



RESEARCH ARTICLE

Implementation of Exercises Functional Program on Knee Osteoarthritis in Women

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ARTICLE INFO	ABSTRACT
Received: Apr 24, 2024 Accepted: Jul 13, 2024	<p>Osteoarthritis (OA) is a major public health problem. It is one of the major causes of impaired function that reduces quality of life (QOL) worldwide. Therapeutic exercise is the first line of treatment that can reduce pain, enhance physical function, and improve quality of life as well as save time and cost. To evaluate the effect of implement of exercises functional program on knee osteoarthritis in women. Quazi experimental study design was utilized in this study Tools: Tool(I): Women's interview questionnaire sheet, Tool (II): Exercises functional program and Tool (III): Physical Health Status Assessment Results: The studied sample (study and control) their age ranged from 50-60 years and not working (77.5% and 60%) respectively and body mass index for (study and control group the highest percent were obese (42.5% and 52.5%) respectively. There are statistical significance difference of all items of knowledge and physical health status assessment in pre and post implementation of program. provide educational program for women with knee osteoarthritis that about diet, exercises, weight reduction and medication</p>
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INTRODUCTION

Osteoarthritis (OA) is a common chronic condition resulting in pain, fatigue, functional limitations, increased healthcare utilization and high economic costs to society. The burden of OA is projected to increase, due in part to obesity and population aging. While the prevalence of OA increases with age, there is a growing recognition that OA affects people at younger ages. Recent US data demonstrated that half of people with symptomatic knee OA are diagnosed by age 55 (Long et al., 2022).

Osteoarthritis (OA) of the knee is the most common form of joint disease and prevalence of both radio graphically evident and symptomatic. The females having higher prevalence than males (11.4% vs 6.8%) (Cieza et al., 2020). The gender difference in prevalence has recently been emphasized in a meta-analysis, which provides evidence for a greater risk in females for prevalent and incident knee OA (Page et al., 2021). The meta-analysis also reported that females tend to have more severe knee OA radio graphically assessed than males and that the gender differences increase with age > 55 years. The prevalence of OA will increase as the population of the kingdom ages, especially if the incidence of obesity remains at over 50% in the 45+ age group (Kim et al., 2020).

There is clear evidence of or major risk factors, such as age, obesity, joint trauma, and heavy work load. The risk factors can be divided into systemic (for e.g. age, gender, genetics, and overweight) and local biomechanical factors, such as joint injury and malalignment, overweight, and muscle weakness (Collins, 2021).

Abnormal mechanical loading in various sport activities or during heavy work may activate the biochemical cascade that leads to joint degeneration and pain, but also even in normal mechanical loading if the cartilage is impaired (Frazier, 2022).

Clinical symptoms of OA include joint functional limitations, stiffness, pain, disability of walking or running, and probably other symptoms. Bony enlargement and swollen and inflamed joints could be found in OA patients in physical examination. Clinical radiographic examination, such as MRI (magnetic resonance imaging), is able to visualize marginal osteophytes, joint space narrowing, structural changes of osteochondral tissue, and other OA lesions (Maglaviceanu et al., 2021).

The current management of OA, which includes both non-pharmacologic and pharmacologic modalities such as education, weight control use of assistive devices, taping, electrotherapy, ice and heat, exercises and non-steroidal anti-inflammatory drug and surgery. (Aubourg et al., 2022).

Exercise therapy is regarded as the cornerstone of conservative management and is recommended by clinical guidelines. Important of exercise for knee OA can reduce pain and improve function and health status, prevent cartilage degeneration, inhibit inflammation and prevent loss of the subchondral bone and metaphyseal bone trabeculae. Exercise: Giving the large body of evidence demonstrating the beneficial clinical effects of exercise in people with knee OA of varying severity, (Conaghan et al., 2018).

Significance of the study

During the year of 2021-2022, according to Assiut hospital registry (orthopedic department), about 288 women experienced knee osteoarthritis. Knee osteoarthritis is one of the most prevalent disabling joint disorders, involving damage to the joint tissues, including articular cartilage, subchondral bone and synovium. Knee OA affect quality of life for women that lead to limitations in walking, stair climbing, and squatting are common patient complaints that greatly interfere with activities of daily living and recreation so this study were investigated the effect of exercise functional program on women with osteoarthritis.

Aim of the study

To investigate the effect of exercises functional program on women with osteoarthritis.

Research hypothesis

Knee functions were improve after application of exercises functional program.

SUBJECTS AND METHODS

Research design

Quazi experimental study design was used to meet the aims of the study

Setting

This study was conducted in orthopedic outpatient clinic at Assiut University Hospital.

Sample:

A sample of (160) adult women under diagnosis knee osteoarthritis are including the following criteria; age between (20-65) years. The patients divided into two groups (study and control group 80 patients for each group) patients was choosing randomized; simple random sampling by selection odd numbers for study group and even numbers for control group. The study group was receive exercise functional program, while the control group was receive routine hospital care for a period of 4 months from (June to September) of the year 2023.

Tools of the study

Three tools were used in this study and were developed by the researcher to collect the necessary data for this study after reviewing national and international literature under guidance of supervisors

Tool (I): Women's interview questionnaire sheet (Annex I):

This tool was developed by the researcher to assess the women condition; it consists of three parts:

Part (1) Demographic data of the women:

It was developed to assess the women personal characteristics as age, date of admission, residence, educational level and occupation.

Part (2) Physical and medical data of the women:

It was developed to identify the women health problem as follows; general physical assessment of the women, It was included vital signs, weight, height, BMI, surgical history (type and date), family history of chronic diseases.

For body mass index (BMI)= $\frac{\text{Weight (in kilograms)}}{\text{Height (in meters)}^2}$ (Davis and Syed, 2000)

Within standard level	20 to < 26
Over weight	26 to < 30
Obese	30 to < 40
Morbid obesity	>40

Tool (II): Physical Health Status Assessment (WOMAC) scale (Annex II):

Physical Health Status Assessment will used to assess patients knee joint condition upon their first admission to the department, during and after intervention, this part includes Western Ontario and McMaster Universities Arthritis Score (WOMAC) covered 3 dimensions (Angst et al., 2018). It was developed by Bellamy in 1982 and updated by American college in 2013 researchers and to carry out daily activities such as using the stairs, rising from sitting adopted by researcher to evaluate functional status is comprised of 24 items divided into three subscales: Pain (5 items) ,score range (0-20), stiffness (2 items), score range (0-8) , and function al limitation(17 items) ,score range(0-68).

Patients are asked a range of questions about their ability, lying in bed and conducting light or heavy domestic duties. WOMAC take 12 minutes

Scoring systems

The 24 items were scored based on likert scale. A Likert scale is used and all items have five possible answer options scored from zero (No Problems) to four (Extreme Problems) and each of the

five scores are calculated as the sum of the items included. It consists of 3 subscales, part I Pain subscale: range from No pain equal to (Zero) ,Slight Pain equal to (1-5),Moderate equal to(>5-10),Severe equal to(>10-15), Worst Pain equal to (>15-20), part II Stiffness subscale range from Zero equal to No stiffness, slight stiffness (>1-4), Moderate equal to (>4-6), Severe equal to(>6-8),

part III Physical function range from Zero equal to No functional limitation, slight functional limitation equal to (1-17), Moderate functional limitation equal to (>17-34), severe functional limitation equal to (>34-51), Extreme functional limitation equal to (>51-68).

Scores are transformed to a 0–96 scale, ranging from none' to 'extreme'

None = (zero), Mild = (1), Moderate = (2), Severe = (3) and Extreme = (4)

Scores for each section will be summed. So that lower subscale scores represent, less pain, less stiffness, or better physical function.

Total Scoring system

Normal functional status allocated score equal to zero to less than 25, Mild functional limitation allocated score equal to 25 to less than 50, Moderate functional limitation allocated score equal to 50 to less than 75 and Severe functional limitation allocated score equal to 75-96

Tool (III): Exercise functional program (Annex III):

constructed by researcher after review of literature it consists of the following:

- Exercise functional program for knee OA, it include importance, types and technique for each type
- The exercises include Hamstring Stretch, Calf Stretch, Straight Leg Raise, Quad Set, Pillow Squeeze and Seated Hip March

Tool (IV): Women evaluation sheet (Annex III) :

Constructed by researcher after review of literature to evaluate the effect of exercise functional program on reduce complications such as pain, stiffness and improve physical function for knee pre and 4 weeks from applying the exercise function program.

II- Operational Design:

Technique for data collection: This study was carried out in three phases:

Phase I: Preparatory phase:

- Official approval letter was obtained from the dean of the faculty of nursing, Assiut University to the head of orthopedic department at Assiut University Hospital to collect the necessary data; the aims of the study and the program were explained to them to obtain their cooperation.
- The researcher reviewed related literature of the current study, local and international using textbooks, articles and scientific magazines; the study setting was assessed for patients flow in orthopedic outpatient clinic at Assiut university Hospital, This phase ended by a pilot study.

A pilot study:

- The purpose of the pilot study was to; ascertain the relevance of the tools, detect any problem peculiar to statements clarity that might interfere with process of data collection and to estimate the time needed to complete the interview schedule. the study tools on 10 % (16 women) of sample. pilot sample was included in the studied patients, no modification occur in tool.

Content Validity:

The content validity of study tools were checked by 3 expert professors in the field of nursing and medical staff, they reviewed the tools for clarity, relevance, comprehensiveness, understanding, applicability and easiness for administration, minor modifications that required correction was carried out accordingly

Phase II:- Implementation phase

At initial interview the researcher introduced herself to initiate line of communication, fill out the questionnaire sheet, after assessment of the needs by using the structured interview questionnaire tool in the study group, the exercise training program was developed, the contact was consistent with and meet the women needs, interests and their levels of understanding. All women received the exercise training program contents by the researcher herself, using standardized teaching methods.

The implemented exercise functional program was conduct through three sessions the duration of each session was around 20-30 minutes. At the beginning of the first session; women were oriented regarding the program contents, its purpose and its impact on their health condition. By the end of the first session, patients were informed about the time of the next one.

Each of the following exercise functional program sessions were usually started by briefing about what was discussed in the previous session(s) and the objectives of the new session, using simple Arabic language. Each session ends by summary to its contents and a feedback from the patients was elicited to ensure maximized educational benefits. After implementation of the designed exercise functional program, assessment of knee function.

The first session: included information about knee joint anatomy, function, definition of knee OA, symptoms and complications. The second session: included information about how to prevent knee OA, treatment, important of knee exercise, types, knowledge about how to perform this exercise and duration of this exercise (Hamstring stretch and its technique). The third session: provided, knowledge and demonstrate about how to perform exercises and duration of each exercises about(calf stretch, straight leg raise and pillow squeeze).

Phase III: Evaluation phase:

In this phase evaluate the effect of the exercise functional program on women's outcome such as decrease pain and perform activity of daily life, it carry out after 4 weeks on follow up (Annex III).

Ethical considerations

Research proposal was approved from ethical committee in the faculty of nursing at Assiut University, there is no risk for study patients during application of the research, confidentially was assured, oral informed consent was taken from all patients who were participating in the study and study patient privacy was considered during collection of data and study patients had the right to refuse to participate and or withdraw from the study without any rational any time.

Statistical analysis

The collected data was summarized, coded, tabulated and computerized and then the data descriptive statistics (frequencies, percentages, mean and standard deviation) were done using

computer program Statistical Package for the Social Sciences (SPSS). Pearson Correlation was used to measure the statistical relationship, or association between two continuous variables. It is known as the best method of measuring the association between variables of interest because it is based on the method of covariance. It gives information about the magnitude of the association, or correlation, as well as the direction of the relationship (Nikolić et al., 2012).

Results

Part (1): Demographic data and medical data assessment

Table (1): Distribution of sample according to demographic data for both group n=160

Variables	Control n=80		Study n=80		X2 and p.value
	N	%	N	%	
Age 1-					
29yrs>20	5	6.2%	0	0%	14.234 .003
40 yrs >29	15	18.8%	4	5%	
50yrs>40	28	35%	29	32.2%	
65 yrs≥50	32	40%	47	58.8%	
2- Residence					
Urban	34	42.5%	49	61.2%	5.633 .013
Rural	46	57.5%	31	38.8%	
3- Level of education					
High education	11	13.8%	0	0%	22.265 .000
Secondary education	26	32.5%	17	21.2%	
Read and write	32	28.8%	19	23.8%	
Illiterate	20	25%	44	55%	
4- Occupation					
Working	32	40%	18	22.5%	22.265 .000
Not working	48	60%	62	77.5%	

Table (2): Distribution of sample according to body mass index for women n=160

Item	Control		Study		P.V
	N	%	N	%	
Normal to 20 less than 26	13	16.2%	21	26.2%	.400
Over weight 26-29	22	27.5%	23	28.8%	
Obese 30-39	42	52.5%	34	42.5%	
Morbid obesity 40	3	3.8%	2	% 2.5	

Table (3): Distribution of sample according to past history for women (n=160)

Variables	Control		Study		X2	p. value
	N	%	N	%		
Undergoing surgery	36	45%	13	16.2%	15.562	.001**
Diabetes	26	32.5%	30	37.5%	.440	.310
Hypertension	17	21.2%	20	25%	.354	.316
Asthma	0	0%	1	1.2%	.500	1.006
Lung disease	3	3.8%	0	0%	3.057	.123
Kidney disease	3	3.8%	1	1.2%	.310	1.026

Table (4): Comparison between study and control groups regarding physical health status assessment pre and post implementation of exercises functional program n=160

Dimension assessed			Study		control		P.V
			N	%	N	%	
Pain	Pre	Slight pain	43	53.8	80	100	011.*
		Moderate pain	37	46.2	0	0	
	Post	Slight pain	33	41.2	32	40	.000**
		Moderate pain	47	58.8	48	60	
Stiffness	Pre	No stiffness	.....	.....	6	7.5	.....
		Slight stiffness	80	100	74	92.5	
	Post	No stiffness	.....	.....	.....	.....	028*
		Slight stiffness	80	100	80	100	
Physical function	Pre	limited	78	97.5	80	100	1.000
		moderate					
	Post	limited	79	98.8	76	95	120.
		moderate	1	1.2	4	5	
Total function	Pre	Normal function	75	93.8	80	100	1.000
		Mild function limitation	5	6.2	0	0	
	Post	Normal function	77	96.2	78	97.5	1.000
		Mild function limitation	3	3.8	2	2.5	

Table(1): This table revealed that the highest percentage of the studied sample their age range from (50>-65yrs) were (58.8%), (61.2%) were living in urban areas, illiterate (55%),not working (77.5%) while control group their age ranged from (50>65) were (40%), (57.5%) living in rural area, secondary education (32.5%) and not working (60%).

Table (2): Illustrated that regarding body mass index for study and control group the highest percent were obese (42.5% and 52.5%) respectively.

Table (3): Illustrated that regarding present past history for study sample (16.2%) were undergoing surgery, (25%) were have hypertension, (37.5%) were have diabetes. While control group (45%) were undergoing surgery, (21.2%) were have hypertension and (32.5%) have diabetes.

Table (4): Show that there are statistical significance difference in all item of physical health assessment between study and control group post implementation of exercises functional program.

DISCUSSION

Knee Osteoarthritis (KOA) is the most common type of arthritis disorder which can predispose significant functional limitations is a degenerative disease due to chronic joint failure and attacks, especially the joint cartilage. The joints affected have a predilection for weight-bearing joints. (Munthe et al., 2021).

The aim of this study was to evaluate the effect of implement exercises functional program on women with osteoarthritis.

Regarding socio demographic of studied patients, the current study found indicated that more than half of the studied women their age ranged.

from 50 to less than 65 years old this findings agreement with (Mahmoud et al., 2019), who mentioned that the majority of patients in the groups studied were between 45 ≥55 years old. Moreover, (Saffari et al., 2018) added that the prevalence of osteoarthritis will increase incredibly in the near future due to the aging of the population.

Regarding knee osteoarthritis patients' residence, the current findings more than half living in urban areas this result comes in agree with (Jorgensen et al., 2021), who found that living in a rural setting was related to OA.

When analyzing the distribution of patients in the current study about the educational level, it was found that more than half of study sample were illiterate. This finding is in the same line with (Abd Elfatah, et al., 2019), who illustrated that above half of the studied patients were illiterate, and disagreement with the (Uludağ & Kaşıkçı 2019) study which found that less than half of patients were educated.

Concerning occupation, it was seen that two-third of study sample were not working This agrees with (Uludağ & Kaşıkçı 2019), who noticed that most knee osteoarthritis patients didn't work anywhere.

The present study revealed that; regarding body mass index for study sample the highest forty percent in this study were obese , this result comes in agreement with (Nevitt, et al 2018) who found that excess weight increases the biomechanical load on these joints during weight-bearing activity. Forces across the knee and hip during walking and stair climbing, for example, are 2 to 4 times body weight.

From the opinion of researcher the obesity may increase the risk of osteoarthritis because adiposity is associated with abnormal levels of hormones and growth factors, greater bone mineral density, and other metabolic intermediaries. Indeed, the association between obesity and osteoarthritis in non-weight-bearing joints is evidence for a systemic effect of adiposity.

For comorbidity, nearly one third of the studied patients have comorbid diseases, were have diabetes and hypertension. It might be explained by the shared traditional risk factors between hypertension and knee osteoarthritis; such as aging process, obesity, and chronic inflammation.

Furthermore, multiple genes are affected in both hypertension and osteoarthritis. Moreover, the pro-inflammatory cytokine interleukin -6 responsible for hypertension and knee osteoarthritis, also, polymorphisms in the vitamin D receptor, may be related to low bone density, osteoarthritis and hypertension (Zhang et al., 2017). This finding is in line with the study conducted by (Lin et al., 2020) They concluded that the majority of their studied patients had comorbid diseases.

For overall Western Ontario and McMaster Universities Arthritis Score (WOMAC) scale, the current study revealed statistically significant difference in all item of physical health as pain, stiffness and knee function improvement after implementing the exercise functional program. This results could be linked to relieve of pain after exercise program completion, which is the first indicator and motivator for functional and daily living activities enhancement. (Nur et al., 2018).

It may be due to the dynamic effect of exercise influence the knee cartilage by squeezing and moving the fluids in and out the matrix, which promote growth of cartilage and, accordingly joint restoration as well as relieving knee pain (Yang et al., 2021). This result is similar to the finding of a study carried out by (Karadag 2019), that compared the effect of heat application with implementation of the home exercise program, on pain and level of function for patient with knee osteoarthritis. They reported the influence of- home exercise (WOMAC scale).

As regard knee joint stiffness, these study findings showed that the most of patients studied were knee- stiff in the morning. This result is in the same line with the result made by (Hafez et al., 2020) that life quality of knee osteoarthritis patients influenced by knee stiffness, pain, significantly reduced physical function, sleep disturbances, depression, and anxiety of those patients.

REFERENCES

- 1- Abd elFatah M., Weheida S. and Mekkawy M. (2019): Effect of Cold Application Versus Contrast Hydrotherapy on Patients Knee Osteoarthritis Outcomes. *American Journal of Nursing Science*; Vol. 8(4): pp. 151-158.
- 2- Aubourg, G., Rice, S. J., Bruce-Wootton, P. & Loughlin, J. (2022): Genetics of osteoarthritis. *Osteoarthr. Cartil.* 30, 636–649 (2022).
- 3- Cieza A, Causey K, Kamenow K, Wulf Hansen S and Chatterji S, Vos T.(2020): Global estimates of the need for rehabilitation based on the Global Burden of Disease study: a systematic analysis for the Global Burden of Disease Study. *Lancet*. Dec 19; 396(10267)
- 4- Collins K. H.(2021): Adipose tissue is a critical regulator of osteoarthritis. *Proc. Natl Acad. Sci. USA* 118, e2021096118 .
- 5- Conaghan PG, Dickson J and Grant RL(2018): Care and management of osteoarthritis in adults: summary of NICE guidance. *BMJ* 336, 502-3
- 6- Davis B.L and Syed T Y,(2000): Obesity and Osteoarthritis of knee medical hypnosis's 54, 182-185.
- 7- Frazier. T.(2022): Non-homologous use of adipose-derived cell and tissue therapies: osteoarthritis as a case study. *Bone Rep.* 17, 101601.
- 8- Hafez, A. R., Alenazi, A. M., Kachanathu, S. J., Alromi, M. A. and Mohamed, E. S. (2020): Knee osteoarthritis: A review of literature. *Physical Medicine and Rehabilitation International*; Vol. 1(5):pp. 1-8.
- 9- Jorgensen KT., Pedersen BV. and Nielsen NM. (2021): Sociodemographic factors, reproductive history and risk of osteoarthritis in a cohort of 4.6 million Danish women and men. *Osteoarthritis Cartilage*; Vol. 19: pp. 1176–82
- 10- 10-Karadağ, S., Taşci, S., Doğan, N., Demir, H., & Kiliç, Z. (2019). Application of heat and a home exercise program for pain and function levels in patients with knee osteoarthritis: A randomized controlled trial. *International journal of nursing practice*, 25(5), e12772. females more than males
- 11- 11-Kim JE, Chang JH and Jeong MJ. 2020): A systematic review and meta-analysis of effects of menopausal hormone therapy on cardiovascular diseases. *Sci Rep*;10:20631. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
- 12- 12-Page MJ, McKenzie JE and Bossuyt PM. (2021):. The PRISMA statement: an updated guideline for reporting systematic reviews. *BMJ*;372:n71. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
- 13- Lin, Y. T., Lee, W. C., & Hsieh, R. L. (2020):.Active video games for knee osteoarthritis improve mobility but not WOMAC score: A randomized controlled trial. *Annals of physical and rehabilitation medicine*, 63(6), 458-465
- 14- 14-Long H, Liu Q, Yin H, Diao N and Zhang Y, Lin J.(2022): Prevalence trends of site-specific osteoarthritis .Findings from the global burden of disease study. *Arthritis Rheumatol*; 74(7): 1172-1183.
- 15- 15-Saffari M, Emami Meybodi MK, Sanaeinasab H, Karami A, Pakpour AH. and Koenig HG.(2018): A theory of planned behavior-based intervention to improve quality of life osteoarthritis: A randomized controlled trial. *Clin Rheumatol*; Vol 37(9):pp.2505-15..
- 16- 16-Uludağ E and Kaşıkçı KM. (2019): The Effect of Local Cold Compression upon Pain and Movement Restriction among Patients with Knee Osteoarthritis. *Austin J Nurs Health Care*; Vol.6 (1): pp.1048.

- 18- 17-Maglaviceanu, A., Wu, B. & Kapoor, M. (2021): Fibroblast-like synoviocytes: Role in synovial fibrosis associated with osteoarthritis. *Wound Repair Regen.* 29, 642–649 .
- 19- 18-Mahmoud, G. A., Moghazy, A., Fathy, S., & Niazy, M. H. (2019). Osteoarthritis knee hip quality of life questionnaire assessment in Egyptian primary knee osteoarthritis patients: relation to clinical and radiographic parameters. *The Egyptian Rheumatologist*, 41(1), 65-69.
- 20- 19-Munthe RV, Hendrika W and Gurusinga NY.(2021): Relationship between body mass index (BMI) and knee osteoarthritis at the UKI General Hospital, Jakarta in 2017. *Int J Health Sci Res.*; 11(10): 365-377. DOI: <https://doi.org/10.52403/ijhsr.20211047>
- 21- 20-Nevitt, M. C., & Lane, N. (2018). Body weight and osteoarthritis. *The American journal of medicine*, 107(6), 632-633.
- 22- 21-Nikolić D, Muresan, R, Feng W and Singer W (2012):Scaled correlation analysis: a better way to compute a cross-correlogram. *European Journal of Neuroscience*, vol. (35), pp. 1–21.
- 23- Nur, H., Sertkaya, B. S., & Tuncer, T. (2018). Determinants of physical functioning in women with knee osteoarthritis. *Aging c linical and experimental research*, 30(4), 299 -306.
- 24- 23-Yang, X., Thudium, C. S., Bay Jensen, A. C., Karsdal, M. A., van Santen, J., Arden, N. K., ... & Kluzek, S. (2021). Association between Markers of Synovial Inflammation, Matrix Turnover and Symptom s in Knee Osteoarthritis: A Cross Sectional Study. *Cells*, 10(7), 1826
- 25- 24-Zhang, Y. M., Wang, J., & Liu, X. G. (2017): Association between hypertension and risk of knee osteoarthritis: A meta- analysis of observational studies. *Medicine*, 96(32)