International Journal of Health Sciences and Research
[Indexed, Peer-Reviewed Journal]
Volume 15; Issue: 7; July 2025
Website: www.ijhsr.org
Original Research Article *ISSN: 2249-9571*

Study on the Association Between Dietary Intake, KOOS Scores, Stress Scores and Sleep Quality in Individuals Diagnosed with Knee Osteoarthritis Aged 40-65 Years

Palak Rathod[1], Dr. Nisha Bellare[2]

[1]Masters Student in Specialized Dietetics, [2]Assistant Professor,
Sir Vithaldas Thackersey College of Home Science (Autonomous), SNDT Women's University, Juhu, Mumbai

Corresponding Author: Palak Rathod

DOI: https://doi.org/10.52403/ijhsr.20250746

ABSTRACT

Background: Knee osteoarthritis (KOA) is a chronic, degenerative joint disorder that leads to reduced mobility and quality of life among adults, particularly with advancing age. While aging and obesity are recognized risk factors, recent evidence highlights the contribution of lifestyle and psychosocial factors such as dietary intake, stress, and sleep quality. The present study aimed to assess the association between nutritional status, dietary intake, perceived stress, sleep quality, and KOOS scores in adults aged 40–65 years diagnosed with KOA.
Methods: A cross-sectional study was conducted among 100 individuals with KOA recruited through purposive sampling from physiotherapy and orthopaedic clinics. Data collection involved anthropometric assessments (self-reported Weight, Height, Waist Circumference, BMI), a 24-hour dietary recall, a food frequency questionnaire (FFQ), and a validated tools such as the Perceived Stress Scale (PSS), Pittsburgh Sleep Quality Index (PSQI), and Knee Injury and Osteoarthritis Outcome Score (KOOS) were administered along with dietary assessment tools. Statistical analysis included descriptive and correlational methods using SPSS Version 21.
Results: The majority of participants were females (62%) and were overweight or obese (mean BMI: 27.4 ± 3.8 kg/m²). Protein intake was below RDA in 72% of participants, with 68% and 74% showing inadequate calcium and vitamin D intake, respectively. While no significant associations were found between macronutrient intake and KOOS scores ($p > 0.05$), stress and sleep quality showed significant relationships ($p < 0.05$). Participants with high perceived stress had lower KOOS Pain (47.6 ± 10.4) and QoL scores (42.1 ± 9.8) than those with low stress (Pain: 62.1 ± 9.5; QoL: 51.3 ± 8.7). Poor sleep quality (reported by 63%) was significantly associated with lower KOOS ADL scores (44.8 ± 11.7 vs. 58.9 ± 10.1, $p = 0.002$).
Conclusion: The study shows that stress and poor sleep quality are strongly linked to lower KOOS scores in pain, ADL, and QoL domains. While dietary gaps were common, they had no direct impact. These findings underscore the importance of addressing psychosocial factors alongside nutritional care in KOA management through a holistic, lifestyle-based approach

Keywords: Knee Osteoarthritis, Dietary Intake, KOOS Scores, Stress Levels, Sleep Quality, Knee Pain, Symptoms, Quality of Life

INTRODUCTION

Knee osteoarthritis (KOA) is one of the most common forms of osteoarthritis and a leading cause of chronic pain, functional limitation, and disability among older adults. It is characterized by the progressive deterioration of articular cartilage, subchondral bone remodeling, osteophyte formation, and low-grade synovial inflammation, which contribute to pain, stiffness, reduced mobility, and diminished quality of life (Geng et al., 2023; Yunus et al., 2020). KOA can be classified as primary (idiopathic), with no identifiable cause, or secondary, resulting from factors such as trauma, mechanical misalignment, or underlying metabolic disorders (Hunter et al., 2023).

Globally, the burden of KOA is increasing due to factors such as population aging, rising obesity rates, and sedentary lifestyles. As of 2020, osteoarthritis affected approximately 595 million people worldwide, with the knee joint being the most frequently involved site (GBD, 2021). In India, socioeconomic disparities, limited healthcare access, and lack of awareness contribute to both underdiagnosis and disease progression (Singh et al., 2022).

Emerging evidence highlights the role of modifiable lifestyle factors including diet intake, psychological stress, and sleep patterns in the pathogenesis and symptom severity of KOA. Diets rich in saturated fats, sugars, and processed foods may promote systemic inflammation and obesity, exacerbating joint degeneration (Souza et al., 2017; Xu et al., 2021). In parallel, elevated stress levels have been associated with increased pain sensitivity, reduced pain tolerance, and heightened functional impairment in individuals with KOA (Huh et al., 2021). Furthermore, disturbances in sleep quality have shown a bidirectional relationship with KOA-related pain and functional limitations, thereby influencing overall disease burden and patient well-being (Gilbert et al., 2022; Feda et al., 2023).

Although these associations have been independently studied, limited research has examined their combined impact on KOA severity, particularly in Indian populations. The present study seeks to explore the relationship between dietary intake, KOOS scores, perceived stress, and sleep quality among adults aged 40–65 years with knee osteoarthritis. Understanding these interrelated factors may offer insights into comprehensive lifestyle-based approaches for managing KOA and improving long-term patient outcomes.

MATERIALS & METHODS

This cross-sectional study was conducted to assess the association between dietary intake, KOOS scores, stress levels, and sleep quality in individuals aged 40–65 years diagnosed with knee osteoarthritis. Given the multifactorial nature of KOA, the study aimed to explore how modifiable factors such as nutrition, stress, and sleep influence the severity of disease outcomes.

A total of 100 participants (27 males and 73 females) were recruited using purposive sampling from Orthopedic and Physiotherapy clinics across Mumbai. Participants were screened based on inclusion criteria: clinical diagnosis of KOA in at least one knee, aged between 40–65 years, and classified with Kellgren-Lawrence Grades 1 to 3. Those with secondary causes of OA, recent joint surgeries, or other rheumatic diseases were excluded. The study duration was four months. Ethical approval was obtained from the Inter System Biomedica Ethics Committee, and informed written consent was collected from all participants prior to data collection.

Data collection was carried out through face-to-face interviews using a structured case record form. The form captured socio-demographic characteristics, anthropometric measurements (height, weight, BMI, and waist circumference), clinical and radiographic findings, dietary intake, and psychometric evaluations. Dietary intake was assessed using a 24-hour dietary recall

and a Food Frequency Questionnaire (FFQ). Nutrient intake was analyzed using the Ntuitive nutrition calculator and compared against the 2024 ICMR Recommended Dietary Allowances.

The severity of KOA and functional limitations were assessed using the Knee Injury and Osteoarthritis Outcome Score (KOOS), which includes five subscales: Pain, Symptoms, Activities of Daily Living (ADL), Sports and Recreation, and Knee-related Quality of Life. Perceived stress was evaluated using the Perceived Stress Scale (PSS), and Sleep quality was measured with the Pittsburgh Sleep Quality Index (PSQI). Both instruments are validated and widely used in clinical research.

This methodology enabled a comprehensive assessment of the interrelationship between lifestyle factors and KOA severity, contributing to the understanding of holistic management strategies for individuals with knee osteoarthritis.

STATISTICAL ANALYSIS

Data analysis was conducted using SPSS (version 21). Descriptive statistics summarized participant characteristics. Pearson's correlation coefficient was used to examine relationships between dietary intake, stress, sleep quality, and KOOS scores. Independent t-tests were employed to assess differences across subgroups. A p-value <0.05 was considered statistically significant.

RESULTS AND DISCUSSION

Sociodemographic Findings of Study Participants

This cross-sectional study assessed 100 individuals (73 females, 27 males) aged 40–65 years diagnosed with knee osteoarthritis. A higher prevalence was observed among females, aligning with prior studies linking female dominance to hormonal changes, joint structure differences, and inflammatory pathways (Moretti et al., 2022; Plotnikoff et al., 2015). Most participants were married (91%) and lived in nuclear families (76%), with no significant gender differences across marital status, living arrangement, or socioeconomic class. The majority (57%) belonged to the upper-middle class. While literature suggests socioeconomic status (SES) influences KOA risk (Cui et al., 2020), no significant association was found in this study possibly due to homogeneous socioeconomic composition of the sample largely upper-middle class which could have attenuated the detection of SES-related disparities.

Similar inconsistencies have been noted in another population-based research (Kiadalriri et al., 2017).

Anthropometric Profile of Study Participants

Table 1: Anthropometric Profile of Study Participants

Characteristics	Male (n=27)	Female (n=73)	t Value	P Value
	Mean ± Std Deviation	Mean ± Std Deviation		
Age	50.7 ± 6.821	52.90 ± 6.000	-1.569	0.12
Weight	78.15 ± 7.009	71.67 ± 10.290	3.017	0.03*
Height	168.81 ± 4.306	158.47 ± 5.795	8.446	0.00*
Body Mass Index	27.585 ± 3.0611	28.447 ±4.1887	-0.976	0.332
Waist Circumference	93.337 ± 6.9137	91.822 ±16.0384	0.475	0.637

Mean ± Std Deviation, p <0.05*

Table 1 presents the anthropometric characteristics of the 100 individuals diagnosed with knee osteoarthritis showing that the mean age for male participants (n = 27) was 50.7 ± 6.82 years, while for females (n = 73), it was slightly higher at 52.90 ± 6.00 years; however, this difference was not statistically significant (p = 0.12). Male participants were significantly taller (168.81 ± 4.31 cm) and heavier (78.15 ± 7.01 kg)

than female participants (158.47 ± 5.80 cm and 71.67 ± 10.29 kg, respectively). Despite these differences, the mean BMI did not differ significantly between genders 27.59 ± 3.06 kg/m² for males and 28.45 ± 4.19 kg/m² for females indicating that both groups were, on average, overweight. Similarly, waist circumference values (93.34 ± 6.91 cm in males and 91.82 ± 16.04 cm in females) showed no significant variation.

Overall, 76% of the study population was either overweight or obese, with a higher overweight prevalence in males and greater obesity in females. These findings underscore the strong link between excess body weight and KOA, aligning with prior research (Liao et al., 2023) emphasizing overweight as a key modifiable risk factor in the onset and progression of knee osteoarthritis.

Comorbidities and Lifestyle Characteristics of Study Participants

Among participants with knee osteoarthritis (KOA), the most commonly reported comorbidities were hypertension (43%), diabetes (31%), and obesity (26%), with no significant gender differences observed for most conditions. However, asthma was reported exclusively in females (15.1%) and was statistically significant (p = 0.033). Other comorbidities such as thyroid disorders (10%), depression/anxiety (6%), and cardiovascular diseases (8%) were more prevalent among females but did not differ significantly by gender. These findings reflect the high metabolic and inflammatory burden often associated with KOA (Wu et al., 2024).

Clinically, 37% of participants reported a family history of OA, and 67% had symptoms persisting for 1–6 years. Treatment approaches primarily included physiotherapy (51%), physical activity (42%), and prescription medication (31%). While females reported greater use of physiotherapy and alternative therapies, differences were not statistically significant

In terms of lifestyle, only 9% of participants reported daily physical activity, while 36% engaged in it less than once a week or never. Walking was the most common activity (80%), and running was reported only by males (p = 0.040). Supplement use was highest for calcium (77%) and vitamin D (19%). Smoking (7%) and alcohol consumption (19%) were relatively low, aligning with global trends in OA populations (Kwon et al., 2020)

Dietary Intake among Participants with Knee Osteoarthritis

Table 2. Comparison of Macronutrient and Micronutrient Intake Between Male and Female Participants with Knee Osteoarthritis

Nutrient	Male (n=27)	Female (n=73)	t Value	P value
	Mean ± Std Deviation			
Consumption of Macronutrient Consumption among genders				
Energy (kcal)	1854.11 ± 306.811	1679.52 ± 300.705	2.564	0.012*
Energy EAR%	87	101.2		
Protein (g)	48.00 ± 9.804	47.36 ± 10.010	0.288	0.774
Protein RDA %	88.88	102.95		
Carbohydrate (g)	261.83 ± 44.205	240.17 ± 41.557	2.274	0.025*
Fat (g)	70.95 ± 24.944	61.61 ± 18.735	2.016	0.047*
Consumption of Micronutrient Consumption among genders				
Sodium (mg)	498.65 ± 331.93	612.88 ± 1061.288	-0.548	0.585
Sodium RDA %	24.9	30.6		
Potassium (mg)	2086.79 ± 518.304	1969.68 ±474.101	1.069	0.288
Potassium RDA %	59.62	98.48		
Fiber (g)	27.39 ±7.220	39.55 ± 57.747	-1.087	0.28
Fiber RDA %	91.3	158.2		
Calcium (mg)	486.77 ± 164.861	477.81 ± 154.115	0.253	0.801
Calcium RDA %	48.67	47.78		

Zinc (mg)	8.69 ± 7.107	6.59 ± 5.142	1.626	0.107
Zinc RDA %	51.11	49.9		
Omega 3 (mg)	147.63 ± 108.604	213.02 ± 209.443	-1.544	0.126

Mean ± Std Deviation, p <0.05*

Table 2 presents a comparison of macronutrient and micronutrient intake between male and female participants diagnosed with knee osteoarthritis (KOA). Males had a significantly higher mean energy intake (1854.11 ± 306.81 kcal) than females (1679.52 ± 300.71 kcal; p = 0.012). However, females achieved greater adequacy relative to their energy requirements (101.2% vs. 87%), possibly due to intentional caloric control often seen in women managing weight-related OA symptoms.

Protein intake was similar between genders (males: 48.00 ± 9.80 g; females: 47.36 ± 10.01 g; p = 0.774), yet protein adequacy was notably higher in females (102.95%) compared to males (88.88%). This is clinically relevant, as inadequate protein may contribute to sarcopenia and reduced joint support in OA patients (Jeanmaire et al., 2018). Males reported significantly higher carbohydrate (p = 0.025) and fat intake (p = 0.047), which may reflect broader gender-based dietary patterns. High carbohydrate consumption has been linked to greater pain intensity, whereas lower carbohydrate or ketogenic diets have shown promise in reducing inflammation and improving joint function (Klement et al., 2021).

No significant gender differences were observed in micronutrient intake (p > 0.05) for sodium, potassium, calcium, zinc, fiber, or omega-3. However, females showed better fiber adequacy (158.2% vs. 91.3%) and higher omega-3 intake, both of which are beneficial for reducing inflammation and improving gut health, which may indirectly affect joint function. Males had slightly higher potassium and zinc intakes. These trends align with findings by Shin et al. (2021), who reported that women with KOA often consume fewer calories but maintain better diet quality. While other studies have found no strong link between individual micronutrients and joint integrity (Shin et al., 2021), maintaining nutrient adequacy remains essential for musculoskeletal health and symptom management in KOA.

In order to contextualize these findings, the frequency of consumption of various food groups was also assessed. Among participants with knee osteoarthritis, 87% reported daily consumption of wheat and 51% consumed rice, whereas traditional millets such as jowar and nachni were rarely included in the diet. Moong and tur dal emerged as the most frequently consumed pulses, with many participants reporting daily or weekly intake, while urad and matki were consumed less commonly. Only 13% of participants consumed milk daily, although fermented dairy products like curd and buttermilk were more widely consumed. Non-vegetarian food intake was notably low, with 75% never consuming chicken and 81% abstaining from fish. Nuts such as almonds and peanuts were the most commonly included, with over 60% of participants reporting weekly or biweekly intake. Outside food items like pani puri (38%), samosa (36%), and bhel puri (31%) were frequently consumed once in 15 days or more. A high intake of processed snacks and sweets was also observed, while 74% reported never or rarely consuming alcohol. These dietary patterns characterized by high consumption of refined grains, fried foods, and sugary items may exacerbate systemic inflammation and contribute to excess weight, thereby potentially worsening KOA symptoms.

Knee Injury and Osteoarthritis Outcome Scores (KOOS)

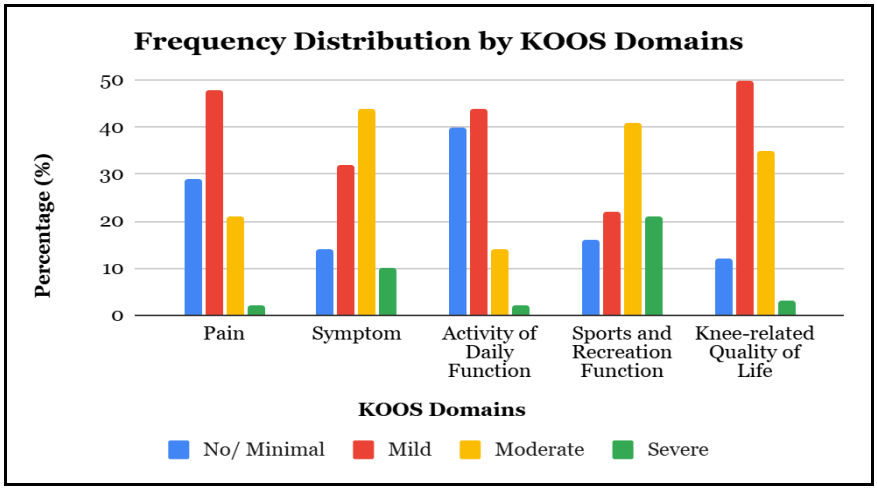

Figure 1: Frequency Distribution of KOOS Domains by Severity

In order to contextualize symptom severity, the frequency distribution of participants across the five KOOS domains was assessed (Figure 1). In the Pain domain, a majority reported no/minimal (29%) or mild pain (48%), suggesting relatively mild pain perception in the cohort. However, the Symptom domain showed broader distribution, with moderate (44%) and mild (32%) symptoms being most common, and 10% reporting severe symptoms highlighting the persistence of stiffness and swelling beyond pain alone. Notably, 84% experienced either no/minimal or mild functional limitation in Activities of Daily Living (ADL), indicating preserved independence. In contrast, the Sports and Recreation Function (SPRF) domain revealed substantial impairment, with 62% facing moderate to severe restrictions. Similarly, 85% of participants reported mild to moderate limitations in knee-related Quality of Life (QOL), consistent with previous studies linking KOA symptoms to impaired daily and social functioning (Wojcieszek et al., 2022; Neogi et al., 2013).

Table 3: KOOS Domain Scores Between Male and Female Participants with Knee Osteoarthritis

KOOS DOMAINS	Male (n=27)	Female (n=73)	t Value	p Value
	Mean ± Std Deviation			
Pain	65.81 ± 17.456	63.67 ±17.348	0.548	0.585
Symptom	54.81 ± 21.161	50.40 ±20.722	0.941	0.349
Activity of Daily Function	73.59 ± 16.835	68.68 ± 17.359	1.265	0.209
Sports and Recreation Function	50.93 ± 25.796	46.16 ± 27.074	0.791	0.431
Knee-related Quality of Life	62.41 ± 17.835	55.18 ± 16.180	1.929	0.057

Gender-wise comparison (Table 3) revealed consistently higher KOOS scores in males across all domains, indicating better knee function. However, none of the gender differences reached statistical significance ($p > 0.05$). The largest disparity was observed in the QOL domain (males: 62.41 ± 17.84; females: 55.18 ± 16.18; $p = 0.057$), suggesting females may experience a greater subjective burden aligned with findings from Paradowski et al. (2016) and Khired et al. (2023), who reported greater pain and functional decline in women. These results reflect the multifaceted impact of KOA on pain, function, and overall well-being.

Stress Levels Among Study Participants

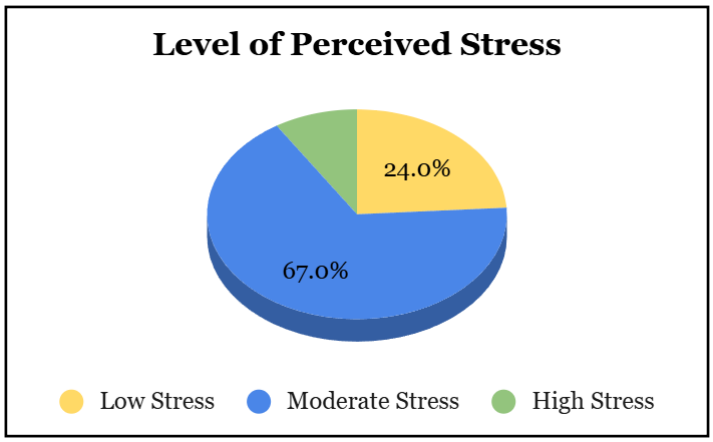

Figure 2: Distribution of Perceived Stress Levels among Study Participants

Figure 2 illustrates the distribution of perceived stress levels among participants with knee osteoarthritis, showing that 67% experienced moderate stress, 24% reported low stress, and 9% had high stress. This indicates that psychological distress is a common comorbidity in KOA, likely exacerbated by chronic pain, restricted mobility, and diminished quality of life.

Table 4. Gender-wise Distribution of Perceived Stress Scores among Study Participants

Perceived Stress Scores	Male (n=27)		Female (n=73)		Total (n=100)		x2 Value	P Value
	N	%	N	%	N	%		
Low	6	22.2	18	24.7	24	24	1.478	0.478
Moderate	20	74.1	47	64.4	67	67		
High	1	3.7	8	11	9	9		

Frequency Percentage (N, %), p <0.05*

The distribution of perceived stress levels among participants with knee osteoarthritis (KOA) indicated that 67% experienced moderate stress, 24% had low stress, and 9% reported high stress. This highlights the psychological burden often associated with KOA, likely stemming from chronic pain, functional limitations, and reduced quality of life.

Gender-wise analysis (Table 4) revealed that moderate stress was the most common category for both males (74.1%) and females (64.4%). While low stress was similarly reported (22.2% in males, 24.7% in females), high stress was more frequently observed in females (11%) than males (3.7%). Although this gender difference was not statistically significant (p = 0.478), the higher proportion of females in the high-stress category may reflect a tendency toward greater emotional burden in women with KOA.

Further insights were drawn from item-wise responses on the Perceived Stress Scale. Across most questions, "sometimes" was the most frequent response for both genders, indicating moderate perceived stress overall. However, gendered response patterns emerged. Females were more likely to report feelings such as "nervous and stressed" and "difficulties piling up," while males more often endorsed responses like "felt confident" or "felt on top of things." One item-"felt that difficulties were piling up so high that you could not overcome them" approached statistical significance (p = 0.064), with females showing higher agreement.

These findings, though not statistically conclusive, point toward subtle gender-based differences in stress perception and coping. This reinforces the need for gender-sensitive mental health support as part of comprehensive KOA management.

Sleep Quality Among Study participants

Figure 3: Distribution of Sleep Quality among Study Participants

The figure 3 shows the distribution of sleep quality among 100 participants with knee osteoarthritis, assessed using the Pittsburgh Sleep Quality Index (PSQI). A significant proportion (83%) of participants were found to have poor sleep quality, while only 17% reported good sleep quality.

Table 5. Gender-wise Distribution of Sleep Quality among Study Participants

Sleep Quality	Male (n=27)		Female (n=73)		Total (n=100)		x2 Value	P Value
	N	%	N	%	N	%		
Poor Sleep Quality	20	74.1	63	86.3	83	83	2.088	0.148
Good Sleep Quality	7	25.9	10	13.7	17	17		

Frequency Percentage (N, %), p <0.05*

Gender-wise distribution (Table 5) revealed poor sleep in 74.1% of males and 86.3% of females, with no statistically significant difference (p = 0.148). However, a greater proportion of females fell in the poor sleep category, suggesting possible gender-based vulnerability to sleep disturbance.

Further breakdown of PSQI components showed that most participants rated their subjective sleep quality as “fairly bad” (43%) or “fairly good” (34%). Sleep duration was commonly 6–7 hours (43%), and 32% reported high sleep latency (5–6 points). Despite these challenges, 57% achieved >85% sleep efficiency. Daytime dysfunction and sleep disturbances were reported by over 40% and 65% of participants, respectively. No component showed significant gender differences. These results align with studies by Akintayo et al. (2019) and Gilbert et al. (2022), who found high prevalence of poor sleep, particularly among females with KOA. Though not statistically significant, the findings underscore the need for routine sleep assessment in KOA care, especially among women, due to their slightly higher reported burden.

Table 6. Correlation of Age, Body Mass Index (BMI), and Socioeconomic Status with KOOS Domains, Perceived Stress Scale, and Pittsburgh Sleep Quality Index

Variables	Age		BMI		Socioeconomic status	
	Pearson Correlation	p Value	Pearson Correlation	p Value	Pearson Correlation	p Value
KOOS SCORES						
Pain	-0.131	0.193	-0.311	0.002*	0.263	0.008*
Symptom	-0.15	0.137	-0.288	0.004*	0.236	0.018*
Activity of Daily Function	-0.144	0.154	-0.342	0*	0.221	0.027*
Sports and Recreation Function	-0.144	0.152	-2.44	0.014*	0.202	0.044*

Knee-related Quality of Life	-0.192	0.055	-0.226	0.024*	-0.033	0.742
PERCEIVED STRESS SCALE						
Total PSS	0.007	0.942	-0.028	0.024*	-0.033	0.742
PITTSBURGH SLEEP QUALITY INDEX						
Final PSQI Score	0.001	0.993	0.219	0.028*	-0.488	0.00*

Table 6 summarizes the Pearson correlation coefficients between demographic variables- age, body mass index (BMI), and socioeconomic status (SES) and outcomes related to knee function, perceived stress, and sleep quality.

Age did not show statistically significant correlations with any parameter ($p > 0.05$), though a weak negative trend with knee-related quality of life ($r = -0.192$, $p = 0.055$) suggests that increasing age may be associated with a slight decline in perceived QOL.

BMI exhibited significant negative correlations with all KOOS domains: Pain ($r = -0.311$, $p = 0.002$), Symptoms ($r = -0.288$, $p = 0.004$), ADL ($r = -0.342$, $p < 0.001$), Sports and Recreation Function ($r = -0.244$, $p = 0.014$), and QOL ($r = -0.226$, $p = 0.024$), indicating that higher BMI is consistently linked to poorer knee function. Additionally, BMI showed a positive correlation with PSQI ($r = 0.219$, $p = 0.028$), suggesting poorer sleep with higher body weight.

SES demonstrated significant positive correlations with KOOS domains—Pain, Symptoms, ADL, and Sports and Recreation Function implying better knee outcomes in higher SES groups. SES was also negatively associated with PSQI ($r = -0.488$, $p < 0.001$), indicating better sleep quality among those with higher socioeconomic status.

Table 7. Correlation of KOOS Domain Scores with Perceived Stress Scale (PSS) and Pittsburgh Sleep Quality Index (PSQI)

KOOS Domains	Total PSS		FINAL PSQI SCORE	
	Pearson Correlation	p VALUE	Pearson Correlation	p VALUE
Pain	0.121	0.231	-0.533	0.00*
Symptom	-0.091	0.37	-0.494	0.00*
Activity of Daily Function	0.094	0.351	-0.539	0.00*
Sports and Recreation Function	-0.111	0.27	-0.434	0.00*
Knee-related Quality of Life	-0.213	0.033*	-0.236	0.018*

Table 7 presents the Pearson correlation coefficients and corresponding p-values assessing the relationship between KOOS domains: Pain, Other Symptoms, Function in Activities of Daily Living (ADL), Function in Sport and Recreation, and Knee-related Quality of Life (QOL) with Perceived Stress Scale (PSS) and Pittsburgh Sleep Quality Index (PSQI) scores.

No statistically significant associations were observed between any of the KOOS domains and PSS scores ($p > 0.05$), although a weak negative correlation was found for Knee-related Quality of Life ($r = -0.213$, $p = 0.033$), suggesting that higher stress levels may be associated with slightly lower perceived knee-related quality of life.

In contrast, all KOOS domains showed statistically significant negative correlations with PSQI scores ($p < 0.001$ for all domains), indicating that poor sleep quality was consistently associated with worse functional outcomes. Specifically, PSQI was strongly negatively correlated with the Pain domain ($r = -0.533$), Other Symptoms ($r = -0.494$), ADL ($r = -0.539$), Sports and Recreation Function ($r = -0.434$), and QOL ($r = -0.236$). These findings highlight the strong relationship between sleep disturbances and reduced knee function and quality of life in individuals with knee osteoarthritis.

Table 8. Pearson Correlation Between Nutrient Intake and Perceived Stress, Sleep Quality, and KOOS Domain Scores

Nutrient	Total PSS		Final PSQI Score		Pain		Symptom		Activity of Daily Function		Sports and Recreation Function		Knee-related Quality of Life	
	r value	P value	r value	p value	r value	p value	r value	p value	r value	p value	r value	p value	r value	p value
Energy (kcal)	-0.092	0.362	0.206	0.04*	-.007	0.94	-.042	0.677	0.09	0.371	-.051	0.617	0.202	0.04*
Protein (g)	-0.074	0.462	0.34	0.001*	-.025	0.81	-.226	0.023*	0.005	0.961	-0.25	0.012	0.154	0.125
Carbohydrate (g)	-0.064	0.527	0.303	0.002*	-0.09	0.375	-.086	0.396	0.013	0.898	-.083	0.412	0.109	0.278
Fat (g)	-0.128	0.211	0.003	0.973	-0.13	0.199	0.066	0.516	0.164	0.103	0.046	0.653	-.276	0.005*
Sodium (mg)	-0.021	0.832	-0.005	0.957	0.144	0.153	0.187	0.062	0.181	0.072	0.185	0.065	-.257	0.01
Potassium (mg)	-0.084	0.407	0.137	0.175	0.007	0.948	-0.11	0.277	0.053	0.603	0.119	0.237	0.1	0.323
Fiber (g)	-0.025	0.805	0.124	0.219	-0.05	0.624	-0.03	0.764	0.033	0.745	-.033	0.742	0.024	0.813
Calcium (mg)	0.011	0.916	0.195	0.051*	-0.46	0.652	-.237	0.017*	-.096	0.343	-.256	0.01*	-.097	0.336
Zinc (mg)	-0.073	0.472	-0.037	0.715	0.013	0.9	0.163	0.104	-0.03	0.77	0.195	0.052	0.049	0.626
Omega 3 (mg)	-0.085	0.403	-0.026	0.009	0.225	0.024	0.056	0.583	0.107	0.29	0.027	0.789	-0.02	0.843

Table 8 illustrates the correlation between nutrient intake and various functional and psychological outcomes, including KOOS domain scores, Perceived Stress Scale (PSS), and Pittsburgh Sleep Quality Index (PSQI). Notably, energy intake showed a significant positive correlation with PSQI ($r = 0.206$, $p = 0.040$) and knee-related quality of life (QOL) ($r = 0.202$, $p = 0.044$), suggesting that while higher energy intake may be associated with poorer sleep quality, it may also support better subjective knee-related well-being.

Protein intake demonstrated a strong positive correlation with PSQI ($r = 0.340$, $p = 0.001$), indicating its potential association with poorer sleep. However, it also correlated negatively with KOOS Symptoms ($r = -0.226$, $p = 0.023$) and Sports/Recreation Function ($r = -0.250$, $p = 0.012$), suggesting improved symptom relief and physical function with higher protein consumption. Similarly, carbohydrate intake was positively associated with PSQI ($r = 0.303$, $p = 0.002$), indicating poorer sleep quality with higher intake.

Fat intake showed a negative correlation with knee-related QOL ($r = -0.276$, $p = 0.005$), while sodium was negatively associated with QOL ($r = -0.257$, $p = 0.010$), indicating that excessive fat and sodium may negatively affect perceived knee health. Calcium intake correlated negatively with Symptoms ($r = -0.237$, $p = 0.017$) and Sports Function ($r = -0.256$, $p = 0.010$), suggesting benefits of calcium-rich diets on physical outcomes. Omega-3 fatty acid intake was significantly negatively correlated with PSQI ($r = -0.261$, $p = 0.009$), indicating its role in better sleep quality, and positively associated with Pain ($r = 0.225$, $p = 0.024$).

SUMMARY

This cross-sectional study explored the association between dietary intake, KOOS scores, perceived stress, and sleep quality in 100 individuals aged 40–65 years with knee osteoarthritis (KOA). Most participants were female (62%) and overweight (mean BMI: 27.4 ± 3.8 kg/m²). Nutritional inadequacies were common, 72% had low protein intake, while 68% and 74% had inadequate calcium and vitamin D, respectively. Although no strong direct correlations were observed between diet and KOOS scores, better diet quality showed a slight positive trend with quality of life. KOOS scores revealed the greatest impairments in Sports and Recreation, followed by ADL and Symptoms, with females reporting significantly lower QoL ($p < 0.05$). Psychosocial factors had a more substantial impact, 86% reported moderate to high stress, and 63% had poor sleep quality. Both were significantly correlated with worse KOOS scores, particularly pain and QoL. Overall, stress and sleep disturbances emerged as key contributors to reduced knee function and quality of life in KOA.

CONCLUSION

This study highlights the multifactorial nature of knee osteoarthritis (KOA), revealing significant associations between psychological stress, sleep quality, and functional impairment in individuals aged 40–65 years. Poor sleep and elevated perceived stress levels were strongly linked to lower KOOS scores, whereas dietary intake and BMI showed limited direct correlations with disease severity. These findings highlight the need for a holistic management approach that includes psychological and behavioral dimensions alongside physical health. While the use of validated assessment tools adds strength, limitations such as the small urban-based sample and reliance on self-reported data may affect generalizability. Future research should adopt longitudinal designs to better understand causal relationships. Integrating psychological counseling, sleep hygiene, and tailored nutrition education may enhance outcomes and support more effective lifestyle-based interventions for KOA.

Declaration by Authors

Ethical Approval: Approved the Inter System Biomedica Ethics Committee, and informed written consent was collected from all participants prior to data collection.

Acknowledgement: I sincerely acknowledge Sir Vithaldas Thackersey College of Home Science (Autonomous), SNDT Women's University, for providing the opportunity and resources to undertake this research. The guidance and support of my research mentor, Dr. Nidsha Bellare, played a crucial role in shaping this study, and her insights were truly valuable. Support from my family and friends kept me motivated throughout the process. The cooperation of the study participants was instrumental in completing this research successfully. Each contribution, in its own way, made this journey meaningful and enriching.

Source of Funding: None

Conflict of Interest: The authors declare no conflict of interest.

REFERENCES

1. Akintayo, R. O., Yerima, A., Uhunmwangho, C., Olaosebikan, H., & Akpabio, A. A. (2019). Tossing and turning with degenerative arthropathy: An assessment of poor sleep quality in knee osteoarthritis. Reumatologia, 57(4), 207–213. https://doi.org/10.5114/reum.2019.87615
2. Clémence Jeanmaire, Mazières, B., Verrouil, E., Bernard, L., Guillemin, F., & Rat, A.-C. (2018). Body composition and clinical symptoms in patients with hip or knee osteoarthritis: Results from the KHOALA cohort. Seminars in Arthritis and Rheumatism, 47(6), 797–804. https://doi.org/10.1016/j.semarthrit.2017.10.012
3. Cui, A., Li, H., Wang, D., Zhong, J., Chen, Y., & Lu, H. (2020). Global, regional prevalence, incidence and risk factors of knee osteoarthritis in population-based studies. EClinicalMedicine, 29–30, 100587. https://doi.org/10.1016/j.eclinm.2020.100587
4. Dai, Z., Neogi, T., Brown, C., Nevitt, M., Lewis, C. E., Torner, J., & Felson, D. T. (2020). Sleep Quality Is Related to Worsening Knee Pain in Those with Widespread Pain: The Multicenter Osteoarthritis Study. The Journal of Rheumatology, 47(7), 1019–1025. https://doi.org/10.3899/jrheum.181365
5. Feda, J., Miller, T., Young, J. L., Neilson, B., & Rhon, D. I. (2023). Measures of sleep are not routinely captured in trials assessing treatment outcomes in knee osteoarthritis: A scoping systematic review and call to action. Osteoarthritis and Cartilage Open, 5(4), 100400. https://doi.org/10.1016/j.ocarto.2023.100400
6. GBD 2021 Osteoarthritis Collaborators. (2023). Global, regional, and national burden of osteoarthritis, 1990–2020 and projections to 2050: a systematic analysis for the Global Burden of Disease Study 2021. The Lancet Rheumatology, 5(9), e508–e522. https://doi.org/10.1016/S2665-9913(23)00163-7
7. Geng, R., Li, J., Yu, C., Zhang, C., Chen, F., Chen, J., ... Jin, T. (2023). Knee osteoarthritis: Current status and research progress in treatment (Review). Experimental and Therapeutic Medicine, 26, 481. https://doi.org/10.3892/etm.2023.12180
8. Gilbert, A. L., Lee, J., Song, J., Semanik, P. A., Ehrlich-Jones, L. S., Kwoh, C. K., ... Chang, R. W. (2021). Relationship Between Self-Reported Restless Sleep and Objectively Measured Physical Activity in Adults with Knee Osteoarthritis. Arthritis Care & Research, 73(5), 687–692. https://doi.org/10.1002/acr.23581
9. Huh, H. J., Kim, K. H., Lee, H. K., Jeong, B. R., Hwang, J. H., & Chae, J. H. (2021). Perceived Stress, Positive Resources and Their Interactions as Possible Related Factors for Depressive Symptoms. Psychiatry Investigation, 18(1), 59–68. https://doi.org/10.30773/pi.2020.0208
10. Kwon, H. M., Yang, I.-H., Park, K. K., Cho, B.-W., Byun, J., & Lee, W.-S. (2020). Cigarette smoking and knee osteoarthritis in the elderly: Data from the Korean National Health and Nutritional Examination Survey. Experimental Gerontology, 133, 110873. https://doi.org/10.1016/j.exger.2020.110873
11. Liao, J., Chen, J., Xu, W., et al. (2023). Prevalence and associations of sarcopenia, obesity and sarcopenic obesity in end-stage

knee osteoarthritis patients. Journal of Health, Population and Nutrition, 42, 108. https://doi.org/10.1186/s41043-023-00438-wu

12. Moretti, B., Spinarelli, A., Varrassi, G., Massari, L., Gigante, A., Iolascon, G., Benedetti, M. G., & Moretti, A. M. (2022). Influence of sex and gender on the management of late-stage knee osteoarthritis. Musculoskeletal Surgery, 106(4), 457–467. https://doi.org/10.1007/s12306-021-00725-8
13. Paradowski, P. T., Bergman, S., Sundén-Lundius, A., Lohmander, L. S., & Roos, E. M. (2006). Knee complaints vary with age and gender in the adult population. Population-based reference data for the Knee injury and Osteoarthritis Outcome Score (KOOS). BMC Musculoskeletal Disorders, 7, 38. https://doi.org/10.1186/1471-2474-7-38
14. Plotnikoff, R., Karunamuni, N., Lytvyak, E., Penfold, C., Schopflocher, D., Imayama, I., Johnson, S. T., & Raine, K. (2015). Osteoarthritis prevalence and modifiable factors: a population study. BMC Public Health, 15, 1195. https://doi.org/10.1186/s12889-015-2
15. Shin, W., & Kim, J. (2021). Poor diet quality is associated with self-reported knee pain in community-dwelling women aged 50 years and older. PLOS ONE, 16(2), e0245630. https://doi.org/10.1371/journal.pone.0245630
16. Singh, A., Das, S., Chopra, A., Danda, D., Paul, B. J., March, L., ... Antony, B. (2022). Burden of osteoarthritis in India and its states, 1990–2019: findings from the Global Burden of Disease Study 2019. Osteoarthritis and Cartilage, 30(8), 1070–1078. https://doi.org/10.1016/j.joca.2022.05.004
17. Souza, I. F., de Oliveira Neta, R. S., Gazzola, J. M., & de Souza, M. C. (2017). Elderly with knee osteoarthritis should perform nutritional assessment: integrative literature review. Einstein, 15, 226–232.
18. Strath, L. J., Meng, L., Rani, A., Sinha, P., Johnson, A., Huo, Z., ... Cruz-Almeida, Y. (2022). Accelerated Epigenetic Aging Mediates the Association between Vitamin D Levels and Knee Pain in Community-Dwelling Individuals. The Journal of Nutrition, Health & Aging, 26, 318–323.
19. Wojcieszek, A., Kurowska, A., Majda, A., Liszka, H., & Gądek, A. (2022). The Impact of Chronic Pain, Stiffness and Difficulties in Performing Daily Activities on the Quality of Life of Older Patients with Knee Osteoarthritis. International Journal of Environmental Research and Public Health, 19(24), 16815. https://doi.org/10.3390/ijerph192416815
20. Wu, Y., Li, X., Meng, H., Wang, Y., Sheng, P., Dong, Y., Yang, J., Chen, B., & Wang, X. (2024). Dietary fiber may benefit chondrocyte activity maintenance. Frontiers in Cellular and Infection Microbiology, 14, 1401963. https://doi.org/10.3389/fcimb.2024.1401963
21. Xu, C., Liu, T., Driban, J. B., McAlindon, T., Eaton, C. B., & Lu, B. (2021). Dietary patterns and risk of developing knee osteoarthritis: Data from the Osteoarthritis Initiative. Osteoarthritis and Cartilage, 29(6), 834–840. https://doi.org/10.1016/j.joca.2021.02.571
22. Yunus, M. H. M., Nordin, A., & Kamal, H. (2020). Pathophysiological Perspective of Osteoarthritis. Medicina (Kaunas, Lithuania), 56(11), 614. https://doi.org/10.3390/medicina56110614
23. Zhang, Y., Li, X., Wang, Y., Ge, L., Pan, F., Winzenberg, T., & Cai, G. (2023). Association of knee and hip osteoarthritis with the risk of falls and fractures: a systematic review and meta-analysis. Arthritis Research & Therapy, 25(1), 184. https://doi.org/10.1186/s13075-023-03179-4

How to cite this article: Palak Rathod, Nisha Bellare. Study on the association between dietary intake, KOOS scores, stress scores and sleep quality in individuals diagnosed with knee osteoarthritis Aged 40-65 Years. *Int J Health Sci Res.* 2025; 15(7):400-412. DOI: *https://doi.org/10.52403/ijhsr.20250746*

******