hours a day, during the period of maximum daily activity (taking care of the child, carrying it, going for walks). Sleeping in an orthosis was contraindicated.

The course of orthotics lasted approximately 1,5 months. It was discontinued under the condition of the woman's normal well-being, restoration of the anterior abdominal wall, and the individual state of healing. postoperative suture (which was confirmed by a doctor 's consultation).

Conclusions.

1. The postpartum period in women , regardless of the type of delivery, was characterized by the presence of complaints related to physical limitations of movements due to weakness, pain, depression of the psycho-emotional state, and, with the exception of signs pelvic floor muscle weakness, all others were more pronounced in women after CC.

2. Depression of the mental and emotional state of women of all groups was assessed according to the results of the Edinburgh questionnaire Postnatal Depression Scale The results of the questionnaire testified to the risk of blind depression. Deterioration of the quality of life after childbirth, determined by the SF -36 questionnaire, characterized her condition as low; women who underwent caesarean section, according to Physical health, Role-Physical, General Health, Vitality had a worse outcome than those who underwent vaginal delivery. In the late postpartum period were observed signs dorsopathies , which are mostly women were determined still in period pregnancy

3. Deterioration of the physical condition of women in the postpartum period is determined by Functional parameters Movement Screen , which demonstrate physical capabilities and from the standpoint of their practical application in movements close to everyday activities. Everyone 's condition groups was characterized decrease physical performance (according to PWC $_{170}$ and maximum consumption oxygen).

4. The presented program of physical therapy for women after CC, taking into account the presence of physical and psycho-emotional disorders, developed on the basis of the results of determining the psycho-emotional state of women, their quality of life, assessment of physical condition and physical capacity, the presence of signs of dorsopathy and pelvic floor muscle dysfunctions, has complex nature and includes the following elements, which are justified from the standpoint of physiological postpartum recovery and lifestyle features of women in the late postpartum period : kinesitherapy (therapeutic exercises of various orientations, functional training), massage, orthosis of the abdominal cavity, It is not logical taping , training women and men .

5. The complex nature of the developed program of physical therapy is that it provides an impact on women's health from the standpoint of changes in all domains of the ICF - acceleration of the recovery of the physiological postpartum period at the "Structure and Function" level, improvement in the performance of activities taking into account the presence of a post - operative scar and changes caused by pregnancy ("Activity"), improvement of the quality of life of women and their state of health from the point of view of motherhood (child care) and the need to perform activities of everyday life and professional activity

Conflict of interest. Authors declare their absence conflict interests.

Prospects for further research. In the future, it is planned to continue work on the development and implementation of a rehabilitation program for women in the postpartum period. Who underwent caesarean section.

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РЕАБІЛІТАЦІЯ ЖІНОК ПІСЛЯ КЕСАРСЬКОГО РОЗТИНУ ТА ПРОФІЛАКТИКА ДІАСТАЗУ М'ЯЗІВ У ПОРОДІЛЬ

І.К. Чурпій[1], М.Г. Аравіцька[3], Ю.С. Куравська[1], Л.А. Пилипів[4], М.В. Зелінська[1], М.І. Гуцол[1], М.А. Пачків[2]

[1]Івано-Франківський національний медичний університет, кафедра фізичної терапії та ерготерапії, м. Івано-Франківськ, Україна
[2]Івано-Франківський національний медичний університет, кафедра медичної інформатики, медичної та біологічної фізики, м. Івано-Франківськ, Україна
[3]Прикарпатський національний університет імені Василя Стефаника, кафедра фізичної терапії, ерготерапії, м. Івано-Франківськ, Україна
[4]КНП «Лисецька лікарня» Лисецької селищної ради, м. Івано-Франківськ, Україна
ORCID ID: 0000-0003-1735-9418,
e- mail : ch.igor.if@gmail.com
ORCID ID: 0000-0003-2000-823X,
e-mail: aravmed@i.ua
ORCID ID: 0000-0002-1338-0757,
e-mail: zxcvbnm2580@ukr.net
ORCID ID: 0009-0000-2523-8670,
e- mail: lesyapylypiv1979@gmail.com
ORCID ID: 0009-0008-8623-4743,
e-mail: mzelinska@ifnmu.edu.ua
ORCID ID: 0009-0003-7033-3070,
e-mail: mgutsol@ifnmu.edu.ua
ORCID ID: 0000-0002-4040-3934,
e-mail: mshufnarovich@ifnmu.edu.ua

Резюме. В даній статті було проаналізовано та надано результати авторської програми реабілітації для жінок, у яких в анамнезі був кесарський розтин, після проведення якого пацієнтки мали такі скарги, як: больові відчуття у ділянці рубця, ознаки дисфункції м'язів тазового дна та м'язів передньої черевної стінки, зокрема – діастазу м'язів, пригнічення психоемоційного стану та обмеженням фізичної активності внаслідок слабкості.

Кожен із можливих пунктів оцінювали за певними шкалами.

Показник пригнічення психоемоційного стану жінок усіх груп оцінювали за результатами анкетування за Edinburgh Postnatal Depression Scale. Результати анкетування свідчили про високий ризик виникнення післяпологової депресії. Погіршення якості життя після пологів визначене за опитувальником SF-36, характеризувало її стан як низький; жінки, які перенесли кесарів розтин, за шкалами Physical health, Role-Physical, General Health, Vitality виявили гірший результат, ніж ті, які перенесли вагінальні пологи. Також пацієнтки відмічали ураження заднього опорного комплексу, що провокували больовий сидром та обмеження рухливості як під час вагітності, так і в після пологовому періоді.

Погіршення фізичного стану жінок у післяпологовому періоді визначено за параметрами Functional Movement Screen, які демонструють фізичні можливості з позицій їх прикладного застосування в рухах, наближених до повсякденної діяльності. Стан жінок всіх груп характеризувався зниженням фізичної працездатності (за PWC_{170} та максимального споживання кисню).

Дана програма фізичної терапії для жінок після кесарського розтину була розроблена з урахуванням наявності порушень фізичної та психоемоційної сфери. Було проаналізовано та оброблено результати тестування психоемоційного стану жінок, якості їх життя, оцінки фізичного стану та фізичної працездатності, наявності ознак дорсопатії та дисфункцій м'язів тазового дна, що дало можливість розробити саме таку програму, яка має комплексний характер та включає наступні елементи, що є обґрунтованими з позицій фізіологічного післяпологового відновлення та особливостей стилю життя жінок у пізньому післяпологовому періоді. До таких методів входять: терапевтичні вправи різної спрямованості, функціональне тренування, масаж, ортезування черевної порожнини, кінезіологічне тейпування, навчання жінок комплексів терапевтичних вправ.

Ключові слова: діастаз прямих м'язів живота, кесарський розтин, реабілітаційні втручання, післяпологовий період, фізична терапія, реабілітація.

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