EFFECT OF PROPRIOCEPTIVE EXERCISES ON JOINT PAIN AND QUALITY OF LIFE AMONG GERIATRIC PATIENTS WITH KNEE OSTEOARTHRITIS

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Abstract

Background: *Knee osteoarthritis, the disease of knee joint pain and had a negative effect on quality of life for geriatric patients. Proprioceptive exercises have been recommended as suitable for reducing joint pain and enhancing quality of life.*
Study aim: *Determine the effect of proprioceptive exercises on joint pain and quality of life among geriatric patients with knee osteoarthritis.*
Methods: *A purposive sample of 140 geriatric patients divided into 2 equal groups of 70 geriatric patients (study and control). Quasi-experimental research design was used. This study was conducted at Rheumatology and Rehabilitation Department at Assiut University Hospital. Study tools including structured interview questionnaire, Visual Analog Scales and 36 - Item Short-Form Health Survey. The investigation was recorded at www.clinicaltrials.gov (NCT06574334 identifier) on October 01,2023.*
Results: *The results of this study suggested that proprioceptive exercises and isometric exercise have positive effect on reducing pain and enhancing quality of life among geriatric patients as there was statistically significant difference for study & control group in regards to quality of life (P=0.000). Also, there was statistically significant difference between pretest and post-test in regards to pain (P =0.0001).*
Conclusion: *Findings of this study indicate that proprioceptive exercises and also isometric exercise are effective on reducing joint pain and enhancing quality of life of geriatric patients with osteoarthritis in the knee.*

Key Words: *Geriatric patients, Joint pain, Knee osteoarthritis, Proprioceptive exercises, Quality of life.*

INTRODUCTION

Aging is a lifetime process of growing old and growing up. It starts at conception and finishes with death. Aging causes the human body to undergo many obvious changes, one of which is the regular decline in biological activities. However, a decline in function is not the same as a disease-induced loss of function (Chalise, 2022). According to the report of the Central Agency for Public Mobilization and Statistics of Egypt (2024), the percentage of geriatric people age 60 or over in January 2024 was around is 8.8% from the total population. This percentage is expected to reach 20.8 % by 2050 (Central Agency for Public Mobilization and Statistics, 2024).

Osteoarthritis (OA) of the knee is a degenerative joint condition. It often arises from wear, strain and gradual articular cartilage loss, and it is most prevalent among the geriatric. It occurs when the knee joint's cartilage degrades. When this occurs, friction from the rubbing of the knee joint's bones causes the knees to ache, stiffen, or enlarge (Zhou et al., 2023). Patients who suffer from knee OA experience discomfort and fatigue. Patients frequently complain of pain decreased muscle strength, and joint instability when they have this sickness (Naqi et al., 2021). In addition, increased pain in knee OA patients also progressively worsen their quality-of-life (Sharma, 2021).

Pain is primary issue in patients with knee OA which reduces their mobility and makes it more difficult for them to complete daily tasks that progressively worsen their quality-of-life. Patients with osteoarthritis in the knee have pain that impacts their physical and mental health. Also pain lead to exhaustion, difficulty sleeping, a worse perception of one's health, a decrease in activity, a deterioration in function and loss of independence (Thirumaran et al, 2023).

Patients with knee OA experience limited or decreased proprioceptive activity, which results in reduce activities of daily life (ADLs). An individual's capacity to feel their own movement and position in relation to their joints is known as joint proprioception. It includes joint position as well as joint motion so proprioceptive exercises have been used for the strengthening of muscles surrounding the knee joint (Viswas et al., 2021).

Nurses have integral role in the care of osteoarthritis patients. They can help them in reducing pain and enhancing quality of life through educating patients about exercises through suitable training programs. They ought to educate the patient on how to use exercise properly to increase knee joint flexibility and muscular strength that led to lowering pain and improving quality of life (Al-Omari& Hill, 2020). Proprioceptive exercises are recommended exercise which significantly improved pain in knee OA patients which as results lead to enhance quality of life (Guede-Rojas et al., 2023).

Significance of the Study

Osteoarthritis is a chronic, deteriorating condition that affects about 10% to 15% of people aged over 60 years (Di Nicola, 2020). It might lead to pain and irreversible deterioration of the joint. In Egypt, Knee OA is a major health issue and prevalent condition that affects 5,596,869 of the total population (Ahmed et al., 2022). Physiotherapy is essential for treating osteoarthritis of the knee, which includes proprioceptive exercises and isometric exercise that strengthen the muscles, reduce pain, and are therefore improve quality of life (Huffman et al., 2024).

Study aim

Determine the effect of proprioceptive exercises on joint pain and quality of life among geriatric patients with knee osteoarthritis.

Study hypothesis

Proprioceptive exercises implementation has a positive effect in reducing joint pain, and enhancing quality of life of geriatric patients with osteoarthritis of the knee.

RESEARCH METHODOLOGY

Design of study

Quasi experimental research design was used in this study.

Setting

The study was performed at Rheumatology and Rehabilitation Department at Assiut University Hospital. This department is in the first floor of main university hospital that belong to the Ministry of Science and Higher Education. It consists of three sections, outpatient clinic, inpatient and rehabilitation unit.

Type of sample

Purposive sample was used in this study.

Sample size calculation

The total number of geriatric patients suffering from osteoarthritis that attending Rheumatology and Rehabilitation outpatient clinic at Assiut University Hospital are around 220 per year. By Using the EPI /Info software version 3, the sample size was calculated with a 95% confidence interval (CI). The sample size of this study is 140 patients split into two equal groups of 70 geriatric patients (study and control).

Inclusion criteria

- Geriatric patients who are 60 years of age or older.
- Male and female geriatric patients.

- Mild and moderate knee OA (based on X-rays).

Exclusion criteria

- Patients suffering from advanced knee osteoarthritis.
- Patients who have advanced organ failure.
- Patients who are cognitively impaired and cannot participate actively in the study.
- Patients whose physical or neurological conditions prevent them from taking part in the study.
- Patients with uncontrolled medical conditions.

Study tools

Tool I: A structured interview questionnaire: It was designed and developed by the researchers. It had two parts: - Part I: It involved demographic data as age, sex, residence, education, marital status etc. Part II: It involved assessment of medical history such as past and present history, accidental and falling history, family history, duration of illness, smoking history, and history of any other disease etc.

Tools II: Visual Analog Scales (VAS): (Sriwatanakul et al., 1983).

VAS scale is used to measure pain. It has a score system of 0 to 10, which 0 means no pain, 5 means moderate pain, and 10 means extreme pain.

Tools III: - 36 - Item Short-Form Health Survey (SF-36). (Brazier et al., 1999)

This instrument used to measure life quality. It is composed of 36 items divided into eight domains: physical functioning, role physical, bodily pain, general health, vitality, social functioning, role emotional and mental health. Using a measurement scale with values ranging from zero (which represents the worst health state) to 100 (which represents the highest health status), we were given a score for each subject and for each of the eight categories.

Validity and reliability

Tools evaluated for content validity by group of seven experts in gerontological nursing, community health nursing and medical surgical nursing. The necessary adjustments were completed. Reliability was determined by utilizing the Alpha Cronbach's test for tool II (r =0.97) and tool III (r =0.87).

Pilot study

A pilot study was done on 10% (14) geriatric patients to assess the applicability, clarity and feasibility of the study tools; these selected patients were not included in the research.

Data collection (Field work)

A formal acceptance letter was obtained from the head of the department of rheumatology and rehabilitation to conduct the research. The study was conducted in the first of October 2023 and finished at the end of May 2024; data for eight months. The study sample (70) geriatric patients received proprioceptive exercises only, while the control group (70) geriatric patients received routine exercise (Isometric exercise) only. The researchers gathered data three days a week, four hours per day from 9.30 am to 1.30 pm, and about 2-3 geriatric patients was interviewed each day. Additionally, each patient's session lasts between forty-five and sixty minutes.

Exercises program phases

I. Assessment phase

The researcher was conducting the assessment at the outpatient clinics period. Participants from both (study and control group) were interviewed individually in order to assess their baseline data.

II. Planning phase

1. The patient's phone number was obtained in order to schedule future appointments, confirm that they are adhering to the program, and respond to any questions.
2. Place: In the Rheumatology and Rehabilitation outpatient clinic, proprioceptive exercises were performed, and in the Rheumatology and Rehabilitation unit, isometric exercises were performed.
3. Teaching methods: It was planned before carrying out the exercises to provide basic teaching methods such as lecture, discussion, demonstration, and re-demonstration. Media such as booklets, images, and audio-visual aids were also used.

III. Implementation phase

- The first session was included an orientation to the exercises and its purpose to geriatric participants in the first week.
- The 2nd session for study group included education about definition and benefits of proprioceptive exercises in the first week. Also, was including proprioceptive exercises that included; One-leg balance, Toe walking, Heel walking, Cross-body leg swings, Blind advanced one leg balance and instructed them to do these five exercises (15-20 repetitions of each) per session, five days a week. While the 2nd session for control group included education about definition, benefits and steps of isometric exercise that included participants taking the long sitting position. A role of towel was placed below the affected knee. The participants were then asked to press the towel down and hold it to one minute and then relax. This was repeated again for the other knee and (10-15 repetitions) per session, five days a week.

- The 3rd session for repetition of exercises to make sure the patient understood them

IV.Evaluation phase

This phase was carried out for both groups after the exercise program by using the following tools; tool II and tool III after six weeks later wk. (8) to make post-test and two-month later wk. (16) to do follow up test.

Ethical Consideration

Faculty of Nursing's Research Ethics Committee at Assiut University, Egypt provided ethical approval for this study with reference number 1120230581 on February 26, 2023 and the investigation was recorded at www.clinicaltrials.gov (NCT06574334 identifier). The study complied with clinical research ethics guidelines. The research was applied without putting study participants in danger. Anonymity and confidentiality were guaranteed. At any time, for any reason, participants could choose not to participate in the study or withdraw from it.

Statistical analysis

The acquired data was examined, coded, tabulated, analysed, and prepared for computer entry. Version 22 of the computer program SPSS was used to perform descriptive statistics like standard deviation and mean, as well as percentages and frequencies. In order to assess the reliability of the tools, the Cronbach alpha coefficient was calculated. To examine the association of both groups, one-way ANOVA, Chi-square tests, and independent sample T-tests were utilized. When the P-value was less than 0.05, it was considered significant.

RESULT

Table 1. Distribution of demographic data of geriatric patients with knee osteoarthritis for both study and control groups.

Demographic data	Group				P value
	Study(n=70)		Control (n=70)		
	N	%	N	%	
Gender					0.198ns
Male	28	40	34	48.6	
Female	42	60	36	51.4	
Age					0.043ns
60– 65	43	61.4	42	60	
66 – 70	21	30.0	20	28.6	
71-75	6	8.6	8	11.4	
Mean ± SD	65.6714± 3.15189		65.9286±3.16833		
Residence					0.851ns
Urban	24	34.3	35	50	
Rural	46	65.7	35	50	
Marital status					0.093ns
Single	3	4.3	4	5.7	
Married	49	70.0	58	82.9	
Widowed	18	25.7	8	11.4	
Education Level					0.367ns
Illiterate	30	42.9	29	41.5	
read and write	8	11.4	4	5.7	
primary certificate	14	20.0	11	15.7	
University degree	18	25.7	26	37.1	
Job before retirement					0.449ns
Employee	18	25.7	26	37.1	
Farmer	17	24.3	15	21.5	
Free- work	7	10.0	8	11.4	
Housewife	28	40.0	21	30	
Job after retirement					0.005
Farmer	17	24.3	15	21.5	
Free- work	7	10.0	8	11.4	
Housewife	39	55.7	28	40	
None	7	10.0	19	27.1	
Supporting person					0.091ns
Husband/wife	42	6	48	68.6	
Son	11	15.7	14	20.0	
Daughter	14	20.0	4	5.7	
Alone	3	4.3	4	5.7	

Chi-square test P<0.05 SD=standard deviation

Table 1 illustrated that (61.4%) of the study group had ages between (60-65) years, and (60%) of control group had ages between (60-65) years and, while (60%,51.4%) of study and control group respectively were female, according to residence, (65.7%) of the study group live in rural areas while (50%) of control group live in the urban areas.

Table 2. Distribution of geriatric patients' history for both study and control groups.

Items	Group				P value
	Study(n=70)		Control(n=70)		
	N	%	n	%	
Level of Knee osteoarthritis (based on X-rays)					0.204ns
Mild	32	45.7	36	51.4	
Moderate	38	54.3	34	48.6	
Current complains #					
Pain	70	100.0	70	100.0	0.013ns
Cracking	28	40	26	37.1	0.431ns
Limited movement	64	91.4	66	94.3	0.372ns
Duration of diagnosis					
Less than 5 years	53	75.7	50	71.4	0.351ns
(5-10) years	17	24.3	20	28.6	
More than 10 years	0		0		
History of falling					0.025ns
Yes	18	25.7	8	11.4	
No	52	74.3	62	88.6	
History of road accident					0.060ns
Yes	4	5.7	0		
No	66	94.3	70	100.0	
Family history of knee osteoarthritis					0.570ns
Yes	25	35.7	25	35.7	
No	45	64.3	45	64.3	
Smoking status					0.068ns
Yes	25	35.7	16	22.9	
No	45	64.3	54	77.1	
History of Chronic disease #					
HTN	40	57.1	45	64.3	0.244ns
DM:	31	44.3	49	70.0	0.004*

Chi-square test P<0.05 **HTN:** Hypertension **DM:** Diabetes mellitus **#:** More than one answer

Table 2 showed that (54.3%) of study group had moderate KOA while (51.4%) of control group had mild KOA and total number 100% of both groups were suffering from pain and most of both groups (75.7%, 71.4%) respectively were diagnosed osteoarthritis in less than five years. furthermore, this table illustrated that (25.7%) of study group had history of fall while only 11.4% of control group had history of fall.

Table 3. Comparison between pre, post and follow up of study and control group according to QOL domains.

SF - 36 8- Domain (QOL)	Group	Pre	Post	Follow up	P-value	
		Mean ± SD	Mean ± SD	Mean ± SD	P1	P1
Physical functioning	Study	4.62± 0.98	6.98± 0.97	6.81± 0.78	0.0001*	0.0001*
	Control	4.74±1.00	6.94±0.961	6.95±0.92	0.0001*	0.0001*
Role physical	Study	16.22± 2.69	22.82± 2.46	21.80± 2.68	0.0001*	0.0001*
	Control	16.87±2.59	24.10±4.71	22.02±3.63	0.0001*	0.0001*
Bodily pain	Study	6.77± 1.05	9.31± 1.38	9.07± 1.28	0.0001*	0.0001*
	Control	0.74±1.39	9.74±1.46	9.65±1.47	0.0001*	0.0001*
General health	Study	4.52± 0.97	6.98± 0.97	6.81± 0.78	0.0001*	0.0001*
	Control	4.64±1.00	6.94±0.96	6.95±0.92	0.0001*	0.0001*
Vitality	Study	14.22± 2.69	22.82± 2.46	21.80± 2.68	0.0001*	0.0001*
	Control	14.87±2.59	24.10±4.71	22.02±3.63	0.0001*	0.0001*
Social functioning	Study	6.34± 1.91	8.75±1.31	8.27± 1.45	0.0001*	0.0001*
	Control	7.07±1.72	8.47±1.31	8.45±1.32	0.0001*	0.0001*
Role emotional	Study	17.82±2.38	19.68±1.72	20.08±1.89	0.0001*	0.0001*
	Control	19.04±2.08	20.05±2.16	20.11±2.29	0.005*	0.0001*
Mental health	Study	5.62±0.98	6.88±0.97	6.81±0.78	0.0001*	0.0001*

	Control	5.74±1.00	6.84±0.96	6.95±0.92	0.0001*	0.0001*

Independent Samples Test*highly significant P1 between pre-test &post P2 between pre-test &follow up
Table 3 indicated that there was a highly statistically significant difference for study and control group regarding Short Form Health Survey (SF-36) QOL (P=0.0001) for all domains.

Table 4. Relation between QOL and pain of study and control group.

Short form Health Survey (SF-36) (QOL)		Visual Analogue			P. value
		No Pain	Mild	Moderate	
		Mean ± SD	Mean ± SD	Mean ± SD	
1. Physical functioning	Study	7.1724± .79776	6.2885± 1.17971	4.5833± 1.08830	0.0001*
	Control	25.4250± 2.56448	20.0000± 4.50505	16.2439± 2.11873	0.0001*
2. Role physical	Study	24.275±1.8523	20.1154± 2.92730	15.8333± 2.19606	0.0001*
	Control	7.1000± .86566	6.1348± 1.26303	4.6585± 1.19603	0.0001*
3. Bodily pain	Study	10.3621± .91188	8.2692± .88384	6.2500± .72932	0.0001*
	Control	10.7000± .64435	8.3258± 1.01997	5.6829± .47112	0.0001*
4. General health	Study	15.1724± 1.4282	16.4808± 1.29210	16.5833± 1.04847	0.0001*
	Control	15.8500± .73087	16.4494± 1.26141	16.6098± .77065	0.0001*
5. Vitality	Study	9.1034± 1.14998	8.2019± 1.27241	5.3125± 1.40146	0.0001*
	Control	8.9500± .89866	8.0787± 1.41602	5.9756± 1.17234	0.0001*
6. Social functioning	Study	15.1524± 1.3282	16.4608± 1.27210	16.3833± 1.05847	0.0001*
	Control	15.5000± .67505	15.2135± 2.07513	14.1220± 1.30758	0.0001*
7. Role emotional	Study	20.241± 1.17444	19.8942± 1.76216	16.4375± 1.91196	0.0001*
	Control	7.1000± .86566	6.1348± 1.26303	4.6585± 1.19603	0.0001*
8. Mental health	Study	7.1724± .79776	6.2885± 1.17971	4.5833± 1.08830	0.0001*
	Control	20.7500± 2.25860	19.6629± 1.89463	17.9268± 1.58730	0.0001*

One Way ANOVA Tests P<0.05 *highly significant SD: standard deviation
Table 4 indicated that there was a highly statistically significant relationship between all domains of Short Form Health Survey (SF-36) QOL and Visual Analogue of study and control group P=0.0001.

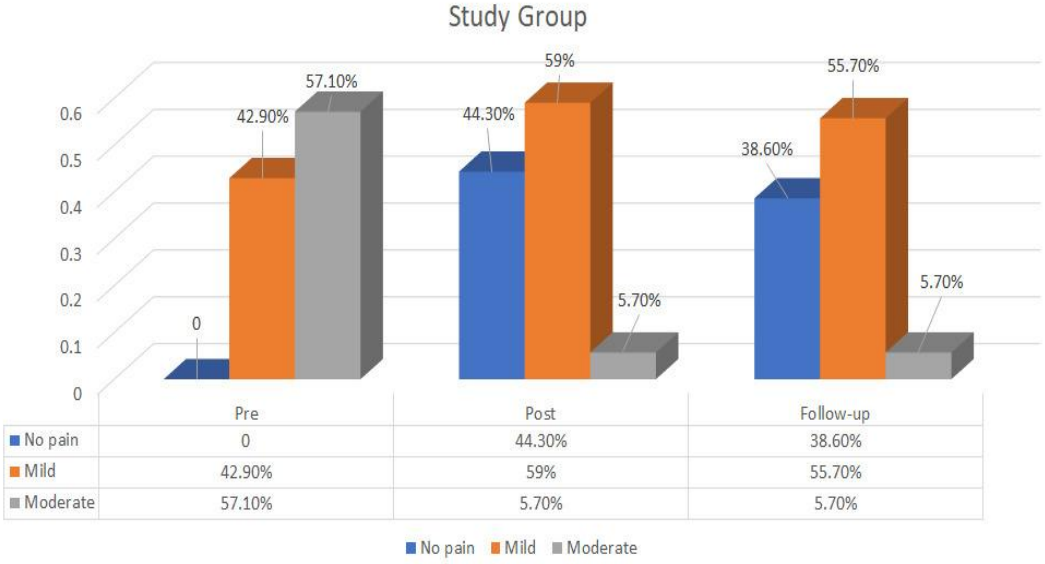

Figure 1. Comparison between pre, post and follow up of the study group according to pain.

Figure 1 showed that (57.1%) of study group had moderate pain and (42.9%) of them had mild pain in pretest while (44.3%, 38.6%) of them had no pain in post-test and follow up test respectively.

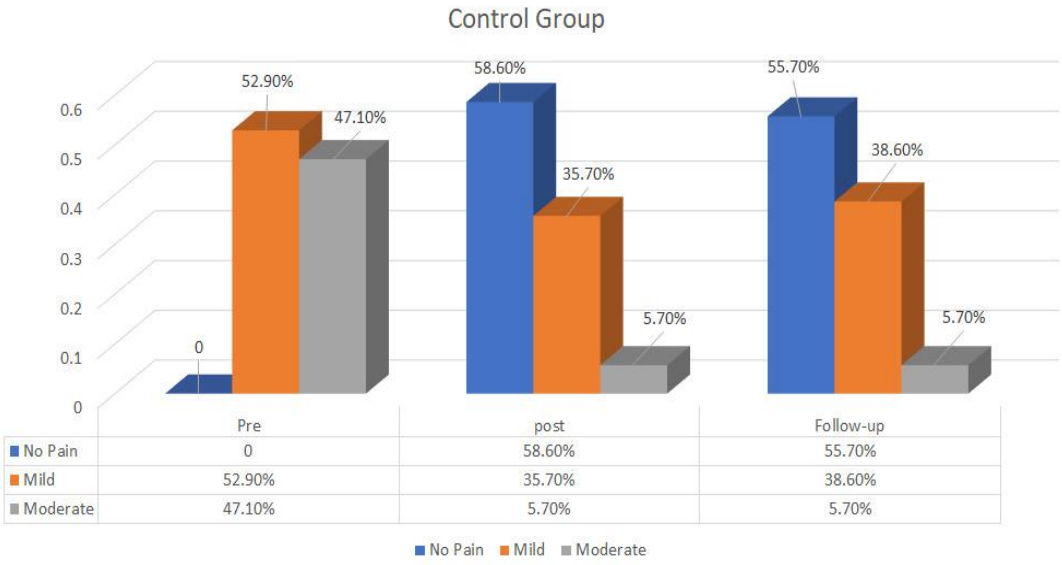

Figure 2. Comparison between pre, post and follow up of the control group according to pain

Figure 2 showed that (52.9%) of study group had moderate pain and (47.1%) of them had mild pain in pretest while (58.6%, 55.7%) of them had no pain in post-test and follow up test respectively.

DISCUSSION

Osteoarthritis (OA) is considered an age-related disease and is the main reason of pain and disability (Valdes & Stocks, 2018). It is also considered the third cause of disability in Egypt after cardiovascular diseases and back disorders (ElSayed et al., 2020). Thus, this study was carried out to determine the effect of proprioceptive exercises on joint pain and quality of life among geriatric patients with osteoarthritis of the knee.

The current study indicated that more than three fifth of the study sample aged (60 < 65) years, with mean age 65.67± 3.15 and about three fifth of the control sample were aged (60 < 65) years with mean age 65.92±3.168, this may be explained by the prevalence of KOA in advanced age groups and more than half of both groups were female this could be because women experience KOA more frequently than men do, and hormonal variations between both sex may contribute to the development of osteoarthritis. This is similar to the results of a study done by AlKuwaity et al, (2018) who reported that mean age of the geriatric patients were 70.4±9.3 and 51.7 % of them were female.

In relation to residence, the the current research demonstrated that slightly less than two third of the studied sample live in rural areas and half of the control sample lived in rural areas. This could be because the majority of geriatric people work hard jobs like agriculture, which could aggravate knee OA. This agrees with Liu et al, (2018) who found that 58.1% of geriatric people live in rural areas.

The present study illustrated that more than half of study group had moderate KOA based on X-ray this come in contrast with Ince et al., 2023 who reported that 69% of experimental group were in stage 3 (Moderate KOA), while more than half of control group had mild KOA this agree with Diu et al., 2023 who found that the 43.3% of patients were in stage 2 (Mild KOA).

In the current study, all the geriatric patients in both groups were suffering from pain as pain the most common symptoms related to KOA and regarding to duration of disease, it was observed that most of both study and control group were diagnosed osteoarthritis in less than five years. A possible explanation could be that the increased awareness about KOA and pain that drives the geriatric patients to seek medical advice. This agree with Abd El Moniem et al, (2020) who found that 100% of participants were experienced pain and 70.0% of them were diagnosed with OA in less than 5 yrs.

Considering the family history for osteoarthritis, the current study stated that more than one third of the study and control sample had a positive family history for knee osteoarthritis. Family history is considered a risk factor for knee osteoarthritis. This agrees with Abd Elhakim et al, (2018) who reported that 51.90% of the study sample had family history for osteoarthritis.

This study represented that there was a highly statistically significant difference for study and control sample of patients in relation to Visual Analog Scales (VAS) for no pain, mild and moderate pain. This indicated that the proprioceptive exercises and isometric exercise had greater effect in reducing pain in geriatric patients with KOA. This was similar to Naqi et al, (2021) who documented that both (Proprioceptive and Isometric) exercises significantly decreasing the Knee OA pain.

This study confirmed that there was a highly statistically significant difference for study group in related to QOL domains P=0.0001 as the proprioceptive exercises more effective in improvement of QOL. This concurs with study performed by Richardia et al, (2023) who reported that proprioception circuit exercise demonstrates more significant enhancement in quality of life. Also, this study showed that there was a highly statistically significant difference for control group regarding QOL domains P=0.0001 this comparable to the investigation carried out by Kangeswari et al, (2021) who reported that that isometric exercise had significant effect on decreasing pain that led to enhancement in quality of life.

CONCLUSION

On the light of results of this study it was concluded that proprioceptive exercises and also isometric exercise are effective on reducing joint pain and enhancing quality of life of geriatric patients with osteoarthritis in the knee.

RECOMMENDATIONS

Conducting educational program for nurses in the Rheumatology and Rehabilitation unit about proprioceptive exercises to enhance quality of life for geriatric patients and decrease pain. Proprioceptive exercises and isometric exercise should be used alternatively or together in the management of geriatric patient with knee OA.

Limitation of the study

The current investigation had some limitations as the small sample size could prevent the researcher to generalize the study finding. In addition, no long term follows up and also the age group of patients limits the study.

Abbreviation

OA: Osteoarthritis
QOL: Quality of life
VAS: Visual Analog Scales
HTN: Hypertension
DM: Diabetes mellitus
SF-36: 36 - Item Short-Form Health Survey.

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Author contributions

M.A.H helped with the research design, data analysis, manuscript writing and revision of the final version, A. H.A helped with the research design, data analysis, manuscript writing and revision of the final version, M.S.A helped with the research design, data analysis, manuscript writing and revision of the final version, A.S.H helped with the research design, data analysis, manuscript writing and revision of the final version.

Accessibility of information and resources

All of the data created or analyzed throughout the research are included in this article.

Conflict of Interest

According to the authors, there are no conflicts of interest.

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