



Kinesiophobia and Related Factors in Patients with Osteoporosis and Osteopenia

Osteoporoz ve Osteopeni Hastalarında Kinezyofobi ve İlişkili Faktörler

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Abstract

Objective: This study aimed to determine the relationship between kinesiophobia, physical activity level (PAL), and quality of life (QoL) in patients with osteoporosis (OP) and osteopenia (OPN).

Materials and Methods: The study included 41 patients with OP and 41 with OPN. Kinesiophobia was assessed using the Tampa scale of Kinesiophobia, PAL using the International Physical Activity Questionnaire-Short Form, and QoL using the European Osteoporosis Federation QoL questionnaire.

Results: The study was completed with 80 patients (40 patients in each group). Although there was a significant difference between the two groups in kinesiophobia ($p=0.027$), no significant difference was observed in terms of activity levels ($p=0.103$). In addition, a significant correlation was observed between kinesiophobia and PAL and all sub-parameters of QoL in patients with OP ($p<0.05$). A significant correlation was observed between kinesiophobia and PAL in patients with OPN ($p<0.001$, $r=0.544$) however no significant correlation was observed between kinesiophobia and QoL ($p>0.05$).

Conclusion: Kinesiophobia was found to be high in patients with OP and OPN, which negatively affected the PAL and QoL of patients with OP. Considering the positive effects of exercise on these patients, the evaluation and treatment of kinesiophobia have become increasingly important.

Keywords: Kinesiophobia, physical activity level, quality of life, osteoporosis, osteopenia

Öz

Amaç: Bu çalışmanın amacı osteoporoz (OP) ve osteopeni (OPN) hastalarında kinezyofobi, fiziksel aktivite düzeyi ve yaşam kalitesi (QoL) arasındaki ilişkiyi belirlemektir.

Gereç ve Yöntem: Çalışmaya 41 OP ve 41 OPN hastası dahil edildi. Kinezyofobi, Tampa Kinezyofobi ölçeği, fiziksel aktivite seviyesi Uluslararası Fiziksel Aktivite Anketi-Kısa Formu ve QoL, Avrupa Osteoporoz Federasyonu QoL anketi kullanılarak değerlendirildi.

Bulgular: Çalışma her grupta 40 hasta olmak üzere 80 hasta ile tamamlanmıştır. İki grup arasında kinezyofobi açısından anlamlı bir fark bulunurken ($p=0,027$), aktivite düzeylerinde anlamlı bir fark gözlenmemiştir ($p=0,103$). Ayrıca, OP'li hastalarda kinezyofobi ve fiziksel aktivite seviyesi ile QoL'nin tüm alt parametreleri arasında anlamlı korelasyon gözlenmiştir ($p<0,05$). OPN'li hastalarda kinezyofobi ve fiziksel aktivite seviyesi arasında anlamlı bir korelasyon gözlenirken ($p<0,001$, $r=0,544$), kinezyofobi ve QoL arasında anlamlı bir korelasyon saptanmamıştır ($p>0,05$).

Sonuç: Kinezyofobinin OP ve OPN hastalarında yüksek olduğu ve bu durumun OP hastalarında fiziksel aktivite seviyesi ve QoL düzeyini olumsuz etkilediği bulunmuştur. Egzersizin bu hastalar üzerindeki olumlu etkileri göz önüne alındığında, kinezyofobinin değerlendirilmesi ve tedavisi giderek daha önemli hale gelmektedir.

Anahtar kelimeler: Kinezyofobi, fiziksel aktivite seviyesi, yaşam kalitesi, osteoporoz, osteopeni

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Introduction

Osteoporosis (OP) is a disease characterized by deterioration of the microarchitecture of bone tissue and low bone mineral density. This may lead to a decrease in bone strength, an increase in bone fragility and consequently an increased risk of fracture (1). It is known as a silent disease because it does not show any symptoms until a symptomatic fracture develops, particularly in elderly individuals (2). OP-related fractures usually occur in the hip, vertebrae and wrist. OP causes excess morbidity, mortality, decreased quality of life (QoL) and health expenditures (3). The prevalence of OP is 2% and the incidence of hip fracture is 13 per 10,000 men and women over the age of 50 years in Turkey (1). Rates increase with age. In recent years, the rate of OP in 80-year-old women was approximately 30%. OP and its complications, particularly hip fractures, cause significant physical, psychological, social and economic burdens for patients and governments (2).

One of the most important preventive and therapeutic approaches in OP is physical activity, because inactivity is an important risk factor for bone loss. Weight-bearing activities reduce bone loss, fall risk and fractures (4). The rate of OP and sarcopenia decreases as the level of physical activity increases according to the study conducted in Korean elderly individuals (5).

Fear of movement is a significant issue that has adverse effects on both the physical and mental well-being of patients, ultimately impacting their QoL. This fear can result in varying levels of participation limitations and disability issues. Furthermore, individuals with kinesiophobia tend to limit their activities and avoid exercise, which can lead to a long-term decline in physical fitness, reduced activity levels, functional impairments, disuse, and even depression. Recognizing this problem and incorporating strategies to address kinesiophobia into the treatment plan may have a positive impact on overall treatment outcomes (6).

Recent studies have shown that many chronic musculoskeletal diseases, such as back pain, lead to kinesiophobia because of the belief that pain will increase during activity (7,8). Kinesiophobia in OP patients with inadequate knowledge has been shown to be associated with lower physical activity levels (PAL) in individuals with chronic pain (9). Consequently, the risk of a sedentary lifestyle is increasing. Inactivity leads to an increased risk of not only chronic pain but also other health problems such as cardiovascular diseases. Kinesiophobia is also associated with poor treatment outcomes (10). OP is a painless, silent disease unless osteoporotic fractures occur. However, the diagnosis of OP with inadequate education about the disease may lead to kinesiophobia in OP patients. An irrational belief that possible falls and related fractures will increase during physical activity may be observed in these patients. Studies evaluating the levels of kinesiophobia and related factors in patients with OP and OPN are limited in the literature. Gunendi et al. (11) showed that patients with OP had higher levels of kinesiophobia than age and gender-matched healthy control group. They also

concluded that there was a moderately significant relationship between kinesiophobia and QoL (11). Oksuz and Unal (12) also concluded that pilates exercise training was effective in reducing kinesiophobia in patients with OP. The aim of this study was to compare the level of kinesiophobia in female patients with OP and OPN and to evaluate the relationship between kinesiophobia and PAL and QoL in these patients.

Materials and Methods

Study Design

The study was approved by Firat University Non-Interventional Clinical Research Ethics Committee referenced 2023/10-17 (date: 27.07.2023). An informed consent form was taken from the participants.

The study included 82 postmenopausal female patients with OP who were being treated and followed up at Elaziğ Medical Hospital. Female patients with lumbar vertebrae and femoral neck T-scores <-2.5 standard deviation (SD) for OP patients and T-scores between -1 and -2.5 SD for OPN patients according to the World Health Organization classification system and dual energy X-ray absorptiometer (DEXA) at least 1 year ago and aged 45-65 years were included in the study. Patients who had a history of fracture or fall within the last 1 year, neurologic or musculoskeletal diseases that may affect mobility, and chronic pain that may cause kinesiophobia were excluded from the study. Demographic data [age, height, weight, age at menopause, body mass index (BMI)] and bone densitometry results reported within the last one year were recorded.

Outcome Measurements

Kinesiophobia Assessment

The Tampa scale of Kinesiophobia (TSK), which has been validated in Turkish, was used to assess kinesiophobia. This questionnaire, which evaluates fears associated with pain or previous injury, consists of 17 questions. A 4-point Likert scale (1= strongly disagree, 2= disagree, 3= agree, 4= strongly agree) was used to evaluate the questions. The minimum score is 17 and the maximum score is 68. This questionnaire evaluates the increase in pain with movement, fear of injury and avoidance of movement due to pain (6).

Physical Activity Level Assessment

PAL was assessed with the International Physical Activity Questionnaire-Short Form (IPAQ-SF). The Turkish validity and reliability of the IPAQ was performed by Saglam et al. (13). This questionnaire provides information about the time spent in walking, moderate and vigorous activities in the last 7 days. There is also a separate section on sitting. This section asks how much time is spent sitting on average per day. The total score is calculated by multiplying the duration (minutes) and frequency (days) of walking, moderate and vigorous activities by certain values (13).

Quality of Life Assessment

The European Osteoporosis Federation Quality of Life Questionnaire (QUALEFFO-41) was used to assess health-related QoL. This questionnaire covers five dimensions of health: pain (QP), physical functioning (QPF), social activities (QSA), general health assessment (QGH) and mental functioning (QMF). Higher scores indicate worse health-related QoL (14).

Statistical Analysis

SPSS (Version 22.0, SPSS Inc., Chicago, IL, USA) software was used for statistical analysis of the data collected in the study. Descriptive statistics were shown as mean ± SD. Normality distribution was analyzed by Kolmogorov-Smirnov test. Two independent sample mean comparisons for continuous variables were performed using the test of significance of the difference between two means when parametric test assumptions were met, and Mann-Whitney U test when parametric test assumptions were not met. Spearman correlation analysis was used to determine the relationship between the parameters. The statistical significance level was accepted as $p < 0.05$.

Results

This study was completed with a total of 80 OP and OPN patients, 40 in each group. One patient with OP and one patient with OPN were excluded from the study due to having an additional neurologic disease and not willing to the study, respectively (Figure 1). Demographic characteristics and DEXA results of the patients are summarized in Table 1. There was no statistically significant difference between the groups in age and BMI ($p > 0.05$), however age at menopause was statistically lower in the group with OP ($p = 0.038$). QoL, kinesiophobia and

PAL comparisons of the groups are summarized in Table 1. There was a statistically significant difference between the two groups in QMF ($p = 0.007$) and QT ($p < 0.001$) parameters, which are the subheadings of the QUALEFFO-41, while no significant difference was observed in the other subheadings ($p > 0.05$). While there was a significant difference in kinesiophobia in OP and OPN patients ($p = 0.027$), no significant difference was observed in PAL ($p = 0.103$). The relationship between QUALEFFO-41, TSK and IPAQ scores in individuals diagnosed with OP and OPN are summarized in Table 2 and Table 3, respectively.

Discussion

This study was planned to evaluate kinesiophobia and associated factors in OP and OPN patients. The results of the study showed that patients with OP had higher kinesiophobia scores, worse QoL and lower PAL than patients with OPN. In addition, kinesiophobia scores of OP patients were significantly correlated with all sub-parameters of QoL and negatively correlated with PAL. One of the barriers to physical activity is kinesiophobia. Considering the importance of physical activity in patients with OP, it is necessary to evaluate and treat kinesiophobia in these patients.

Kinesiophobia, refers to an irrational and debilitating fear of engaging in physical activities and movement, driven by the fear of experiencing painful injuries or re-injury. This fear can often be attributed to a lack of proper knowledge about the condition (15). Kinesiophobia may develop due to an excessive concern about getting injured during physical exercise, especially when patients have inadequate education about their disease (16). It is important to recognize that kinesiophobia is a psychological and cognitive factor that can impede the recovery process following

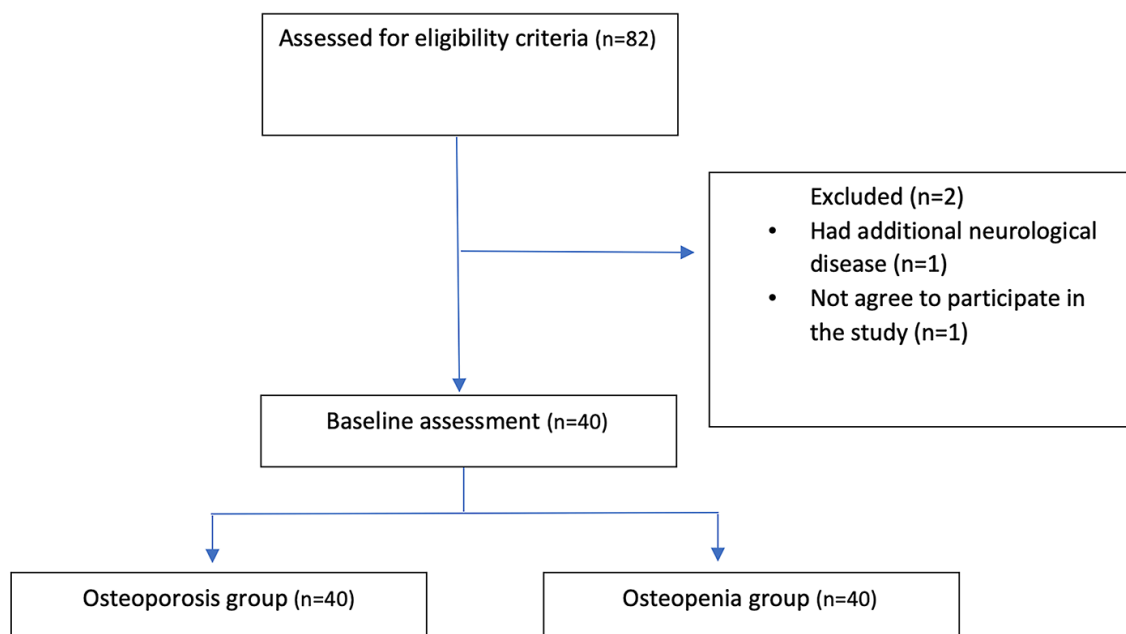


Figure 1. CONSORT flow diagram on study design

Table 1. Comparison of demographic characteristics, DEXA results, quality of life, kinesiophobia and physical activity level of osteoporosis and osteopenia patients

Characteristics	OP group (n=40)	OPN group (n=40)	p-value
Age/years	56.28±4.65	55.72±4.69	0.769
BMI/kg/cm ²	29.51±5.07	30.36±5.34	0.610
Menopause age	45.68±3.99	47.90±4.68	0.038
LVBMD (L1-L4)	-2.7±0.38	-1.71±0.58	<0.001
LVBMD (L2-L4)	-2.9±0.38	-1.65±0.68	<0.001
FNBMD	-1.26±1.00	-1.06±0.84	0.205
FNBMD	-1.17±0.93	-1.01±0.83	0.240
QP	40.12±22.02	33.05±19.90	0.078
QPF	30.52±12.56	29.43±11.92	0.992
QSA	58.13±18.63	50.00±16.13	0.059
QGH	57.54±14.25	55.12±12.85	0.301
QMF	49.78±14.49	40.48±13.42	0.007
QT	42.60±10.45	32.56±7.98	<0.001
TSK	43.07±6.44	39.17±7.27	0.027
IPAQ	1163.95±111.77	1218.95±168.72	0.103

DEXA: Dual energy X-ray absorbsiometer, OP: Osteoporosis, OPN: Osteopenia, LVBMD: Lumbal vertebrae bone mineral dansitometry, FNBMD: Femur neck bone mineral dansitometry, BMI: Body mass index, kg: Kilogram, cm: Centimeter, QP: Pain subscale of QUALEFFO-41, QPF: Physical function subscale of QUALEFFO-41, QSA: Social activites subscale of QUALEFFO-41, QGH: General health subscale of QUALEFFO-41, QMF: Mental function subscale of QUALEFFO-41, QT: Total score of QUALEFFO-41, TSK: Tampa scale of Kinesiophobia, IPAQ: International Physical Activity Questionnaire, QUALEFFO-41: European Osteoporosis Federation Quality of Life Questionnaire

Table 2. Correlations among kinesiophobia, physical activity level and quality of life in patients with osteoporosis

Parameters	QP	QPF	QSA	QGH	QMF	QT	TSK	IPAQ	
QP	r	1	0.270	0.198	0.369	0.331	0.543	0.381	0.090
	p	-	0.092	0.220	0.019	0.037	<0.001	0.015	0.580
QPF	r	0.270	1	0.084	0.214	0.295	0.277	0.642	-0.301
	p	0.092	-	0.608	0.184	0.065	0.084	<0.001	0.059
QSA	r	0.198	0.084	1	0.205	0.334	0.231	0.401	-0.292
	p	0.220	0.608	-	0.205	0.035	0.152	0.010	0.067
QGH	r	0.369	0.214	0.205	1	0.312	0.524	0.401	-0.139
	p	0.019	0.184	0.205	-	0.050	<0.001	0.010	0.392
QMF	r	0.331	0.295	0.334	0.312	1	0.533	0.453	-0.436
	p	0.037	0.065	0.035	0.050	-	<0.001	0.003	0.005
QT	r	0.543	0.277	0.231	0.524	0.533	1	0.398	-0.027
	p	<0.001	0.084	0.152	<0.001	<0.001	-	0.011	0.870
TSK	r	0.381	0.642	0.401	0.401	0.453	0.398	1	-0.476
	p	0.015	<0.001	0.010	0.010	0.003	0.011	-	0.002
IPAQ	r	0.090	-0.301	-0.292	-0.139	-0.436	-0.027	-0.476	1
	p	0.580	0.059	0.067	0.392	0.005	0.870	0.002	-

QP: Pain subscale of QUALEFFO-41, QPF: Physical function subscale of QUALEFFO-41, QSA: Social activites subscale of QUALEFFO-41, QGH: General health subscale of QUALEFFO-41, QMF: Mental function subscale of QUALEFFO-41, QT: Total score of QUALEFFO-41, TSK: Tampa scale of Kinesiophobia, IPAQ: International Physical Activity Questionnaire, QUALEFFO-41: European Osteoporosis Federation Quality of Life Questionnaire

a trauma (17). Consequently, this fear can lead to a reduction in physical activity, negatively impacting a patient’s postoperative therapy and rehabilitation efforts (18). This often results in a pattern of avoidance behavior, in which individuals shy away

from everyday activities such as exercise, socializing, and work, thereby exacerbating their pain experience (15). Although there was no pain in OP patients until fracture development, kinesiophobia values were found to be high in our study.

Table 3. Correlations among kinesiophobia, physical activity level and quality of life in patients with osteopenia

Parameters		QP	QPF	QSA	QGH	QMF	QT	TSK	IPAQ
QP	r	1	0.011	-0.002	0.221	0.433	0.581	0.216	-0.191
	p	-	0.947	0.990	0.170	0.005	<0.001	0.181	0.237
QPF	r	0.011	1	0.127	0.028	-0.102	0.154	-0.041	0.020
	p	0.947	-	0.436	0.865	0.532	0.341	0.800	0.903
QSA	r	-0.002	0.127	1	0.163	0.091	0.363	0.105	-0.032
	p	0,990	0.436	-	0.314	0.576	0.021	0.518	0.846
QGH	r	0.221	0.028	0.163	1	0.307	0.594	0.084	0.045
	p	0.170	0.865	0.314	-	0.054	<0.001	0.605	0.783
QMF	r	0.433	-0.102	0.091	0.307	1	0.636	0.161	0.031
	p	0.005	0.532	0.576	0.054	-	<0.001	0.321	0.848
QT	r	0.581	0.154	0.363	0.594	0.636	1	0.256	-0.056
	p	<0.001	0.341	0.021	<0.001	<0.001	-	0.111	0.730
TSK	r	0.216	-0.041	0.105	0.084	0.161	0.256	1	-0.544
	p	0.181	0.800	0.518	0.605	0.321	0.111	-	<0.001
IPAQ	r	-0.191	0.020	-0.032	0.045	0.031	-0.056	-0.544	1
	p	0.237	0.903	0.846	0.783	0.848	0.730	<0.001	-

QP: Pain subscale of QUALEFFO-41, QPF: Physical function subscale of QUALEFFO-41, QSA: Social activities subscale of QUALEFFO-41, QGH: General health subscale of QUALEFFO-41, QMF: Mental function subscale of QUALEFFO-41, QT: Total score of QUALEFFO-41, TSK: Tampa scale of Kinesiophobia, IPAQ: International Physical Activity Questionnaire, QUALEFFO-41: European Osteoporosis Federation Quality of Life Questionnaire

Vlaeyen et al. (19) defined a score above 37 as a high kinesiophobia score. The mean score of OP patients in our study was 43.07 and that of OPN patients was 39.17. A possible reason for this may be inadequate patient education. This result may change with more information about their disease and the importance of physical activity. Fletcher et al. (20) showed that reducing the fear of activity in patients with chronic pain may be possible with the patient's understanding of the neurophysiology of pain. Therefore, educating patients about pain physiology in the treatment of chronic pain was suggested to decrease fear of movement. Similarly, organizing education about the disease and treatment in patients with OP may reduce kinesiophobia in these patients.

A significant negative correlation was found between kinesiophobia and PAL in patients with OP and OPN in this study. Especially weight-bearing exercises provide mechanical stress, so the bone response is higher and aerobic exercise is beneficial for increasing enzymatic activation of osteoblasts (21). However, the results of our study support that kinesiophobia negatively affects the level of physical activity in patients with OP and OPN. Similar to our study, Pang et al. (22) also found a negative correlation between kinesiophobia and PAL in patients with OP. In studies conducted in patients with chronic low back pain and osteoarthritis, a significant relationship was found between kinesiophobia and PAL (7,23). However, no significant correlation was found between kinesiophobia and PAL in studies evaluating factors associated with kinesiophobia in patients with systemic lupus erythematosus and chronic neck pain (24,25).

Significant differences were observed in kinesiophobia and QoL between OP and OPN patients in this study. Although no significant difference was found in PAL, it was observed that patients with OP had lower activity levels than patients with OPN. Mısırcı et al. (26) concluded that OP and OPN patients had higher kinesiophobia levels compared to healthy controls; however no significant difference was found in kinesiophobia in OP and OPN patients. The authors interpreted the reason for the lack of significant difference as insufficient information to distinguish between the two diseases (26). Kinesiophobia levels of patients with OP and OPN were found to be significantly different in this study. Although patients with OPN also had high levels of kinesiophobia, fear avoidance behavior was higher in patients with OP. This result suggested that patients with OP were more fearful and avoided activity probably due to fear of fracture risk. Ceylan and Korkmaz (27) found that kinesiophobia was significantly associated with fall risk. Therefore, further studies should investigate treatments to reduce fall risk and kinesiophobia such as balance and strengthening exercises.

Health-related QoL refers to physical, mental and social well-being and is a subset of QoL (28). OP has negative effects on health status and these effects are reflected on QoL. In previous studies, it has been demonstrated that QoL decreased in patients with OP with and without fractures (29,30). Assessing QoL in postmenopausal women with OP provides important information for OP prevention and treatment practices in this population (31). In our study, when the QoL of OP and OPN women was compared, a significant difference was observed in the total QoL score and mental health sub-parameter. Although

no significant difference was found in other sub-parameters, it was concluded that the scores of patients with OP were worse than those of OPN. This result may be interpreted that patients take OP more seriously and put more psychological pressure. Pilates exercises have been shown to improve QoL in patients with OP (12). Studies on the effects of exercise and physical activity on QoL should be increased.

A significant correlation was found between kinesiophobia and all sub-parameters of QoL in patients with OP; no relationship was found in patients with OPN in QoL. It was observed that high kinesiophobia score was associated with low QoL in OP patients. Therefore, kinesiophobia may negatively affect QoL in these patients. Although high levels of kinesiophobia were observed in patients with OPN, no significant relationship was found with QoL. This may be interpreted as kinesiophobia may affect clinical outcomes more in patients with OP. Kinesiophobia was found to have a negative effect on QoL, and a significant relationship between high kinesiophobia and low QoL has been reported in patients with chronic musculoskeletal pain (32,33). Altuğ et al. (7) showed that kinesiophobia caused a negative effect on QoL in patients with low back pain. Similarly, Gunendi et al. (11) reported a significant negative correlation between kinesiophobia and QoL in the patients with OP. Consistent with the literature, we found a correlation between increased kinesiophobia and decreased QoL in OP patients. Overcoming kinesiophobia in the OP patients may contribute to improved QoL.

Study Limitations

Kinesiophobia is known to be associated with anxiety and depression. The fact that we did not evaluate psychological symptoms in our study can be seen as a limitation. In addition, the absence of a healthy control group may also be considered as a limitation. More comprehensive studies evaluating the relationship between OP and OPN symptoms and kinesiophobia are required.

Conclusion

In conclusion, patients with OP had more impaired kinesiophobia, QoL and PAL than patients with OPN according to the results of our study. In addition, there was an inverse relationship between kinesiophobia level, PAL and QoL in OP patients. Besides, a significant relationship was observed between kinesiophobia and PAL in patients with OPN. Preventing kinesiophobia in patients with OP and OPN may be a potential treatment method to increase PAL and QoL. Future studies should investigate treatments to prevent kinesiophobia and improve QoL and PAL.

Ethics

Ethics Committee Approval: The study was approved by Firat University Non-Interventional Clinical Research Ethics Committee referenced 2023/10-17 (date: 27.07.2023).

Informed Consent: An informed consent form was taken from the participants.

Authorship Contributions

Concept: S.B.Y., Design: S.B.Y., Data Collection or Processing: M.S.E., Analysis or Interpretation: M.S.E., Literature Search: M.S.E., S.B.Y., Writing: M.S.E., S.B.Y.

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