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A survey of kinesiophobia as a correlate of lower limb function in patients with lower extremity fractures during inpatient post-operative rehabilitation

Ajediran I Bello [1*], Love Kanebi [1], Fidelis T Iyor [2], Babatunde OA Adegoke [3]

[1] Department of Physiotherapy, School of Biomedical and Allied Health Sciences, College of Health Sciences, University of Ghana, Accra, Ghana; [2] Department of Physiotherapy, Benue State University Teaching Hospital, Markudi, Nigeria; [3]Department of Physiotherapy, College of Medicine University of Ibadan, Ibadan, Nigeria.

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Abstract

Background: The rehabilitation phase of patients with lower extremity fractures (LEF) is often hindered post-operatively by fear of moving (kinesiophobia) with consequent deconditioning and declining of functions. Profiling the prevalence of kinesiophobia and its association with demographic variables could become useful during the rehabilitation process.

Objective: The study aimed to determine the prevalence of kinesiophobia and its correlation with lower limb functions among patients with LEF post-operatively.

Methods: One-hundred and nine (n = 109) patients [male = 79 (72.50%)] with mean age of 41.83 ± 17.37 yr. participated in the cross-sectional study. Participants with LEF who had either undergone closed reduction and immobilization or open reduction with internal or external fixation were recruited into this study using convenience sampling during the rehabilitation phase at the orthopaedic wards of two tertiary healthcare facilities in Accra. Data collection was performed using the Tampa Scale of Kinesiophobia (TSK) and Lower Extremity Functional Scale. Data were analyzed using Spearman's Rho correlation coefficient and Chi-square tests at $p < 0.05$.

Results: Seventy-nine (72.50%) of the participants exhibited kinesiophobia based on their TSK scores (≥ 37). The TSK scores were significantly inversely correlated with participants' lower limb function (r = -0.345; $p < 0.001$). Participants' sex as well as the causes, types and sites of the fractures sustained had no significant association ($p > 0.050$) with the level of kinesiophobia.

Conclusion: There was a high prevalence of kinesiophobia which negatively correlated with LEF but was not associated with the type, site, and cause of fracture as well as the participants' sex. Mitigating kinesiophobia should always be considered an integral rehabilitation goal for in-patients with LEF.

Keywords: *Kinesiophobia, lower limb function, post-operative patients, lower extremity fracture*

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INTRODUCTION

Fractures constitute the most common musculoskeletal injuries in low- and middle-income countries and are accompanied by several long term pain and physical disability [1, 2]. Despite the rapid advancement in the use of technology to reduce human energy expenditure thus ensuring a decline in the prevalence of musculoskeletal disorders, developing countries continue to witness increasing injuries resulting from various risk factors. Such risk factors include increasing usage of cars, unsafe work practices and trauma from wars, road traffic accidents and natural disasters, with a consequent upsurge in the incidence of traumatic injuries including lower extremity fractures (LEF) [3]. The prevalence of LEF globally is predicted to increase alongside its morbidity, mortality, costs and other associated consequences [4, 5] and projected to exceed 6 million cases by the year 2050 [6]. Although the data on the prevalence of LEF in Ghana remain unstable, a recent retrospective study conducted by Baidoo et al. in 2018 on the patterns of hip fracture over ten years at Korle-Bu Teaching Hospital in Ghana [2] has shown that the Ghanaian population above the age of 50 yr. bears a high risk of fractures due to many factors including falls. Following surgery or immobilization of LEF, restoration of pre-morbid functions such as mobility becomes crucial for physiotherapists. However, the initial rehabilitation process

* *Corresponding author*
Email: iabello@chs.edu.gh

is often delayed partly by the unwillingness of patients to move the affected lower limb due to apprehension even after ascertaining the union of the bone fragments. Kinesiophobia, defined as the fear of movement, is a psychological risk factor which has serious implication for the recovery of patients from physical dysfunction. It is known to be associated with patients presenting with LEF, as pain and the ensuing avoidance behaviour could lead to deconditioning and perpetuation of pain [7]. The persistence of kinesiophobia during the rehabilitation phase of management may impose detrimental consequences on patients physically and psychologically.

A prospective descriptive study by Lundberg et al. [8] within a primary healthcare setting in the south-west of Sweden showed the incidence of kinesiophobia in almost half of the patients with musculoskeletal pain who sought care. The authors identified other clinical variables including the stage of the lesion, motivating factors, as well as sites and types of injury as important factors with significant influence on kinesiophobia. Globally, there have been changes in the prevalence and profiles of diseases across geographical regions and environments. Accordingly, the practice of physiotherapy continues to evolve in response to changes in health models, illness and society. The dynamic shift in health demands has also influenced the perception of people about their health which has compelled healthcare providers to modify the model of care delivery from the biomedical model to biopsychosocial model with a central focus largely on the body and mind [9]. In line with the continuum of healthcare delivery, physiotherapists are constantly being challenged to broaden their horizon by harnessing additional skills in the form of extended scope of practice in the management of musculoskeletal disorders [10]. Affective constructs such as fear, anxiety, depressed mood and psychological distress commonly found among healthcare seekers, deserve better attention during the initial rehabilitation goal planning. Suffice it to state that successful rehabilitation of patients with fractures demands adequate consideration of associated demographic details such as the sex of patients as well as the causes, sites and types of fracture in connection with kinesiophobia. This may become useful in clinical practice to inform treatment plans and the extent of intervention especially during the baseline evaluation of patients with the view to ensuring shorter hospital stay thus minimizing direct and indirect healthcare costs [11]. A study by Main and George [12] strongly suggests that clinically significant symptoms that could potentially elicit kinesiophobia need to be recognized during the early postoperative recovery period and should be managed properly to facilitate seamless recovery in the affected patients. Despite the strong evidence in support of kinesiophobia as a potential barrier to rehabilitation [13], information regarding its demographic profile among patients with LEF is yet to be sufficiently documented in Ghana. Indeed, identifying patients with a high profile of kinesiophobia and the associated factors could pave way for better outcomes in their management. Patients and healthcare providers who are well aware of the detrimental effects of kinesiophobia will be interested in modifying all its potent determinants. Moreover, the changing healthcare culture in support of multi-disciplinary approach and patient-centred care underscores the holistic evaluation of all possible clogs that are inimical to the rehabilitation process. Early detection of kinesiophobia and prudent consideration of its common risk factors in practice may have a positive impact on the patients' involvement in post-operative planning and management of LEF and perhaps ensure a quicker recovery. This study was designed to determine the prevalence of kinesiophobia in patients with LEF and its correlation with their lower limb function to justify its consideration in the post-operative management of these patients. We hypothesized that the kinesiophobia score of patients with LEF post-operatively would significantly correlate with their lower limb functions.

MATERIALS AND METHODS

Participants

Patients with LEF who were undergoing rehabilitation between February and April 2019 at the orthopaedic wards of the Korle-Bu Teaching Hospital (KBTH) and 37 Military Hospital (37-MH), Accra, were conveniently sampled into the descriptive cross-sectional study. The selection of these two centres was informed by the high patronage of patients within and outside Ghana. The sample size for this study was estimated through Taro Yamane's formula, given as "n = N / (1 + N e 2)". The study population (N) at the time of the conduct of this research was 149 as obtained from the ward records of both hospitals (KBTH; n = 94; 37-MH; n = 55). Thus, with a 0.05 margin of error, 109 patients were required to participate in the study. Based on the number of patients available for the study in each of the two health facilities, non-proportional quota sampling was employed to achieve high representativeness by multiplying the estimated study sample by the ratio of the number of patients in each centre to the total number of patients in both centres. Invariably, 69 patients from KBTH and 40 patients from 37-MH, were selected from the respective centres. Participants were selected consecutively until the required number from each centre was obtained. Patients were eligible for inclusion if they were 18 yr. and older, had LEF surgery, and were undergoing in-patient post-operative care at the time of the study. Patients with co-morbid neurological impairments, diagnosed with osteoporosis and with any history of psychiatric illness were excluded from the study.

Data collection materials

Participants' demographic information such as sex, age, types, sites and causes of fracture was documented in a data capturing form designed by the researchers for this study. Tampa Scale for kinesiophobia (TSK) validated for assessing 'fear of pain-related movement' in patients with musculoskeletal pain was adopted in this study. It consisted

of 17 items (of which 4 were in reverse order) and the scoring is premised on a 4-point Likert Scale with alternative responses ranging from "strongly disagree" (assigned a score of 1) to "strongly agree" (assigned a score of 4). The respondents' scores on TSK were interpreted on the attainment of cut-off point (≥ 37) to indicate the presence or absence of kinesiophobia [14, 15]. The questionnaire takes about 4 to 8 min to complete. Also, the participants' lower extremity function was assessed using the lower extremity functional scale (LEFS) [16, 17] which comprises 20 items on a person's ability to perform everyday tasks following an injury. Studies have lent support to the reliability, validity, and responsiveness of the LEFS for assessing functional impairments in a wide array of patient groups with lower extremity musculoskeletal conditions [18, 19]. It is a self-rated tool that can be used to evaluate the function of one or both lower extremities. Patients' responses on the items are graded on 5-point Likert scale ranging from "extreme difficulty or unable to perform an activity (0)" to "no difficulty (4)". The maximum possible score is 80 points, indicating very high function whilst the minimum possible score is 0 points, indicating very low function. It took each participant an average of 5 - 7 min to complete the tool.

Procedures for data collection

Ethical approval for the study's protocol was obtained from the Ethics and Protocol Review Committee of the School of Biomedical and Allied Health Sciences, University of Ghana. The management of both health facilities and the heads of both orthopaedic wards were provided with detailed information about the research, after which they granted permission for the study to be carried out. Patients who met the inclusion criteria and were willing to participate in the study were approached with the information sheet and subsequently signed written informed consents after being briefed about the aims, procedure and the expected outcome of the study. Convenient schedules were arranged with the ward heads to obtain information from the patients regarding demographic data with self-prepared form as well as TSK and LEFS to obtain information on kinesiophobia and lower extremity functions, respectively. Four final year physiotherapy students who were undergoing their clinical posting in the orthopaedic wards of the two hospitals at the time of this study were recruited as research assistants. The data capturing form was administered by the research assistants whilst the copies of TSK and LEFS were self-rated by the patients. The research assistants were on standby to collect both copies of the questionnaire from the participants upon their completions. It took the researchers and their assistants an average of 10 - 15 min to administer all copies of the questionnaire. The copies of the questionnaire were collected from the participants following completion.

Statistical analysis

Descriptive data are presented as proportion, mean, and standard deviations. Spearman's Rho Correlation was used to determine the correlation between kinesiophobia and lower extremity functions. The association between the presence of kinesiophobia and participants' sex, as well as sites, types, and causes of fractures was explored using Chi Square test. Statistical package for Social Sciences (SPSS version 23.0) was employed for all statistical analyses. A level of significance of $p < 0.05$ was adopted for the inferential analyses.

RESULTS

Demographic characteristics of participants

Participants in this study were 109 individuals with age range of 18 - 91 yr. (mean = 41.80 ± 17.40 yr.). The majority (72.50%, n = 79) were males whilst 61 (56%) of them sustained open fracture. Road Traffic Accidents were the most common cause of fracture among the sampled patients accounting for 73 (67%) cases compared to 8 (7.30%) cases of fracture resulting from other traumatic injuries. Although different cases of bone fracture of the lower limbs were recorded in both health facilities, femur and tibia were the most affected bones accounting for 35 (32.11%) and 34 (31.20) respectively. The mean score of participants on the TSK was 42.17 ± 9.62. Overall, 79 (72.50%) of the participants had kinesiophobia based on their scores on the TSK (Table 1).

Table 1: Participants' demographic data

Characteristics	Frequency	Percentage
Gender		
Male	79	72.50
Female	30	27.50
Types of fracture		
Closed fracture	48	44.04
Open fracture	61	55.96
Causes of fracture		
Fall	28	25.69
Road traffic accident	73	66.97
Other traumatic events	8	7.34
Sites of fracture		
Pelvis	6	5.50
Femur	35	32.11
Knee fracture dislocation	6	5.50
Tibia	34	31.20
Ankle fracture dislocation	15	13.76
Metatarsal	2	1.83
Two sites	10	9.18
Three sites	1	0.92
Kinesiophobia		
Yes	79	72.50
No	30	27.50

Kinesiophobia status

The correlation between participants' scores on the LEFS and TSK as well as the associations of LEFS and demographic characteristics were explored. Chi square test did not show significant statistical associations between kinesiophobia score and participants' sex ($\chi^2 = 0.02$; $p = 0.902$), types of fracture ($\chi^2 = 0.27$; $p = 0.601$), causes ($\chi^2 = 5.51$; $p = 0.064$), sites of fracture ($\chi^2 = 8.11$; $p = 0.323$) (Table 2). However, there was significant inverse correlation between participants' TSK scores and LEFS ($r = -0.35$; $p = 0.001$). The scatter plot for the correlation (Figure 1) however suggests a weak inverse correlation between the two variables.

DISCUSSION

The focus of this study was to determine the prevalence of kinesiophobia among patients with LEF who were receiving in-patient care, its association with selected clinical and demographic characteristics and the correlation between kinesiophobia score and lower extremity function. The study revealed a significant inverse correlation between the kinesiophobia scores in the sampled patients and lower extremity function. This implies that appreciable exhibition of kinesiophobia trait is accompanied by a lower level of lower limb function among the patients. Our findings hereby uphold the initial hypothesis which forecasts a significant correlation between the two variables. The outcome of this study has serious implication for the rehabilitation of patients with LEF post-operatively, particularly in low resource countries/communities where attainment of rehabilitation goals can be hampered by various factors. Such factors could arise from patients' perspectives, clinicians' perspectives, and facility's perspectives, thereby ultimately culminating in longer hospital stay than necessary. Although previous efforts on this topic have implicated kinesiophobia as a very important predictor of future disability and health status in the general population [20], ascertaining its influence on the rehabilitation of patients presenting with common morbid conditions such as LEF is justifiable for creating awareness among the patients and caregivers particularly in the local Ghanaian context. Indeed, there has been a paradigm shift in the way health is being perceived occasioned by the need to embrace a patient-centred health care approach.

According to Santrock, health is best understood in terms of a combination of biological, psychological, and social factors rather than purely in biological terms [21]. Pain-related fear represents an important psychological factor and a salient predictor of pain disability in a chronic pain population and is even more predictive of disability than biomedical status and pain intensity [22]. This development creates the basis for the biopsychosocial model which explains the persistence of pain caused by the accompanied psychological and social factors other than the underlying pathology only [23]. The treatment approach based on the biopsychosocial model is aimed at decreasing pain behaviour (operant model) and increasing participation in healthy behavior. A growing body of empirical literature suggests that patient perceptions of health and threat of disease, as well as barriers in a patient's social or cultural environment, appear to influence the extent of their engagement in health promoting or treatment behaviours [24]. The high prevalence of kinesiophobia recorded among the sample of patients with LEF in the present study, has implication for physiotherapy practice due to the significant role of physiotherapists in restoring mobility and function of people with musculoskeletal pain. The prevalence of

Table 2: Associations between clinical, demographic variables kinesiophobia status

Variables	Kinesiophobia status ≥ 37		χ^2	*p* value
	Present (%)	Absent (%)		
Sex				
Males	57 (72.20)	2 (27.80)	0.02	0.902
Females	22 (73.30)	8 (26.70)		
Types of Fracture				
Closed	36 (75)	12 (25)	0.27	0.60
Open	43 (70.50)	18 (29.50)		
Causes of fracture				
Fall	22 (78.60)	6 (21.40)	5.51	0.063
Road traffic accidents	54 (73.97)	19 (26.03)		
Other trauma incidents	3 (37.50)	5 (62.50)		
Sites of fracture				
Pelvis	2 (33.33)	4 (66.67)	8.11	0.323
Femur	28 (80)	7 (20)		
Knee fracture dislocation	4 (66.67)	2 (33.33)		
Ankle fracture dislocation	13 (86.67)	2 (13.33)		
Two sites	9 (90)	2 (10)		
Three sites	1 (100)	0		

* χ^2, Chi sqaure

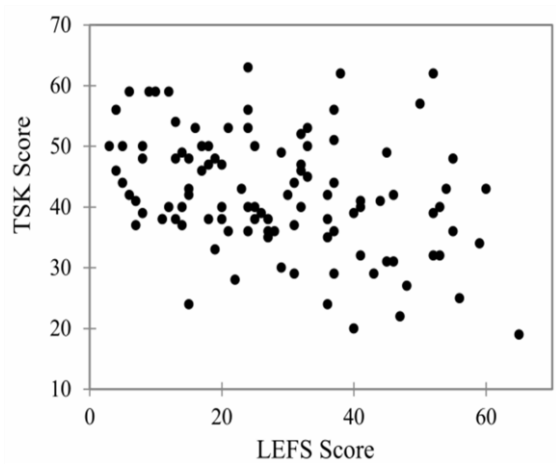

Figure 1: Correlation scatter plot between Tampa Scale of Kinesiophobia (TSK) and lower extremity functional scale (LEFS)

kinesiophobia among participants in this study is considerably higher than the 50% [25] and 24.50% [26] reported from two previous studies using the same TSK cut-off score of ≥ 37. Whilst assessment of kinesiophobia in the previous studies was premised on chronic musculoskeletal pain, the present study specifically involved patients with acute/sub-acute pain (> 7 wk) sequel to fractures of the lower limbs. This might explain the relatively higher prevalence of kinesiophobia observed in the present study. Intuitively, the high pain intensity that often characterizes acute/sub-acute lesion is expected to present more hindrance to movement than chronic pain.

Indeed, previous authors on kinesiophobia were equivocal about the benchmark scores on the TSK scale. Thus, Lundberg et al. in 2006, Demoulin et al. in 2013, and Larsson et al. in 2013 presented reference value of ≥ 40-points as cut-off points for baseline threshold regarding kinesiophobia [8, 27, 28]. However, the lower bench-mark score of ≥ 37 scores adopted by Vlaeyen et al. in 1995 [25] and Koho in 2015 [26] as the trade-off for kinesiophobia was used in this study given the study's relatively small sample size. Many possible reasons are presumed to account for the divergent trade-off scores for diagnosing kinesiophobia ranging from the study sample size, literacy level and socioeconomic status of the different geographical locations of the study sites. The varying healthcare system across countries is also a significant factor. On geographical perspectives, whilst favourable and functional healthcare insurance policies exist in most developed countries, implementation issues still undermine its effective usage in the low- and middle-income countries. Provision of an optimal healthcare system with an adequate insurance cover is expected to serve as potential sources of motivation for adherence to management plans among patients undergoing rehabilitation. The present finding underscores consideration of kinesiophobia as an important construct during baseline evaluation of patients post-operatively.

Patients who are made aware of the adverse effects of kinesiophobia on their functional recovery may likely summon the courage to surmount its ravaging effects and attain their rehabilitation goal, thus facilitating shorter hospital stay. Although most participants in the study were males, the sex of the patients was not significantly associated with their kinesiophobia score. A similar finding has been reported by previous researchers on this theme [8, 29, 30]. Majority of the patients sustained open fracture with the most common cause of fracture being road traffic accident while femur was the most affected bone. These findings were consistent with similar findings previously reported by investigators in fracture management [1, 2]. Although rehabilitation of patients with LEF entails detailed documentation of demographic profile such as sex and fracture characteristics, none of the factors was significantly associated with kinesiophobia in the present study. However, a contrary finding was documented by Carvalho et al. [31] who reported a significant association between kinesiophobia and the male gender. Findings from the study by Feigenbaum, Baraga, Kaplan et al. suggested that patients with open fractures tend to have higher TSK scores than patients who have closed fractures [32]. Findings from the present study tend to suggest that kinesiophobia in patients with LEF is not associated with sex or characteristics of the fractures presented. This study has some limitations. Findings from our study are dependent on the patients' responses regarding their kinesiophobia score and hence subjective. It is worth noting that the objective measurement of an affective construct such as kinesiophobia is always abstract in nature and sometimes riddled with wavering emotion and recall bias. Other important points to note are the influence of other inherent factors such as patients' personality traits and different pain thresholds that can influence their responses but were not however assessed in this study. Perhaps a choice of probability sampling method rather than convenience sampling could have increased the utility of the findings in this study.

Conclusion

Findings in this study reveal kinesiophobia to have an inverse and weak relationship with lower limb function in patients with lower extremity fractures during post-operative physiotherapy care irrespective of their sex, bone affected, type and causes of fracture. The high prevalence of kinesiophobia among the participants in this survey suggests the need for a more supportive role from physiotherapists for patients' self-assurance during the inpatient rehabilitation phase of patients with lower extremity fractures. These findings underscore the need for identification of the presence of kinesiophobia as an important impairment whilst planning and executing rehabilitation procedures

DECLARATIONS

Ethical considerations

The study was approved by the Ethics and Protocol Review Committee of the School of Biomedical and Allied Health Sciences, University of Ghana (ID: SBAHSPT/10583317/SA/2018-2019).

Consent to publish

All authors consented to the publication of the manuscript.

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None

Competing Interests

No conflict of interest was reported by the authors.

Author contributions

AIB and LK designed the study, were involved in data collection and made the first draft of the manuscript; AIB, FTI and BOA transformed the manuscript into intellectual context; FTI and BOA edited and proofread the manuscript.

All the authors read and approved the manuscript for final submission.

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Availability of data
Data is available upon request to the corresponding author.

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