Effect of Patello-Femoral Rehabilitation on Lower Limb Mechanical Changes Postnatally

Walaa K. Swar[1], Hala M. Hanafy[2], Mohamed A. Awad[2], Hossam El Din H. Kamel[3]

[1] M.Sc. of physical therapy, Samanod central hospital, el-Gharbia government, Ministry of Health, Egypt
[2] Department of Physical Therapy for Gynecology and Obstetrics, Faculty of Physical Therapy, Cairo University, Egypt.
[3] Department of Gynecology and Obstetrics, Faculty of Medicine, Al Azhar University, Egypt

ABSTRACT

This study was conducted to determine the effect of patello-femoral rehabilitation on lower limb mechanical changes postnatally. One hundred women complaining from postpartum mild to moderate knee pain and/or mild degree of knee inflammation and/or lower limb functional problem participated in this study. They were selected randomly from Said Galal University Hospital in Cairo. They were diagnosed by physician. The study was conducted from January 2016 to March 2017. Their ages were ranged from 20-35 years old. Their BMI was ranged from 20-35 kg/m2.They were divided into two groups equal in number, group (A) treated by nutrition program only in the form of balanced diet 1200-1400 Kcal/day while group (B) treated by the same diet (1200-1400 Kcal/day) and participated in 90 minutes session of patellofemoral rehabilitation program and localized fat lipolysis using sonoliser device on thigh region twice weekly for 3 months. BMI was assessed by using weight and height scale, anterior knee pain was assessed by VAS, navicular drop test and thigh girth were assessed by tape measurement, Q angle was assessed by goniometer and functional activities of hip and knee joints were assessed by LEFS for both groups A and B before and after treatment. Results found that, there was no significant difference in BMI, VAS, NDT, Q angle, LEFS and thigh girth between both groups A and B before treatment. There was significant improvement in BMI, VAS, NDT, Q angle, LEFS and thigh girth in both groups A and B after treatment. There was significant difference between A and B in BMI, VAS, NDT, Q angle, LEFS and thigh girth between groups A and B after treatment (more improvement in group B).
It can be concluded that patellofemoral rehabilitation program is very effective in relieving anterior knee pain and in correcting lower limb biomechanical changes postnatally.

Key Words: Patellofemoral rehabilitation - Mechanical changes - Postnatally.

eIJPPR 2017; 7(1):26-33

HOW TO CITE THIS ARTICLE: Walaa K. Swar, Hala M. Hanafy, Mohamed A. Awad, Hossam El Din H. Kamel. (2017). "Effect of patello-femoral rehabilitation on lower limb mechanical changes postnatally." , *International Journal of Pharmaceutical and Phytopharmacological Research, 7*(1), pp.26-33.

INTRODUCTION

After labor, the musculoskeletal **system endu**res faces ligament, joint, and postural alterations that can result in painful discomfort in the hips, knees, ankles and spine [1].
These alterations are primarily caused by increase body weight, less degree to occupant impact of high hormone levels, for example, progesterone, estrogen, and relaxin [2].
o parcel of changes, as the pelvic anteversion, More lumbar lordosis, head retification, and longitudinal decrease of the arrangement tar curve. plantar curve changes are essentially caused by the increasment of the volume, length and width of the ladies feet. the ladies [3]. The weight increment in the trunk region and coming

Corresponding author: Walaa K. Swar
Address: M.Sc. of physical therapy, Samanod central hospital, el-Gharbia government, Ministry of Health, Egypt
e-mail ✉ walaa.swar@yahoo.com
Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.
Received: 06 August 2016; **Revised:** 02 February 2017; **Accepted:** 26 February 2017

about because of it moving of the body's focal point of gravity likewise debilitating paunch guts may incline pregnant ladies for body act changes.

This marvel is additionally caused by unwinding of the ligaments and tendons and expanded portability in the joints, this occurs because of a hormone called relaxin, which could be seen from the second pregnancy trimester the body pose in ladies in the first and third trimester of pregnancy watched developing of lumbar lordosis and expanding of anteversion of pelvis in advanced pregnancy [4].

Lower limb weight gain shows to be went with curve stature lasting misfortune and maybe the main pregnancy is the most critical. The expanded hazard for musculoskeletal disorders in ladies might be because of these feet alterations, these disorders resemble baby blues agony of the knee likewise expanded Q angle of knee [5]. After labor every one of these issues may proceed if there is weight pick up particularly in the lower limb area [6].

obesity is a pathology with multifactorial causes that is separated by an increasment of the fat weight and is related with a critical increasment in the dismalness and mortality. In the obese people, the motion of the body is influenced by abundance mass, which changes the person's range of motion and increased joint loading, so prompting a high event of musculoskeletal disorders. Functional tests proclaimed that large subjects experience issues in doing the everyday life exercises and presented to more torment than normal weight subjects [7].

Variances showed between obese and non-obese subjects walking at a fundamental walk speed in the angular kinematics of the lower-extremity joints, and in specifically decreases in the ankle, knee, hip range of motions on the sagittal plane. By compare, kinematic variables of the lower-extremity joint in obese subjects walking at a self-selected speed were establish to be the same of those of normal subjects [8].

Localized obesity in lower limb is distinguished by the presence of more mass at lower-limb areas and pelvis, causing mechanical restraints that central nervous system might accomplish changing the physiological interjoint coupling relationships. So a modification coordination pattern can persuade joint pathology [9].

Obesity shows a big part in pain in general, but it has some of its largest effect on knee pain leading to the anterior knee pain or patellofemoral pain syndrome and biomechanical changes in the lower extremity as increase Q angel of knee and decrease the foot arch [10].

Rehabilitation of patellofemoral has an enchanted part in the cure of the anterior knee pain throughout ice application to reduce edema, relief pain by using ultrasonic application, restoration of the quadriceps muscle control, improve tissue elasticity throughout quadriceps stretching, hamstrings, gastrocnemius, hip adductors, and iliotibial band, improve proprioception as well normalize walking then regularly return to activities [11].

As well ultrasonic cavitation on the thigh area and weight reduction through (1200-1500 Kcal diet) were utilized through the management program to reduce thigh girth and decrease weight that leading to reduce the anterior knee pain and adjusting lower limb mechanical alterations postnatal [12-13].

SUBJECTS, MATERIALS AND METHODS:

Subjects:

This research was performed on one hundred women complaining from postpartum mild knee pain to moderate knee pain and/or mild degree of knee inflammation and/or lower extremity functional problem shared in this research. Their ages were ranged from 20-35 years old.

Their body mass index was ranged from 20-35 kg/m2. They were multiparous and postpartum from 2 months up to 12 months. Women with history of overuse injury, morbid obesity, patellar tracking disorder, lower limb deformities, hyper mobility in lower extremity joints, diabetes mellitus, neurological problems, recent vestibular disorders, kidney problems, spondylolythesis, varicose veins and DVT or deep venous thrombosis were excluded from the study.

They were diagnosed by physician. The study was performed from January 2016 to March 2017. They were randomly selected from Said Galal University Hospital in Cairo, Al Azhar University. They were splitted into two groups equal in number: Group (A) only treated by nutrition program in form of balanced diet 1200-1400 Kcal/day while group (B) treated by the same diet (1200-1400 Kcal/day) and participated in 90 minutes' session of patellofemoral rehabilitation program and localized fat lipolysis using sonoliser device on thigh region twice weekly for twelve weeks.

Procedures: All pregnant women were given a whole demonstration of the protocol of the research and consent form was signed for each woman before participating in the study.

A) Evaluation procedures:

1-Weight-Height scale: It was performed to evaluate the weight and height for both groups (A &B) at the beginning and at the end of the program of treatment.

2- VAS (Visual analogue scale): It was used to assess pain of the anterior knee's intensity for both groups (A&B) at the beginning and at the end of the program of treatment.

3- NDT (Navicular drop test): represents the navicular tuberosity the sagittal plane displacement from a neutral position to a relaxed position in standing for both groups (A&B) at the beginning and at the end of the program of treatment.

4-Tape measurement: It was done to evaluate thigh girth for both groups (A&B) at the beginning and at the end of the program of treatment.

5-Goniometer: This tool was used to evaluate the Q angel (quadriceps angle) for both groups (A&B) at the beginning and at the end of the program of treatment.

6- LEFS (The Functional Scale of the Lower limb): It was reliable, and constructed validity detecting functional level of the lower extremity.

B) Treatment procedures:

I-Balanced diet (will not affect lactation): All women in the two groups (A&B) were advised to follow the same low caloric diet of 1200 kcal / day. The diet was changed each fifteen days for each woman in the two groups (A&B) without any side effects on lactation.

II- Patellofemoral rehabilitation : All women in group (B) participated in 90 minutes session of patellofemoral rehabilitation program.

1-Ice application: Apply the ice or cold pack for 10 minutes on the knee anterior aspect at the beginning of the session twice weekly for twelve weeks.

2-Ultrasound application to relief pain: 10 minutes of continuous ultrasound (Ultrasound Uniphy- Phyaction 190i serial number 27465 The Netherlands) with frequency 1.5 HZ, 300 MA and the intensity was 1.5 w/ cm2 (the device made in Italy) to relief pain twice weekly for twelve weeks.

3-Strength quadriceps muscles: Through faradic application using (Enraf Nonius B.V. Model ENDOMED 381-DC The Netherlands with serial NFL o5756 program number 7) of 1.5 MA amplitude 220-240 v, 50-60 HZ for 20 minutes twice weekly continue for three months pulsed mode and the intensity was increased according to patient's tolerance .

4.Stretching exercises: Stretching for gastrocnemius muscle, hip adductors muscles, hamstrings muscles and iliotibial bands was performed twice in the session each one for 60 seconds with one minute relaxation in between (16 minutes) twice weekly and continue for three months.

5. Mobilization of the patella: Mobilization for the patella 5 minutes up, down, medially and laterally was performed twice weekly for three months .

6. Functional activities of hip and knee joints: Double then single limb support then on stepper were performed twice weekly continue for three months.

7. Proprioception enhancement and control neuromuscular: Weight shifting side-to-side, weight shifting diagonally, mini-squats, squatting and mini-squats on an unstable surface such as a tilt board all those are Specific drills. As the patient advanced from double leg to single leg on tilt board squats.

Manual perturbations may be incorporated with ball tosses to add challenge. The patient advances to do 30 degrees of knee flexion a vertical squat while doing a 3-5 pound weighted ball chest-pass. Then continuing to make tapping the board to add manual perturbations which done by rehabilitation specialist.

Ball throws are trained in from of side-to-side throws and chest-passes and at the end throws as overhead soccer. then, the same activities can be advanced from double-leg to single-leg stance to further challenge the patients control neuromuscular. 8. Normalize Gait in form of retrograde walking over cones as specific techniques.

As the patient moves to the back, the foot hits the floor in a pattern of a toe to heel to make an extension moment at the knee.

III-Fat lipolysis sonoliser device (NEO PANESTETIC S.r.I. Mod. Eosonic Matre. 04200227 , 230 v, 330 W and 30-60 Hz) : It was used to decrease thigh localized obesity. 6 heads of the device was applied on 3 thigh points between each 2 cm in a round manner all over thearea intermittent pulse was used and frequency of 30 Hz, 230 v and 300 MA for 30 minutes twice weekly for 12 weeks.

Statistical analysis

Results are defined as mean ± standard deviation. Test of normality, Kolmogorov-Smirnov test, was performed to evaluate the data distribution measured pre-treatment. Accordingly, comparison between variables in both groups was performed using unpaired t test. Comparison between variables evaluated at the beginning and at the end of cure in the same group was performed using paired t test. Social Sciences Statistical Package computer program (version 19 windows) was used for data analysis. P value = 0.05 was noted as significant.

RESULTS:

I- Physical (general) characteristics of the patients:

1-Age and height:

No statistical significant differences were in between mean values of age and height of the two groups A and B, Table (1).

Table (1): Age and height of the two studied groups.

	Group A (n= 50)	Group B (n= 50)	t value	P value
Age (yrs.)	28.62 ± 4.72	28.40 ± 5.08	**0.225**	**0.823 (NS)**
Height (cm.)	160.64 ± 4.76	160.64 ± 4.76	**-0.151**	**0.880 (NS)**

II- BMI, NDT, VAS, Q angle, LEFS and thigh girth:

A- Within groups:

Significant improvement was in the two groups (A) and (B) in BMI, NDT, VAS, Q angle, LEFS and thigh girth after treatment, Table (2).

Table (2): BMI, NDT, VAS, Q angle, LEFS and thigh girth before and after treatment for both groups A and B.

	BMI		NDT		VAS		Q angle		LEFS		Thigh girth	
	A	B	A	B	A	B	A	B	A	B	A	B
Before TTT	31.86 ±2.29	31.71 ±2.58	0.83 ±0.11	0.84 ±0.13	7.07 ±0.93	7.13 ±0.95	19.32 ±2.17	19.25 ±2.16	46.42 ±6.46	45.12 ±5.72	62.44 ±4.87	62.28 ±4.31
After TTT	30.03 ±2.49	27.33 ±2.41	0.79 ±0.09	0.55 ±0.05	6.10 ±0.76	1.22 ±1.02	18.76 ±1.83	17.46 ±0.91	51.18 ±6.86	73.70 ±3.84	60.70 ±5.16	50.44 ±4.66
Mean difference	1.83	4.38	0.04	0.29	0.97	5.91	0.56	1.79	4.76	28.58	1.74	11.84
% change	5.74 ↓↓	13.81 ↓↓	4.82 ↓↓	34.52 ↓↓	13.72 ↓↓	82.89 ↓↓	2.90 ↓↓	9.30 ↓↓	10.25 ↓↓	63.34 ↓↓	2.79 ↓↓	19.01 ↓↓
T value	16.578	19.642	2.556	18.247	6.776	34.512	5.740	8.260	-7.323	- 27.871	10.322	23.447

P value	0.001 (S)	0.001 (S)	0.014 (S)	0.001 (S)	0.001 (S)	0.001 (S)	0.001 (S)	0.001 (S)	0.001 (S)	0.001 (S)	0.001 (S)	0.001 (S)

B-Between groups:

B-Between groups: No significant difference was between the two groups (A) and (B) before treatment in BMI, NDT, VAS, Q angle, LEFS and thigh girth.

Significant difference was between the two groups (A) and (B) at the end of treatment in BMI, NDT, VAS, Q angle, LEFS and thigh girth (more improvement in group B), Table (3), Fig (1,2,3,4,5 and 6).

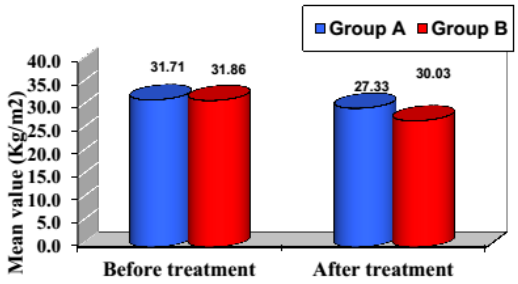

Fig.(1): Mean value of BMI in the two studied groups measured before and after treatment.

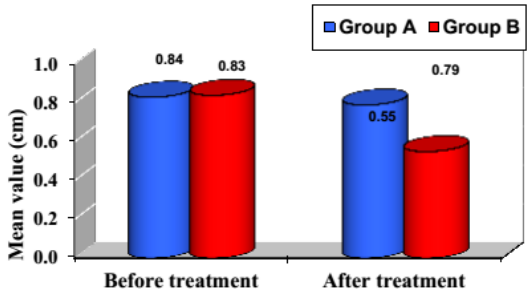

Fig. (2): Mean value of navicular drop test in the two studied groups measured before and after treatment.

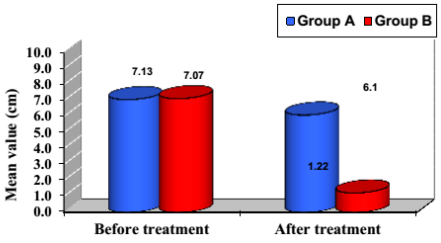

Fig.(3): Mean value of VAS in the two studied groups measured before and after treatment.

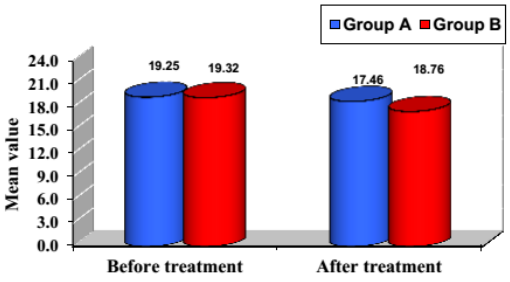

Fig.(4): Mean value of Q. angle in the two studied groups measured before and after treatment.

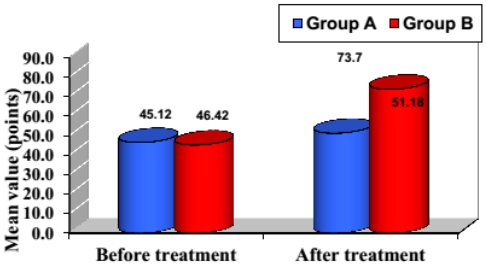

Fig.(5): Mean value of LEFS in the two studied groups measured before and after treatment.

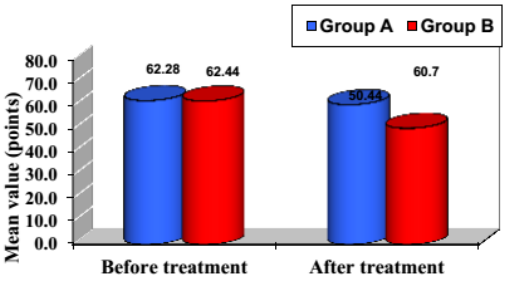

Fig.(6): Mean value of thigh girth in the two studied groups measured before and after treatment.

Table (3): BMI, NDT, VAS, Q angle, LEFS and thigh girth for both groups A and B before and after treatment.

		Group A	Group B	T value	P value
BMI	Before TTT	31.86±2.29	31.71±2.58	0.293	0.770 (NS)
	After TTT	30.03±2.49	27.33±2.41	5.525	0.001(S)
NDT	Before TTT	0.83±0.11	0.84±0.13	-0.252	0.801(NS)
	After TTT	0.79±0.09	0.55±0.05	16.241	0.001 (S)
VAS	Before TTT	7.07±0.93	7.13±0.95	-0.319	0.750 (NS)
	After TTT	6.10±0.76	1.22±1.02	27.162	0.001(S)
Q angle	Before TTT	19.32±2.17	19.25±2.16	0.162	0.872 (NS)
	After TTT	18.76±1.83	17.46±0.91	4.510	0.001 (S)
LEFS	Before TTT	46.42 ± 6.46	45.12±5.72	1.066	0.289(NS)
	After TTT	51.18±6.86	73.70±3.84	-20.257	0.001(S)
Thigh girth	Before TTT	62.44±4.87	62.28±4.31	0.174	0.862 (NS)
	After TTT	60.70±5.16	50.44±4.66	10.439	0.001(S)

DISCUSSION:

After delivery hormone levels that change will be the reasons that muscles and ligaments become more relaxed standby to delivery and this causes the pelvis to be unstable, creating pain and also arthritis. These alternations can continue after birth.

Some female got achy or 'restless' feet and legs in the late childbearing which lasting after delivery [14]. Contributing causes of knee pain may include: loose ankle and foot ligaments and joints, flat feet, muscle imbalances between the quadriceps femoris muscle and hamstrings muscles, tight Achilles tendons, and inflexibility of the calf muscles which occurring after delivery and with high extent in cesarean section [15]. After delivery there is a lot of maternal changes such as low foot arch, weight increasment and in some subjects Q-angle changes.

These biomechanical changes is the cause of mother's pain of the anterior knee and aching after child birth which in long run may cause other injuries as knee osteoarthritis [16]. This study was performed to detect the effect of patello-femoral rehabilitation on lower limb mechanical changes postnatally. One hundred women complaining from postpartum mild to moderate knee pain and/or mild degree of knee inflammation and/or lower extremity functional problem shared in this study. They were randomly selected from University Hospital of Said Galal in Cairo. They were diagnosed by physician.

The study was performed from January 2016 to March 2017. Their ages were ranged from 20-35 years old. They were splitted into two groups equal in number, group (A) treated only by nutrition program in form of balanced diet 1200-1400 Kcal/day while group (B) treated by the same diet (1200-1400 Kcal/day) and participated in 90 minutes session of patellofemoral rehabilitation program and localized fat lipolysis using sonoliser device on thigh region twice weekly for twelve weeks

BMI was assessed by using weight and height scale, pain of the anterior knee was evaluated by VAS, navicular drop test and thigh girth were assessed by tape measurement, Q angle was assessed by goniometer and functional activities of hip and knee joints were assessed by LEFS for the two groups A and B in the beginning and at the end of treatment. Results found that, no significant difference was in BMI, VAS, NDT, Q angle, LEFS and thigh girth in between the two groups A and B before treatment.

Significant improvement was in BMI, VAS, NDT, Q angle, LEFS and thigh girth in the two groups A and B after treatment. Significant difference was between A and B in BMI, VAS, NDT, Q angle, LEFS and thigh girth in-between group A and B after treatment (more improvement in group B). The study results are agreed with [17], who discovered that there are numerous reasons of the pain of the anterior knee.

Several of these can be related to an excessive Q angle. The study results are also agreed by [18-19], who found that supported by after pregnancy reported an average increased weight by 2 to 3 kg linked with the single birth against no childbearing between a biracial cohort (black and white women) and an increase of weight by 1.7 kilogram per delivery between white women.

The study results are also agreed with [20], who found that quadriceps muscles strength has a magic part at the rehabilitation of patellofemoral syndrome. The study results are also agreed with [21], who showed that A six-treatment, 6-week physiotherapy is efficient for cure of the pain of patellofemoral region.

The study results are also agreed with [22], who found that approximately 13% to 20% of childbearing females experience substantial weight retention on postpartum first year, defined as mother weight five kg at least above preconception weight. The study results are also agreed with [23]. Link between body weight increasment and knee arthritis, patellofemoral arthritis, hip pain , and pain of the low back in Americans.

The study results are also agreed with [24], who found that to reduce the likelihood of developing PFPS, any individual, especially those with positive potential risk factors, can perform the proposed rehabilitation program. The study results are also agreed with [25], who showed that the feet in size increase and weight causes an upward/ forward shift in the center of gravity, leading to anterior pelvic tilt.

The study results are also agreed with [26], who found that increasing pelvic tilting anteriorly also increased feet eversion (pronation) which mean arch drop of the feet. The study results are supported by [27], who found that the more the angle of tibiofemoral and anteversion of the femur were significant expectations of increased Q angle in both males and females.

The study results are also supported by [28], who showed that a well-structured program of rehabilitation is the mainstay of treatment in cases of patellofemoral syndrome. The program of the rehabilitation should emphasis on altering the patellar maltracking by knowing the findings appeared on the physical examination. Some patients may need significant strength of the quadriceps.

Others may have quadriceps strength excellent degree but mostly tight lateral structures or poor flexibility of quadriceps. Soft tissue techniques and flexibility exercises can help these patients. A detailed evaluation of the patellar tracking imbalance is therefore important to tailoring treatment.

Specific activities may then be continued as part of the rehabilitation program at home. Patients who need more evaluation or instruction can be referred to a physiotherapist. The study results are also supported by [29], who found that showed that selective and general physiotherapy are beneficial for the treatment of patients with syndrome of the patellofemoral emphasized on quadriceps strength.

The study results are also supported by [30], who showed that women who are overweight before pregnancy bank excessive fat storage due to pregnancy that exists also into the period of the postpartum, or exposed to patterns of postpartum deposition of the fat that are not like from those who are not overweight and both primiparity and mother's body size before pregnancy are linked to high weight gain during pregnancy, which, so on, is highly linked to weight retention after delivery.

The study results are also supported by [31], who noticed that changed lower-extremity biomechanics affect functional activity causing fatigue specially with overweight women. The study results are also supported by [32-10], who found that most patients with the syndrome of the patellofemoral pain treated well with placebo therapy including rest, activities and arch support. The study results are also supported by [33], who found that, with biomechanical changes as flat feet and increased Q angle lead to knee osteoarthritis on long run. The study results are also supported by [34], who showed that there is a significant increase in weight 2.051kg (SD1.7, $p<0.001$) was seen from of childbearing's 8th week and 8th week postpartum.

Maximum girth increase was found in abdominal and hip region with thigh deposition of fat was appeared in some cases. The study results are also supported by [35], who showed that the expected existence of pain of the anterior knee which also named as syndrome of the patellofemoral pain in this sample of female of 18 to 35 years old of 12–13% is much less than the popular cited value of 25%.

The results may suggest a better representation of with AKP patients. The study results are also supported by [36], who showed that the exercises of weight-training increased knee muscle strength and the contact area of the patellofemoral joint. This perhaps mechanical load reduction in the joint, which would help pain relief and function improvement for PFS patients.

The study results are also supported by [37], who showed that proximal exercises are more beneficial than knee exercises in the PFS cure. In an analysis of eight studies, the investigators showed that proximal exercise programs consistently reduced pain and improved function, with patients demonstrating short- and long-term improvement, while the results from knee exercise programs were more variable.

The study results come in consistence with [38], who showed that the childbearing appears to be linked with the arch height permanent loss and the first pregnancy is the most significant. These alternations in the feet could be the cause of the musculoskeletal disorders in women and to be more risky than male. The study results also come in consistence with [39], who found that women's arch height decreased, so on, increasment of their foot length between 2 to 10 millimeters (about 0.1 to 0.4 inches) during five months postpartum.

The study results also come in consistence with [40], who found that pain of Patellofemoral may be well treated with oral anti-inflammatory medication, activity alteration, physical therapy based on strength and flexibility, and, intra-articular injections when needed. The study results also come in consistence with [41], who strongly supported the superiority of quadriceps-strength physiotherapy exercises over placebo information alone in relieving pain and improving function in PFS.

The study results also come in consistence with [42-43], who found that physiotherapy improves the muscles strength all over the knee and hip will erase the load over the knee. Also, specific exercises may aim to correct problems with alignment and muscle balance all over the knee so on physiotherapy has an important intervention in relieving pain of the anterior knee in cases of patellofemoral syndrome.

The study results also come in consistence with [44], who found that some patients with pain of the Patellofemoral Syndrome are more likely to get value from exercise therapy. The study results also come in consistence with [45], who found that he most effective therapeutic exercise programs for patellofemoral syndrome with regard to relief of pain and improvement of the functions include “proprioceptive neuromuscular facilitation stretching and for the hip external rotator and abductor muscles and extensor muscles of the knee strengthening exercises.”

The study results also come in consistence with [46], who found that ice, quadriceps, hip adductors and hip abductors strength, stretching iliotibial, hip, buttock, hamstring, normalize hip and foot biomechanics, normalize gait, jumping and squatting patterns, restore thigh, hamstrings and calf muscles length and proprioception training improve the lower extremity biomechanics and relief knee cap pain.

The study results also come in consistence with [47], who showed that more strengthening of a core muscles program along with the conventional program of physiotherapy has a big role in the reduction of the pain intensity and improving the dynamic balance in females with PFPS. The study results also come in consistence with [48], who found that with increase in weight there are changes seen in Q angle, torsion of the tibia and leg heel alignment.

The study results also come in consistence with [46], who found that lower limb obesity causes anteversion of femur which mean leading to coxavera and increased Q angle. The study results are disagreed with [49], who showed that there is maternal foot arch regain after short period of baby birth so no proof that women may have any biomechanical changes duo to the drop of the arch during pregnancy.

The study results are also disagreed with [27], who found that angle of the pelvis , genu recurvatum, torsion of tibia, navicular drop, and femur to tibia length ratio were not significant independent predictors of Q- angle in males or females. The study results are also disagreed with [50], who showed that there is not any significant correlation between foot pronation and pelvic tilt.

The study results are also disagreed with [51], who found that pelvic width, Q-angle and intercondylar notch width could not be used to expect injuries of knee amongst the U-23 female players in South Africa. The study results are also disagreed with [52], who found that the Q-angle did not exist any relationship with intensity of the pain, functional capacity, projection angle of the frontal plane, or peak torque of hip abductor in the patients with syndrome of the patellofemoral pain.

CONCLUSION:

It can be concluded that patellofemoral program of rehabilitation is effective in decrease pain of kneecap or anterior knee also correcting lower extremity biomechanical changes postnatally.

REFERENCES:

[1] Borg-stein J, Dugans A and Gruber J. 2005: Musculoskeletal aspects of pregnancy. Am J Phys Med Rehabil, 84(10):180.

[2]Frankline and Conner-Kerr. 1998: An analysis of posture and back pain in the first and third trimesters of pregnancy. J Orthop Sports Phys Ther, 28:133.

[3]Gilleardw L, Crosbie J and Smith R. 2000:Static trunk posture in sitting and standing during pregnancy and early post-partum. Arch Phys Med Rehabil83:1739, 2002. J Appl Physiol, 1992, 72:787-95. J Appl Physiol , 89(5): 81-8.

[4]Wetz HH, Hentschel J, Drerup B, Kiesel L, Osada N and Veltmann U. 2006: Changes in shape and size of the foot during pregnancy. Orthopade, 35(11):1124, 1126-30.

[5]Foley S, Ding C, Cicuttini F and Jones G. 2007:Physical activity and knee structural change: a longitudinal study using MRI, Medicine and science in sports and exercise, 39(3): 426–34.

[6]Yusuf S, Hawken S, Ounpuu S, Bautista L, Franzosi MG, Commerford P, Lang CC, Rumboldt Z, Onen CL, Lisheng L, Tanomsup S, Wangai P Jr, Razak F, Sharma AM and Anand SS. 2005: INTERHEART Study Investigators: Obesity and the risk of myocardial infarction in 27,000 participants from 52 countries: a case-control studyLancet , 366(9497): 1640-1649.

[7]Lofgren I, Herron K, Zern T, West K, Patalay M, Shachter NS, Koo SI and Fernandez ML. 2004: Waist circumference is a better predictor than body mass index of coronary heart disease risk in overweight premenopausal womenJ Nutr, 134(5): 1071-1076.

[8] Rosenberg L, Palmer JR and Wise LA, 2003: A prospective study of the effect of child-bearing on weight gain in African-American women. Obes Res, 11(10):1526–35.

[9]Thomeé R, Renström P, Karlsson J and Grimby G. 2007:Patellofemoral pain syndrome in young women. Scandinavian Journal of Medicine & Science in Sports, 5 (4):237–44.

[10]Earl JE and Vetter CS. 2007: Patellofemoral pain. Physical Medicine and Rehabilitation Clinics of North America. 18 (3): 439–58,8.

[11] Plamondon and Tom. 2009:Special tests in the clinical examination of patellofemoral syndrome. Doctors Lounge Retrieved, 2(12):08-20.

[12]Mahgoub, Mohamed Serag El-dein; El-desoky and Mohamed Taher Mahmoud. 2014: Effect of Cavitation Versus Abdominal Exercise Programs on Abdominal Obese Subjects.Indian Journal of Physiotherapy & Occupational Therapy, 3(8):p71

[13]American Medical Society for Sports Medicine. 2014: Five Things Physicians and Patients Should Question, Choosing Wisely: an initiative of the ABIM Foundation (American Medical Society for Sports Medicine), retrieved 29 July 2014, which cites.

[14]Chu SY, Kim SY and Schmid CH. 2007:Maternal obesity and risk of cesarean delivery: a meta-analysis. Obes Rev, 8(5): 385–94.

[15]Smith TO, Drew BT, Meek TH and Clark AB. 2013: Knee orthoses for treating patellofemoral pain syndrome (Protocol). Cochrane Database of Systematic Reviews 5.

[16]Rooney BL, Schauberger CW and Mathiason MA. 2005: Impact of perinatal weight change on long-term obesity and obesity-related illnesses. Obstet Gynecol, 106(11):1349–56.

[17]Horton MG and Hall TL. 1989:Quadriceps Femoris Muscle Angle:Normal Values and Relationships with Gender and Selected Skeletal Measures. Phy Ther, 69(5): 17-21.

[18] Williamson DF, Madans J, Pamuk E, Flegal KM, Kendrick JS and Serdula MK. 1994: A prospective study of childbearing and 10-year weight gain in US white women 25 to 45 years of age. Int J Obes Relat Metab Disord, 18(8):561-9.

[19]Smith DE, Lewis CE, Caveny JL, Perkins LL, Burke GL and Bild D. 1994: Longitudinal changes in adiposity associated with pregnancy. The CARDIA Study. Coronary Artery Risk Development in Young Adults Study. Indian Journal of Physiotherapy and Occupational Therapy - An International Journal, 271(22):1747-51.

[20] Natri A, Kannus P and Jarvinen M. 1998: Which factors predict the long-term outcome in chronic patellofemoral pain syndrome? A 7-yr prospective follow-up study. Med Sci Sports Exerc. 30(5):1572–7.

[21] Crossley K, Bennell K, Green S and Connell J. 2001: A systematic review of physical interventions for patellofemoral pain syndrome. Clinical journal of sport medicine: official journal of the Canadian Academy of Sport Medicine, 11 (2): 103–10.

[22] Olson CM, Strawderman MS, Hinton PS and Pearson TA. 2003:Gestational weight gain and postpartum behaviors associated with weight change from early pregnancy to 1 y postpartum. Int J Obes Relat Metab Disord, 27(1):117-27.

[23]Andersen RE, Crespo CJ, Bartlett SJ, Bathon JM and Fontaine KR. 2003: Relationship between body weight gain and significant knee, hip, and back pain in older Americans. Obes Res, 11(10), 1159–62.

[24]Witvrouw E, Danneels L, Van Tiggelen D, Willems TM and Cambier D. 2004: Open versus closed kinetic chain exercises in patellofemoral pain: a 5-year prospective randomized study. Am J Sports Med. 32(9):1122–30.

[25]Brenda SW, Colette lC and Michele K. 2006: Women's Health and fitness guide. Text book .1st edition. Human Kinetics.177.

[26]Khamis S and Yizhar Z. 2007:Effect of feet hyperpronation on pelvic alignment in a standing position. Gait & posture, 25(1), 127-134.

[27] Anh-Dung N, Michelle C, Boling BL, and Sandra JS. 2009: Relationships Between Lower Extremity Alignment and the Quadriceps Angle. Clin J Sport Med, 19(3): 201–206.

[28]Sameer D, John P, Difior I , Monique B and Brandon M. 2007:Management of Patellofemoral Pain Syndrome. Am Fam Physician. 15,75(2):194-202.

[29]Syme G, Rowe P and Martin D. 2009: Disability in patients with chronic patellofemoral pain syndrome : a

randomized controlled trial of VMO selective training versus general quadriceps strengthening. Man Ther, 14(3): 252-63.

[30]Erica P and Gunderson.2010: Childbearing and Obesity in Women: Weight Before, During, and After Pregnancy. Obstet Gynecol Clin North Am, 36(2): 317–19.

[31]Luke JS and Kate E. 2010: The Effect of Fatigue on Lower-Limb Biomechanics During Single-Limb Landings: A Systematic Review. WebsterJournal of Orthopaedic & Sports Physical Therapy, 8(40):464–473

[32]Bolgla LA and Boling MC. 2011: An update for the conservative management of patellofemoral pain syndrome: A systematic review of the literature from 2000 to 2010. International journal of sports physical therapy, 6 (2): 112–25.

[33]Young-Mo K and Yong-Bum J.2012: Patellofemoral Osteoarthritis. Knee Surg Relat Res, 24(4): 193–200.

[34]Rathi M, Palekar T, Pimpr I and Pun E. 2012: A Study of Weight and Girth Variations During Pregnancy and Postpartum in Underweight, Normal and Overweight Women.Principal Padmashree Dr. D. Y. Patil College of Physiotherapy, 4(6):178-181.

[35]James R, Roush PT, Cat AT and Curtis BR. 2012: Prevalence of anterior knee pain in 18–35 year-old females. Int J Sports Phys Ther, 7(4): 396–401.

[36] Chiu JK, Wong YM, Yung PS and Ng GY. 2012: The effects of quadriceps strengthening on pain, function, and patellofemoral joint contact area in persons with patellofemoral pain. Am J Phys Med Rehabil. 91(2):98-106.

[37]Peter JS and Tyson NL. 2013: Proximal exercises are effective in treating patellofemoral pain syndrome: a systematic review. Int J sports. Phys Ther, 8(5): 689-700.

[38]Neil A, Elizabeth R, Patricia TY, Natalie A, Howard J, Hillstrom H and John Y. 2013: Pregnancy Leads to Lasting Changes in Foot Structure. American Journal of Physical Medicine & Rehabilitation, 92 (3): 232.

[39] Rachael Rettner Kulig and Kornelia. 2013: After Pregnancy, Women Have Bigger Feet. Med Sci Sports Exerc, 37 (1): 24–29.

[40] Moira Mc, and Sabrina Ms. 2013: Patellofemoral pain: an update on diagnostic and treatment options. Musculoskelet Med, 6(2): 188–194.

[41]Kooiker L, Van PI and Weir A. 2014: Effects of physical therapist-guided quadriceps-strengthening exercises for the treatment of patellofemoral pain syndrome: a systematic review. J Orthop Sports Phys Ther. 44(6):391-B1.

[42] Witvrouw E, Callaghan MJ, Stefanik JJ. 2014:Patellofemoral pain: consensus statement from the 3rd International Patellofemoral Pain. Research Retreat held in Vancouver. Br J Sports Med.48(6):411-4.

[43]Van der Heijden RA, Lankhorst NE, van LR, Bierma ZS and van M M. 2013: Exercise for treating patellofemoral pain syndrome (Protocol). Cochrane Database of Systematic Reviews 2.

[44] Lankhorst NE, van MM and van TD. 2015: Can We Predict Which Subjects With Patellofemoral Pain Syndrome Are More Likely to Benefit From Exercise Therapy: A Secondary Explorative Analysis of a Randomized Controlled Trial. J Orthop Sports Phys Ther, 27(22): 1-24.

[45] Alba MP, Gallego IT, PlazaMG, Romero FN, Nunez NS and Pecos MD. 2015: Effectiveness of therapeutic physical exercise in the treatment of patellofemoral pain syndrome: a systematic review. J Phys Ther Sci. 27 (7):2387-90.

[46] John M. Pedro A. Sanchez-lara and Graham JR. 2016:Smith recognizable pattern of human deformation. text book 4th ed. Philadelphia .61.

[47] Mohamed FC, Amer AS, Riziq AG and Khaled AM. 2016:Effectiveness of core muscle strengthening for improving pain and dynamic balance among female patients with patellofemoral pain syndrome.J Phys Ther Sci, 28(5): 1518–1523.

[48]Anand H, Laxmi B and Santosh M. 2016: Correlation between leg-heel alignment, tibial torsion and q angle amongst normal, overweight and obese individuals. International Journal of Physiotherapy and Research, Int J Physiother Res, 4(3):1530-34.

[49]Guyton and Hall. 2005: Textbook of Medical Physiology.11th ed. Philadelphia: Saunders. 103.

[50] DuvalK, Lam T and Sanderson D. 2010: The mechanical relationship between the rearfoot, pelvis and low-back. Gait & posture, 32(4): 637-640.

[51]Mohamed EE, Useh U, and Mtshali BF. 2012: Q-angle, Pelvic width, and Intercondylar notch width as predictors of knee injuries in women soccer players in South Africa. Afr Health Sci,12(2): 174–180.

[52]Gabriel P, Leão A, Ana PM, Campos CS, Fábio JRF, Maurício OM, Thomaz NB, and Amélia PM. 2016 : Q-angle in patellofemoral pain: relationship with dynamic knee valgus, hip abductor torque. pain and function, 51(2): 181–186.