PREVALENCE OF KNEE PAIN AND ITS ASSOCIATED FACTORS AMONG SCHOOL TEACHERS IN SELANGOR, MALAYSIA

Eva NZ[1,3], Hoe VCW[2], and Moy FM[3].
[1]Department of Community Health, Advanced Medical & Dental Institute, Universiti Sains Malaysia, 13200,Pulau Pinang, Malaysia
[2]Centre for Occupational and Environmental Health-UM, Department of Social & Preventive Medicine, Faculty of Medicine, University of Malaya, 50603,Kuala Lumpur, Malaysia
[3]Centre for Epidemiology and Evidence-Based Practice, Department of Social & Preventive Medicine, Faculty of Medicine, University of Malaya, 50603,Kuala Lumpur, Malaysia

Correspondence:
Eva Nabiha Zamri,
Community Health Department,
Advanced Medical and Dental Institute,
Universiti Sains Malaysia,
13200, Kepala Batas, Pulau Pinang, Malaysia
Email: evazamri@usm.my

***Abstract**:*
Knee pain (KP) is commonly reported among workers, especially those in non-managerial occupations such as carpenters, miners and construction workers. However, few studies have been conducted on KP among the teacher population. Therefore, this study aimed to determine the prevalence of KP among school teachers and to explore its association with individual characteristics, lifestyle, work factors, and presence of health conditions. A cross-sectional survey was conducted among teachers at public secondary schools in Selangor, Malaysia. A self-reported questionnaire was utilised to elicit information on socio-demographic characteristics, lifestyle, body mass index, work-related factors, and health-related quality of life (HRQoL). Associations with KP were analysed by logistic regression and reported as odds ratios (ORs) at a 95% confidence interval (CI). The results revealed that the 12-month prevalence of KP was 54.4%. The multivariate analysis showed that age (OR 3.55, 95% CI: 1.92–6.54), kneeling or squatting >1 hour in total (OR 1.48, 95% CI: 1.06–2.08), and physical HRQoL (OR 0.94, 95% CI: 0.92–0.96) were significantly associated with the occurrence of KP. In conclusion, the prevalence of KP among secondary school teachers is high. Age, work-related physical practises, and physical health were found to be significantly associated with KP. Therefore, appropriate strategies should be implemented to address these factors in order to reduce the occurrence of KP, especially among the older teacher population.

***Keywords**: Knee pain, Age, Body mass index, Work-related physical factor, Health-related quality of life, Teachers*

Introduction

Knee pain (KP) is a common musculoskeletal problem which leads to physical disability and decreased quality of life (1). In addition, it is suggested that KP is a better predictor of disability and reduced physical function than radiographic changes in knee osteoarthritis (OA) (2). Knee pain could be a sign and symptom of OA, which could influence the decision to seek medical attention (3). The ubiquity of knee OA has been the subject of numerous research, the results of which vary depending on the study of the targeted population, yet with the frequent occurrences of such cases, KP is still underreported, and underestimated with insufficient treatment (4). In the meta-analysis on the prevalence of knee OA in China revealed that the prevalence of the condition rose with age and showed an almost linear increase beyond the age of 40 (5). Their findings showed that the prevalence of knee OA in the 15- to 39-year-old age group is the lowest (3.1%) and the group of over 70 years old of age is the highest with 26.3%. Meanwhile, previous local study found that the prevalence of knee OA ranged between 25.7% and 30.3% according to age group aged between 55 and 75 years old. The distribution of knee OA was higher among the ethnic Malays 37.7%, followed by ethnic Indians 25.7% and ethnic Chinese 17.9% (4). Nonetheless,

several studies on knee pain have been conducted among school teachers and found that the prevalence of knee pain range between 14.0% - 32.0% (6-9).

Multiple factors are associated with the occurrence of KP. For instance, a past study shows that there is a strong association between age and KP (10). The significant association between prevalence of KP and age may be related to the degenerative processes that result from ageing, which consequently lead to wear and tear of osteomuscular structures (10). On the other hand, a high body mass index (BMI) is considered to be a modifiable risk factor for morbidities including KP (11). A high BMI may have an effect on soft tissues such as tendons, cartilage, and fascias by unduly increasing stress on these tissues and consequently causing musculoskeletal lesions.

Furthermore, a systematic review of recent evidence found an association between knee OA and occupational activities such as kneeling, squatting, lifting/carrying, and heavy standing work (12). These occupational activities are commonly practised by individuals who have low socioeconomic status (SES). In addition, a past study found an association between low SES and a higher prevalence of symptoms of knee OA (13). Three components are measured in SES, namely, education level, income level, and occupation. It has been found that lower education, lower income level, and holding a non-managerial or being unemployed are associated with a higher prevalence of knee OA and knee symptoms (13). While several studies have been focusing among non-managerial workers, few studies on KP have been conducted among school teachers. To our knowledge, none of local studies focusing on KP among school teachers. Therefore, to address this gap, this study set out to determine the occurrence of KP and its associated variables among school teachers.

Methodology

This cross-sectional study was carried out between May and October 2015 among public secondary school teachers in Selangor, Malaysia. All public secondary school teachers in Selangor were the study's sample population. There are 232 public secondary schools in the nine districts of the state of Selangor (14). This study serves as the baseline for the prospective cohort study on Clustering of Lifestyle risk factors and Understanding its association with Stress on health and wellbeing among school Teachers in Malaysia (CLUSTer) (15).

The sample size of the study population was calculated using Open Epi software. Based on Althomali et al. (2021) and Sa et al. (2011), age, gender, percentage of knee pain were selected for sample size calculation. For the sample size calculation, several information were required, including the two-sided 95% confidence interval, 80% power, ratio of unexposed to exposed in the sample, percent of unexposed with the dependant variable and risk estimate (odds ratio (OR)). The largest calculated sample size was 552, which was the final step.

The study participants were selected using a two-stage sampling method. 70% of the public schools in each district were first randomly chosen to receive invitations to participate in the study. A letter of invitation, a fact sheet outlining the study, and a letter of authorization from the Selangor Education Department and the Ministry of Education Malaysia were delivered to the heads of the chosen schools. The second stage involved inviting all of the qualified teachers in the chosen schools to take part in the study using the universal sampling approach. All tenured teachers in the chosen schools were qualified to take part in the study except contract teachers and pregnant teachers. The schools' and the teachers' participation were purely voluntary. Prior to the study, ethical approval was acquired from the University Malaya Medical Centre's Medical Ethics Committee (Reference Number: MEC 950.1). Additionally, prior to data collection, all subjects provided written informed consent.

Researcher disseminated the questionnaire to the participants to obtain information on socio-demographic traits like; age, gender, and ethnicity; degree of physical activity; BMI; aspects of one's job; aspects of one's health-related quality of life (HRQOL); and the presence of KP. Within 2 weeks of sending out the questionnaire, a text was sent to the participants to remind them to complete and return the questionnaire.

The International Physical Activity Questionnaire (IPAQ) (16) was self-administered used to assess the level of physical activity. The seven-item questionnaire asked about the four specific activity types (vigorous intensity, moderate intensity, time spent walking, and time spent sitting) undertaken during any work, transportation, housework, or leisure activity for one week using IPAQ version in Malay Language (17). Based on the IPAQ scoring criteria, the number of daily activities was calculated, and a standardised formula was used to determine the overall physical activity score. The overall physical activity score were then categorised into three groups which are low, moderate or high level of physical activity (16).

Self-reported weight and height measurements were used to compute body mass index. Using the equation of weight in kg/ (height in m)^2, the BMI was computed. The participants were categorised into four groups; underweight for BMI score less than 18.50 kg/m^2; normal weight for BMI score 18.50–24.99 kg/m^2; overweight for BMI score of 25.00–29.99 kg/m^2), and obese for BMI score above 30.0 kg/m^2 (18). The previous study indicated that self-reported weight and height were congruent with actual measurements, hence self-reported weight and height were employed (19).

Based on the International Study of Physical, Cultural, and Psychosocial Influences on Musculoskeletal Symptoms and Associated Disability (CUPID study) Questionnaire and the standard Dutch Musculoskeletal Questionnaire, work

physical aspects were evaluated (20). The work physical factors consisted of walking up and down >30 steps of staircase, kneeling or squatting >1 hour in total, and prolonged standing. The Malay version of the Nordic Musculoskeletal Questionnaire (NMQ), along with anatomical diagrams highlighting particular areas, was used to evaluate the symptoms of KP. Self-reported knee pain was defined as discomfort that persisted for at least one day in the previous 12 months based on a binary response (yes/no). Previous study found that the interrater reliability of Malay version of NMQ demonstrate strong kappa agreement ranged between 0.60 – 1.00 (21). The NMQ is the approved approach that has been regularly utilised to assess the occurrence of MSP (22).

The HRQoL was assessed by using the Malay version of the 12-item Short Form Health Survey (SF-12v2) (23). The SF-12v2 comprises eight subscales: general health, physical function, role physical, role emotional, bodily pain, vitality, social functioning, and mental health. The physical component summary (PCS) and the mental component summary (MCS) are the two SF-12 composite scores that are computed. The score ranges from 0 to 100. A higher score indicates better physical and mental health. The Malay version of the SF-12 MCS has good internal consistency (Cronbach's alpha = 0.70) (23) .

Data analysis

Version 11.0 of Stata software was used to conduct the analysis (Stata Corp., LP, College Station, TX).

Categorical variables were presented as frequencies and percentages. Normally distributed continuous variables were summarised as means and standard deviations. The association between each independent variable and KP was identified using a univariable logistic regression. Multivariate logistic regression was carried out by entering all the variables that were significant univariately ($p<0.05$) simultaneously. Multicollinearity was assessed by checking the variance inflation factor (VIF), standard error of regression coefficient, and correlation coefficient test. The result of these tests showed that there is no multicollinearity between the variables. At a 95% confidence interval (CI) level, the results were displayed as odds ratios (ORs). The significance criterion for each two-sided statistical test was pre-set at $p < 0.05$.

Results

In this study, 70 (60.34%) of the 116 secondary schools that were chosen agreed to take part. Out of those 70 schools, 22 are located in rural and 48 in urban areas. A total of 1280 eligible teachers were invited to take part in the study, 1037 (81.0%) of whom responded.

The mean age of the participants was 40.0 (SD: 8.9) years and the majority were female (85.6%). More than half of the participants were obese and overweight (>50%). Most of the participants had a low level of physical activity. Most of them reported that they performed the following: walking up and down >30 steps of staircase (98.3%), kneeling or squatting >1 hour in total (73.4%), and prolonged standing (97.5%).

The PCS and the MCS total scores were each slightly less than 50, i.e., lower than half of the total maximum score (100). Just over half (54.5%) of the participants had KP (Table 1)

Table 1: Participants' characteristics by age, gender, body mass index, and physical activity level with self-reported of knee pain (N=1037)

	Mean (SD)/ Median (IQR)	**Frequency (%)**	**Knee Pain**		**X^2 value (df)**	**t statistic (df)**	**p-value***
			Yes (n=470)	**No (n=562)**			
Age (years)	40.0 (8.9)		42.7 (8.2)	38.3 (8.8)		-8.211 (997)	<0.001*
20-29		116 (11.6)	28 (24.3)	87 (75.7)	59.278 (3)		
30-39		349 (35.0)	125 (36.0)	222 (64.0)			
40-49		363 (36.4)	196 (54.1)	166 (45.9)			
50-59		170 (17.0)	102 (60.4)	67 (39.6)			
Gender							
Male		149 (14.4)	70 (47.3)	78 (52.7)	0.214 (1)		0.643
Female		888 (85.6)	400 (45.2)	484 (54.8)			
Body mass index (kg/m2)							
Underweight (<18.5)		38 (3.9)	12 (32.4)	25 (67.6)	27.132 (3)		<0.001*

Normal (18.5 – 24.9)		426 (43.5)	161 (38.1)	262 (61.9)		
Overweight (25.0 – 29.9)		335 (34.2)	164 (49.0)	171 (51.0)		
Obesity (≥30.0)		181 (18.4)	107 (59.1)	74 (40.9)		
Physical activity level (METmin/ week)						
Low (<600)		299 (54.3)	143 (48.1)	154 (51.9)	3.676 (2)	0.159
Moderate (600–1499)		136 (24.7)	58 (42.6)	78 (57.4)		
High (>1500)		116 (21.0)	63 (54.8)	52 (45.2)		
Work-related factors						
Walking up and down >30 staircase						
Yes		1001 (98.3)	457 (45.9)	539 (54.1)	3.368 (1)	0.066
No		17 (1.7)	4 (23.5)	13 (76.5)		
Kneeling or squatting >1 hour in total						
Yes		748 (73.4)	360 (48.3)	385 (51.7)	9.256 (1)	0.002*
No		271 (26.6)	101 (37.5)	168 (62.5)		
Prolonged standing						
Yes		996 (97.5)	454 (45.8)	537 (54.2)	3.368 (1)	0.128
No		26 (2.5)	8 (30.8)	18 (69.2)		
Health-related quality of life (HRQoL)						
Overall Physical component score	47.05 (8.36)		44.63 (8.24)	49.07 (7.91)	8.252 (867)	<0.001*
Overall Mental component score	43.66 (6.60)		44.12 (6.52)	43.30 (6.67)	-1.877 (908)	0.061

*: significant with p-value< 0.05

The univariate analysis showed that increasing age, obesity, frequent kneeling down, and better physical health were significantly associated with the occurrence of KP.

It was found that there were consistent associations of KP with age, frequent kneeling down, and physical health, but not with obesity (Table 2).

Table 2: Association between associated factors and self-reported of knee pain

Variables	**Crude Odds Ratio (OR) (95% CI)**	**Adjusted Odds Ratio (AOR) (95%CI)**
Age(years)		
20-29	1.0	1.0
30-39	1.54 (0.99 – 2.38)	1.38 (0.82 – 2.32)
40-49	3.18 (2.06 – 4.91)*	2.31 (1.35 – 3.97)*
50-59	4.14 (2.53 – 6.76)*	3.55 (1.92 – 6.54)*
Gender		
Male	1.0	
Female	1.07 (0.75 – 1.52)	
Physical activity level (METmin/ week)		
Low (<600)	1.0	
Moderate (600–1499)	0.92 (0.64 – 1.33)	
High (>1500)	1.47 (0.99 – 2.17)	
Body mass index (kg/m2)		
Underweight (<18.5)	1.0	1.0

Normal (18.5 – 24.9)	0.92 (0.58 – 1.45)	0.81 (0.37 – 1.79)
Overweight (25.0 – 29.9)	1.46 (0.92 – 2.31)	1.11 (0.49 – 2.46))
Obesity (≥30.0)	2.17 (1.31 – 3.59)*	1.62 (0.70 – 3.74)
Walking up and down >30 staircase	2.75 (0.89 – 8.51)	
Kneeling or squatting >1 hour in total	1.55 (1.16 – 2.06)*	1.48 (1.06 – 2.08)*
Prolonged standing	1.90 (0.81 – 4.41)	
Overall Physical component score	0.93 (0.91 – 0.95)*	0.94 (0.92 -0.96)*
Overall Mental component score	1.02 (0.99 – 1.04)	0.98 (0.95 – 1.00)

Univariate and multivariate logistic regression were applied in the analysis

*- significant with p-value<0.05

Discussion

This study aimed to identify the prevalence and factors associated with KP among secondary school teachers. The findings showed that the prevalence of KP among the study participants was 45.55%, which is slightly higher with previous study conducted in Saudi Arabia reported that 41.04% of their secondary school teachers have KP (24). The prevalence of KP is vary according to geographical distribution and school level. Study from Iran showed that 20.8% of secondary school teachers had KP (25). This prevalence was however, lower than prevalence of knee pain among nursery school teachers in Nigeria (49%) (26).

Our results showed that there was an increased risk of reporting KP as age increases, which is consistent with the findings of a previous study (2, 10). Knee pain has always been associated with the consequence of factors associated with ageing, which are a result of the structural changes that occur in joints in natural ageing (10). This study also found that BMI was significantly associated with KP, where an increase in the BMI value was linked to an increased risk of reporting KP. This finding supports with that of a previous study (27). A high BMI is assumed to cause OA by increasing the mechanical stress on the weight-bearing joints. Although this mechanism is highly plausible in regard to the development of KP, other explanations involving metabolic elements may also be relevant (28). Nonetheless, our multivariate analysis found a non-significant association between BMI status and KP which contradicted with previous study (29).

This contradiction could be due to different populations studied in respective studies. In our population, age and work-related factors seem to have the strongest association with KP compared to BMI. Future prospective cohort studies should be conducted to investigate the association between BMI trajectories and KP as primary outcome.

Kneeling or squatting >1 hour in total was found to be the only work-related physical activity that was significantly associated with KP consistently in the univariable and multivariable analysis. During the learning and teaching process takes place, teachers sometimes choose this position to ensure the interaction exists between student and teacher. Teachers who are physically at the same height as the students make the interaction less threatening which in turn leads to a more communicative atmosphere (30). Job activities that require repetitive stress on the knees might increase the mechanical compression in the knee joint that then leads to an increased risk of KP. In addition, this result supports the assumption put forward by Miranda et al.(2002) that a knee-straining work position rather than overall physical work load seem to be a more important risk factor of KP (28).

Our study also showed that HRQoL specifically the physical health score (PCS), was significantly associated with KP. It could be that the occurrence of KP leads to reduced physical activity or vice versa. According to White & Master (2016), individuals with KP will experience functional limitations such as difficulty getting up out of bed, getting up from a chair, walking, and climbing stairs (31). All these activities provide discomfort to individuals suffering from KP and can increase their pain intensity. Consequently, they are being selective in doing certain physical activities. These caused limitations in their physical role leading to a reduction in general health. Since functional limitations, pain, physical role, and general health are the components of PCS in the instrument SF-12v2, this might be the reason why the PCS score was lower among those who had KP as compared to those who did not, consistent with previous research (32). As this study was conducted cross-sectionally, a cause–effect relationship between these two variables cannot be determined. Therefore, a longitudinal study is needed to confirm this association. Meanwhile, KP was not significantly associated with a lower mental health score. This could be because the SF-12 instrument is less sensitive to the presence of this health condition as compared to other instruments (32)

When considering the findings of this study, some limitations should be noted. Firstly, the study was cross-sectional which limits the generalisability of cause–effect relationships between variables. Secondly, the data were derived from a self-reported questionnaire which carries an inherent risk in terms of the presence of systematic

biases such as recall and social desirability bias. Nonetheless, all the instruments that were used have been validated. To our knowledge, this may be the first study investigating self-report KP and its associated factors among secondary school teachers. The self-report KP could be an early sign of knee OA (33). Additionally, our study also found that more than 50% of overweight and obese teachers had KP. This rate is considered prevalent and if this is left unresolved, this condition might have the potential to interfere with teacher's jobs. Future prospective studies should be considered to investigate this finding in more detail incorporating the nutrient intake in the association between BMI and KP.

Conclusion

This study found that KP is prevalent among the public secondary school teacher population. Teachers aged 40-59 years old, practise work-related kneeling or squatting >1 hour in total per day, and have lower physical HRQoL are more likely to be associated with KP. Future studies should consider the distinction between early symptoms of knee OA and chronic KP. Also, workplace strategies such as individual working behaviour and workstation adjustments should be targeted at older teachers to reduce the occurrence of KP, work-related activities that involve kneeling or squatting, and increase physical HRQoL among this group.

Acknowledgements

We thank the support and participation of the teachers and school administrators in our study. The approval received from the Ministry of Education, Malaysia for the conduct of the study is gratefully acknowledged. This work was supported by a Postgraduate Research Grant (PPP) Grant (UM.0001177/HRU.PR) from the University of Malaya, Kuala Lumpur.

References

1. Ayis S, Dieppe P. The natural history of disability and its determinants in adults with lower limb musculoskeletal pain. The Journal of rheumatology. 2009;36(3):583-91.
2. Kim IJ, Kim HA, Seo Y-I, Jung YO, Song YW, Jeong JY, *et al*. Prevalence of knee pain and its influence on quality of life and physical function in the Korean elderly population: a community based cross-sectional study. J Korean Med Sci. 2011;26(9):1140-6.
3. Son KM, Hong JI, Kim D-H, Jang D-G, Crema MD, Kim HA. Absence of pain in subjects with advanced radiographic knee osteoarthritis. BMC Musculoskeletal Disorders. 2020;21(1):640.
4. Mat S, Jaafar MH, Ng CT, Sockalingam S, Raja J, Kamaruzzaman SB, *et al*. Ethnic differences in the prevalence, socioeconomic and health related risk factors of knee pain and osteoarthritis symptoms in older Malaysians. PloS one. 2019;14(11):e0225075.
5. Li D, Li S, Chen Q, Xie X. The prevalence of symptomatic knee osteoarthritis in relation to age, sex, area, region, and body mass index in China: a systematic review and meta-analysis. Frontiers in medicine. 2020;7:304.
6. Abdulmonem A, Hanan A, Elaf A, Haneen T, Jenan A. The prevalence of musculoskeletal pain & its associated factors among female Saudi school teachers. Pak J Med Sci. 2014;30(6):1191-6.
7. O'Reilly S, Muir K, Doherty M. Occupation and knee pain: a community study. Osteoarthritis and Cartilage. 2000;8(2):78-81.
8. Korkmaz NC, Cavlak U, Telci EA. Musculoskeletal pain, associated risk factors and coping strategies in school teachers. Scientific Research and Essays. 2011;6(3):649-57.
9. Pihl E, Matsin T, Jurimae T. Physical activity, musculoskeletal disorders and cardiovascular risk factors in male physical education teachers. Journal of sports medicine and physical fitness. 2002;42(4):466.
10. Sa KN, Pereira Cde M, Souza RC, Baptista AF, Lessa I. Knee pain prevalence and associated factors in a Brazilian population study. Pain medicine (Malden, Mass). 2011;12(3):394-402.
11. Alfieri FM, Silva NCdOV, Battistella LR. Study of the relation between body weight and functional limitations and pain in patients with knee osteoarthritis. Einstein (São Paulo). 2017;15:307-12.
12. McWilliams D, Leeb B, Muthuri S, Doherty M, Zhang W. Occupational risk factors for osteoarthritis of the knee: a meta-analysis. Osteoarthritis and cartilage. 2011;19(7):829-39.
13. Lee JY, Han K, Park YG, Park S-H. Effects of education, income, and occupation on prevalence and symptoms of knee osteoarthritis. Scientific Reports. 2021;11(1):13983.
14. Jabatan Pendidikan Negeri Selangor J. Kementerian Pendidikan Malaysia, Jabatan Pendidikan Negeri Selangor 2017 [updated 06 Jun 2017; cited 2017 12 Jun]. Available from: http://jpnselangor.moe.gov.my/.
15. Moy FM, Hoe VCW, Hairi NN, Buckley B, Wark PA, Koh D, *et al.* Cohort study on clustering of lifestyle risk factors and understanding its association with stress on health and wellbeing among school teachers in Malaysia (CLUSTer) – a study protocol. BMC public health. 2014;14(1):611.
16. Committee Research of International Physical Activity Questionnaire. Guidelines for Data Processing and Analysis of the International Physical Activity Questionnaire (IPAQ) – Short and Long Forms 2005 [updated September 15, 2015; cited 2017 21 December 2017]. Available from:

http://www.ipaq.ki.se/scoring.htm.
17. Shamsuddin N, Koon PB, Zakaria SZS, Noor MI, Jamal R. Reliability and validity of Malay language version of International Physical Activity Questionnaire (IPAQ-M) among the Malaysian cohort participants. International Journal of Public Health Research. 2015;5(2):643-53.
18. World Health Organization. Obesity: preventing and managing the global epidemic. Geneva: World Health Organization, 2000 9241208945 Contract No.: 894.
19. Kee CC, Lim KH, Sumarni MG, Teh CH, Chan YY, Nuur Hafizah MI, *et al*. Validity of self-reported weight and height: a cross-sectional study among Malaysian adolescents. BMC Med Res Methodol. 2017;17(1):85-93.
20. Coggon D, Ntani G, Palmer KT, Felli VE, Harari R, Barrero LH, *et al*. The CUPID (Cultural and Psychosocial Influences on Disability) study: methods of data collection and characteristics of study sample. PloS one. 2012;7(7):e39820.
21. Amin NA, Nordin RB, Noah R, Oxley J, Fatt QK. Work related musculoskeletal disorders in female nursing personnel: prevalence and impact. International Journal of Collaborative Research on Internal Medicine & Public Health. 2016;8(3):294-315.
22. Crawford JO. The Nordic musculoskeletal questionnaire. Occupational Medicine. 2007;57(4):300.
23. Noor NM, Aziz AA. Validity and reliability of the Malay version of 12-item short form health survey among postpartum mothers. Malaysian Journal of Public Health Medicine. 2014:56-66.
24. Althomali OW, Amin J, Alghamdi W, Shaik DH. Prevalence and factors associated with musculoskeletal disorders among secondary schoolteachers in Hail, Saudi Arabia: A cross-sectional survey. International journal of environmental research and public health. 2021;18(12):6632.
25. Mohammadi G. Musculoskeletal complaints among high school teachers. Journal of Musculoskeletal Research. 2013;16(02):1350010.
26. Lawrence I. Musculoskeletal disorders in Nigeria nursery schools: Work-related risk reduced. Work (Reading, Mass). 2012;5.
27. Rosa S, Martins D, Martins M, Guimarães B, Cabral L, Horta L. Body Mass Index and Musculoskeletal Pain: A Cross-Sectional Study. Cureus. 2021;13(2).
28. Miranda H, Viikari-Juntura E, Martikainen R, Riihimäki H. A prospective study on knee pain and its risk factors. Osteoarthritis and cartilage / OARS, Osteoarthritis Research Society. 2002;10(8):623-30.
29. Rogers MW, Wilder FV. The association of BMI and knee pain among persons with radiographic knee osteoarthritis: a cross-sectional study. BMC Musculoskelet Disord. 2008;9:163.
30. Harmer J. The practice of English language teaching: Pearson longman; 2007.
31. White DK, Master H. Patient-Reported Measures of Physical Function in Knee Osteoarthritis. Rheum Dis Clin North Am. 2016;42(2):239-52.
32. Ohara DG, Ruas G, Castro SS, Martins PR, Walsh IA. Musculoskeletal pain, profile and quality of life of individuals with sickle cell disease. Brazilian Journal of Physical Therapy. 2012;16:431-8.
33. Clark JM, Chesworth BM, Speechley M, Petrella RJ, Maly MR. Questionnaire to Identify Knee Symptoms: Development of a Tool to Identify Early Experiences Consistent With Knee Osteoarthritis. Physical therapy. 2014;94(1):111-20.