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Risk factors and awareness about knee osteoarthritis among secondary school teachers

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ABSTRACT

Objective: find out the prevalence of risk factors for knee osteoarthritis among secondary school teachers and to estimate their awareness about knee osteoarthritis and to investigate the association between awareness level and risk factors. *Methods:* A cross-sectional survey carried out in 16 secondary schools in Baghdad from the first of March/2019, until the end of May/2019, targeting secondary school teachers from both genders. The data were collected by self-administered questionnaire filled by the teachers. *Results:* This study enrolled 300 teachers, 219 (73%) of them were 40 years and older, and 67.7% of them were females. The most prevalent risk factor among study sample for knee osteoarthritis was standing for more two hours/day. Total knee osteoarthritis awareness score was good among 167 (55.7%) teachers, and the prevention domain got the highest awareness score. *Conclusions:* High school teachers had good total awareness about knee osteoarthritis, with highest score in prevention domain and lowest in management domain. Standing > 2hours/day was the most common risk factor for knee osteoarthritis in secondary school teachers.

Higher educational level, climbing 5 or more flights of stairs daily family history of knee osteoarthritis, and knee pain with ≥ 4 risk factors of knee OA increased the odds for better awareness about the disease.

Keywords: Knee, osteoarthritis, joint pain, awareness

1. INTRODUCTION

Osteoarthritis (OA), the most common musculoskeletal condition, is a long-term chronic disease involving the thinning of cartilage in joints, which results in bones rubbing together, creating stiffness, pain, and impaired movement (NIH Osteoporosis and Related Bone Diseases/ National Resource Center, 2018; Chung et al. 2020). OA is related to age, but is associated with a variety of both modifiable and non-modifiable risk factors, including obesity, lack of exercise, genetic predisposition, bone density, occupational injury, trauma, and gender (Tanna, 2013). It is a major cause of disability in elderly populations around the globe, especially in developed countries (Anderson and Loeser, 2010). The prevalence of OA is increasing and will continue to do so as the population increases, ages, and is subject to risk factors such as the obesity epidemic (King et al., 2013). As OA causes pain and impairs functionality of the patient, it places a major burden on individuals, communities, health systems, and social care systems (Tanna, 2013). Among elderly 60 years of age or older the prevalence of symptomatic knee OA is approximately 10% in men and 13% in women (Zhang and Jordan, 2010). Knee OA has a higher prevalence rate compared with other types of OA. The incidence of knee OA increases both with age and with longer lifetime and higher average weight of the population, particularly in obese women (Lespasio et al., 2017). In Iraq, the prevalence of knee OA was reported to be around 21% of people aged 35-45 years, rising to 53% among BMI >30kg/m2 (AL-Barzinjy, 2010). The main risk factors for osteoarthritis include: Age (40 and above), female gender (the gap between the genders decreases after the menopause in women) (Palazzo et al., 2016), Genetic factors: increase risk by 50% for the knee (Zengini et al., 2016), 60% for the hip (Murphy et al., 2016), 65% for the hand, and about 70% for the spine (Yucesoy et al., 2015), and Joint abnormalities (abnormal development of joints) (Loeser et al., 2012), obesity (BMI >30)(El-Tawil et al., 2016), joint injury or disease, occupation (kneeling >30 min/day, squatting >30 min/day, standing > 2hours/day, walking >3km/day, regular stair climbing, heavy lifting (≥ 10 kg), and jumping, and vibration) (Spector and MacGregor, 2004, Yucesoy et al., 2015). Some of the previous studies about knee OA done in Iraq showed some common findings for the possible risk factors; which mainly included female gender, obesity (Alsaleem, 2013, Mohammed et al., 2018, Rajab et al., 2011), and previous injuries (Saied and Atiyah, 2015). Teaching requires long periods of standing and walking in classrooms, and since occupational activities that are consistently associated with knee OA in the literature are kneeling, squatting, lifting/carrying and heavy standing work (McWilliams et al., 2011), teachers are exposed to the risk for developing knee OA, so it would seem sensible to avoid prolonged work in such postures, and control of non-occupational risk factors that interact with those in the work place, like avoiding obesity (Coggon et al., 2000).

For particular medical research challenges, recommendations are made that knowledge be used to refer to information that is, to a greater or lesser extent, detailed and factual, and that awareness be associated with information that is personally relevant (Trevethan, 2017). Increasing public awareness about OA aims first to prevent modifiable risk factors leading to OA and second to help patients diagnosed with OA understanding their disease in order to improve quality of life (Tanna, 2013). As an example of this approach, in 1999 Centers for Disease Control and Prevention (CDC) and the Arthritis Foundation launched *The National Arthritis Action Plan: A Public Health Strategy*, a landmark document that put arthritis on the public health agenda (Meenan et al., 1999). Then in 2010 the CDC launched *A National Public Health Agenda for OA*, that included recommendations about increasing general population awareness about OA prevention strategies in improving the nutrition and weight management, physical activity, and injury prevention in workplace environments, in addition to understanding and change attitudes and behavior among consumers, healthcare providers, policy makers, employers and the business community, and community organizations (Arthritis Foundation et al., 2010).

2. PATIENTS AND METHODS

Study design and setting

A cross-sectional study, carried out in two educational sectors (judgmental sampling) selected from each educational directorate to be representative of Al-Risafa and Al-Karkh sides of Baghdad. A convenient sample was chosen from eight secondary schools in the second sector of Al-Risafa and from eight secondary schools in second sector of Al- Karkh/ Baghdad.

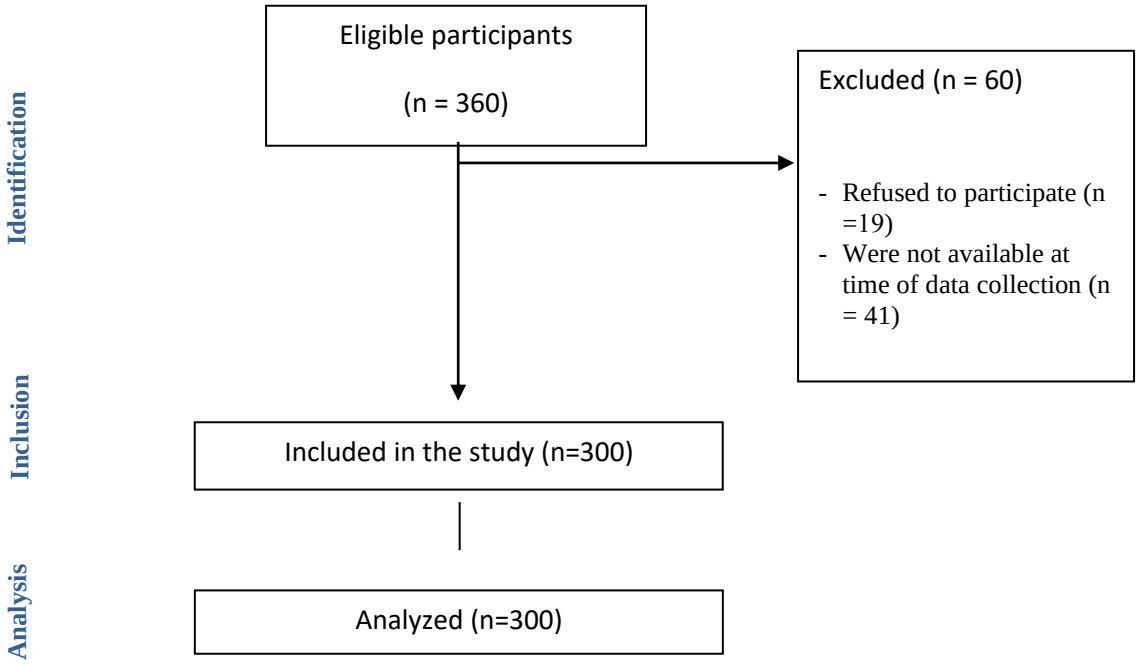
Target population

Secondary school teachers from both genders.

Sample calculation and collection

In each school there were about 20 teachers, as we enrolled 16 schools, so the sample size would be 360. Non-responders, either they were not available at time of visits or refused to participate in this study, were 60 participants, so the total sample size was 300.

Participants flowchart



Data collection tool

After obtaining written informed permission from the participants the data collection included three parts; part one includes demographic data and basic characteristics (physical activity scoring was obtained from a similar study (van Tunen et al., 2018). Part two was used to identify OA risk factors (El-Tawil et al., 2016, Palazzo et al., 2016, Spector and MacGregor, 2004, Yucesoy et al., 2015). Part three was used to identify the awareness of participants about knee OA (risk factors, signs and symptoms, disability, prevention and management), and it was obtained from and validated by previous studies, one in railway workers (Ganasegeran et al., 2014), and the other study used the same questionnaire in for general population (Mukharrib et al., 2018) with total 33 questions, each question was coded 1 for correct answer and 0 for the wrong or "don't know.

Scoring of OA awareness levels

Scoring was made in a way that correct answers given "1" point and "0" for incorrect or I don't know, and good awareness level was identified based on median cutoff value of the total score (≥23), this method was adopted from previous studies who used and validated the questionnaire and its scoring (Ganasegeran et al., 2014, Mukharrib et al., 2018), and the awareness of the subcategories was considered good if the sub-score was higher than its respective median number of correct answers in such a way that: good awareness for risk factors (≥7), symptoms (≥8), disabilities (≥3), prevention (≥3), and management (≥3). Classification of participants according to number of risk factor into high risk was also based on median number of them; (knee pain with ≥4 risk factors), and low risk (0-3 risk factors).

Statistical analysis

The collected data was handled and analyzed by SPSS (Statistical Package for the Social Sciences) Statistics Version 23. Chi-square was the test used for analyzing categorical data. Binary logistic regression models were formulated to predict the odd's ratio of good total awareness level according to risk factors; all analyses were done with 95% confidence intervals (CI). P-values less than 0.05 were considered statistically significant throughout this study.

3. RESULTS

This study enrolled 300 teachers, 219 (73%) of them were 40 years and older, about two thirds (67.7%) of them were females, 230 (76.7%) of them had bachelor degrees, majority were married, and 141 (47%) had low intensity physical activity, as shown in Table (1).

Table 1: Basic characteristics of the study group

Variables		Number	Percent
Age	Below 40	81	27.0
	40 and above	219	73.0
Gender	Male	97	32.3
	Female	203	67.7
Educational level	Bachelor	230	76.7
	Higher	70	23.3
Marital status	Single	35	11.7
	Married	242	80.7
	Divorced	7	2.3
	Widow	16	5.3
Parity N=163*	<5	141	47.0
	≥5	22	7.3
Spacing in years N=133**	<2	46	15.3
	≥2	87	29.0
Physical activity	Sedentary	93	31.0
	Low intensity activities	141	47.0
	Moderate intensity activities	59	19.7
	High intensity activities	7	2.3
*: number of women who had children **: number of women with more than one child			

Regarding risk factors, the most frequent one was standing for more two hours/day with 272 (90.7%), followed by having 40 years of age and more (73%), then family history (68.3%), and female gender (67.7%), other risk factors were shown in Table (2) and figure (1).

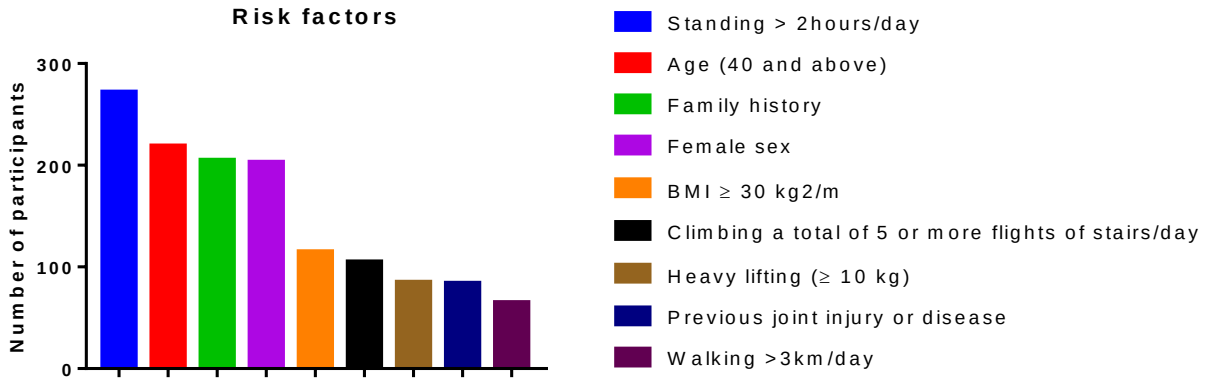


Figure 1: Bar char illustrating the participants'' risk factors for osteoarthritis

Table 2: Distribution of the study sample according to risk factors for osteoarthritis

Risk factor	Number	Percent
Standing > 2hours/day	272	90.7
Age (40 and above)	219	73.0
Family history	205	68.3
Female sex	203	67.7

BMI ≥ 30 kg^2/m	115	38.3
Climbing a total of 5 or more flights of stairs/day	105	35.0
Heavy lifting (≥ 10 kg)	85	28.3
Previous joint injury or disease	84	28.0
Walking >3km/day	65	21.7

The number of participants with good total awareness score was 167 (55.7%), highest frequencies of correct answers were in awareness about prevention (85.42%), about risk factors (71.73%), while awareness about symptoms and disability were almost equal (67.10% and 67.17%, respectively), lowest frequency noticed in awareness about management 62.67%, as shown in Tables (3).

Table 3: Distribution of study sample according mean percent scores of answers regarding each domain

Awareness domains		**Mean percent scores**	
		Incorrect/ Don't know	**Correct**
		%	**%**
a)	Risk factors	28.27	71.73
b)	Symptoms	32.9	67.10
c)	Disability	32.83	67.17
d)	Prevention	14.58	85.42
e)	Management	37.33	62.67
f)	Total	31.72	68.28

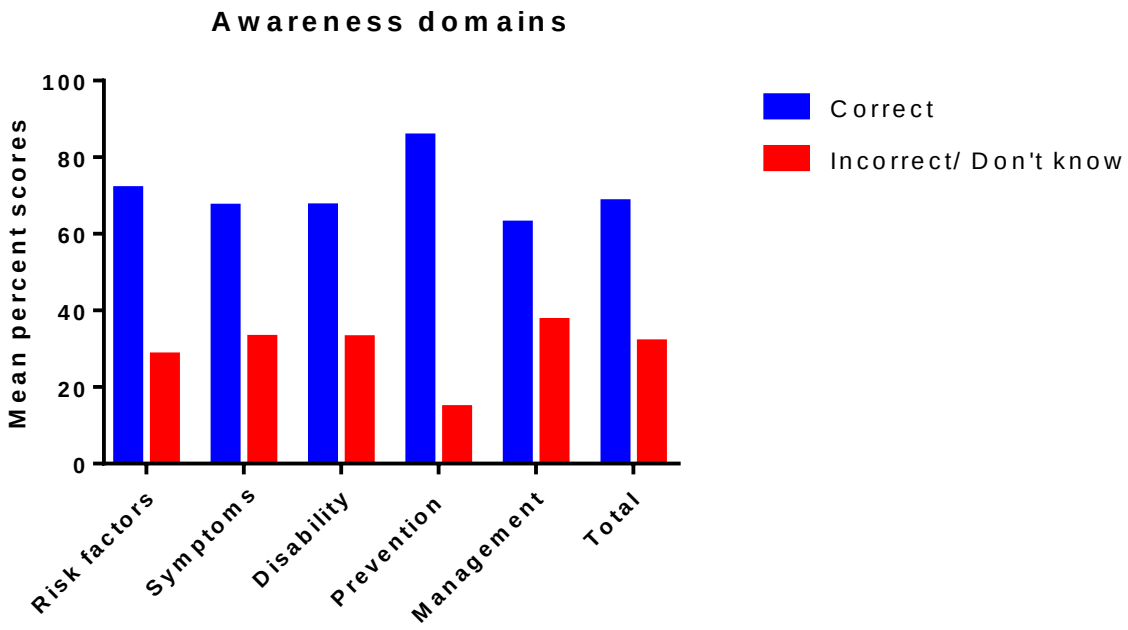


Figure 2: Bar chart illustrating mean percent scores of answers regarding each domain

Analysis using multiple logistic regression revealed that higher educational level (OR: 2.266, *P=0.006*), climbing stairs (OR: 2.128, *P=0.005*), positive family history (OR: 2.216, *P=0.04*) and knee pain with ≥ 4 risk factors (OR: 1.861, *P=<0.001*) significantly increase the odds of having good OA awareness, while walking >3km/day (OR: 0.476, *P=0.023*) lower the odd's of having good awareness about Knee OA. Physical activity showed no statistically significant change to the odds of having god awareness, as shown in Table (4).

Table 4: Odd's ratio for good total awareness level according to selected variables by multivariate binary logistic regression model

Variables	Mean Odd's ratio	95% confidence interval		P-value
		Lower	Upper	
Basic characteristics				
Educational level	2.266	1.260	4.040	**0.006**
Physical activity*	-	-	-	**-**
Sedentary vs moderate/high	0.880	0.456	1.698	0.703
Low vs moderate/high	0.683	0.373	1.253	0.218
Risk factors				
Walking >3km/day	0.476	0.251	0.903	**0.023**
Climbing a total of 5 or more flights of stairs	2.128	1.260	3.594	**0.005**
Positive Family history	2.216	1.296	3.790	**0.004**
Knee pain with ≥ risk factors	1.861	1.466	2.361	**<0.001**
***: patients with high activity was added to moderate activity because they all had poor awareness**				

4. DISCUSSION

Teachers represent a very vital slice of our community, and ensuring their occupational safety is important to ensure their continuous productivity, because in Iraq some parts of educational programs infrastructure are lacking, which include school buildings, accessibility, shortage of teachers, displacement in areas of conflict, and many others (The National Education Cluster in Iraq, 2019), therefore, the occupational safety of current teachers is of prime importance. In the current study, risk factors for knee OA that were reported among the teachers was age 40 and above. It's clear that cumulative cartilage thinning, weakened muscles, altered proprioception, and oxidative damage (Zhang and Jordan, 2010). Pal et al., (2016) in India, who studied a total of 4,909 individuals, and reported that the prevalence of knee OA gradually increased with increasing age. The same study showed that knee OA was more common in females (31.6%) than in males (28.1%) and in obese people (33%), sedentary life style (36.85), and in physically demanding occupations (30.4%) (Pal et al., 2016). In another study, done by Klussmann et al., (2010) who studied 739 cases with knee OA and 571 controls and reported that the risk for knee OA did not increase with standing, but increased with obesity, family history, previous trauma/misalignment, and heavy weight lifting, while sitting had a protective effect (Klussmann et al., 2010). In the current study, the most frequent risk factors for knee OA was standing >2 hours/day. Prolonged standing was considered a risk factor for knee OA by a review done by Yucesoy et al., (2015), but in another meta-analysis done by McWilliams et al (2011) who studied a total of 526,343 subjects from 51 different published and validated studies and reported that subgroup analysis revealed no statistically significant increased risk for knee OA with standing works, this can be explained by the fact that some postural standing increase the risk for knee OA more than other, more specifically femoral bone posterior tilt, hip joint flexion, and anterior spinal inclination. In the current study, other risk factors for knee OA that were reported among the teachers were having family history of knee OA, and female gender. In a study in Mosul city/Iraq by Alsaleem (2013) to investigate some risk factors for Knee OA reported that female gender, obesity and climbing stair was significantly associated with developing knee OA. Related to that some walking gaits increase the risk for knee OA, which include external knee adduction moment (KAM) during gait, KAM impulse, and increased peak external knee flexion moment (KFM) during the standing phase, also illustrated in Figure (1) (McWilliams et al., 2011).

In the current study, 60% of participants had knee pain and ≥ 4 risk factors, which put them under the increased risk for knee OA. To highlight the importance of knee pain, and its correlation with knee OA, Mat et al., (2019) studied 1,226 individuals and reported the prevalence of knee pain to be 33.3% and self-reported knee OA symptoms was 30.8%, with similar risk factors for both entities. In another study correlating between radiographic OA with knee pain and its severity, Wang et al., (2018) who studied 3,021 individuals and reported that there was a strong correlation between the severity of radiographic knee OA, knee pain, and its severity. This could be explained by the association of structural pathology with knee pain, but the latter is highly subjective with significant variability between subjects depending on their genetic predisposition, expectations, mood, previous experiences. In addition, in a meta-analysis done by Fingleton et al., (2015) to investigate the association between pain sensitization and knee OA, and reported that hyperalgesia was significantly associated with symptom severity but not associated with radiographic severity, this can be due to supra-spinally mediated reduction in inhibition and increment in facilitation of nociceptive signaling (Soni et al., 2019). Regarding knowledge about Knee OA, the current study showed that 55.7% had good total awareness level, this was comparable to results of Mukharrib et al., (2018) in Saudi Arabia who investigated the knowledge of knee OA general population (with the same

questionnaire we used in the current study study), they enrolled 1,052 subjects in their study, and reported 82.6% of their study sample had good awareness level regarding OA in total. In another study done in Malaysia by Ganasegeran et al (2014), who enrolled 513 railway workers and investigated their knowledge about knee OA and reported that 53.6% had low levels of knowledge. The Saudi study enrolled people who they randomly interviewed in a Mall, and a significant number of them were health workers some of them were university graduates or post-graduate; these factors could explain the difference in awareness level. The occupational hazards between railway workers and teachers are different, as in the former squatting, heavy weight lifting, and trauma are much more common, which put more strain at tibiofemoral or patellofemoral joints, which is related to increased risk of knee OA (Zhang and Jordan, 2010, Klussmann et al., 2010). In the current study highest scores were observed in prevention and disability domains, and was better compared to results of Mukharrib et al (2018) in Saudi Arabia who reported that 73.1% had good scores about risk factors, 61.6% had good scores about symptoms, 8.9% only had good scores about disabilities, 89.2% had good scores about prevention, and 84.1% had good scores about relieving measures. Better knowledge regarding disabilities can be explained by the difference in age between the two studies, as only 18.9% of their study sample were older than 50 years, in addition, only 43.7% of their study sample had family member clinically diagnosed with knee OA, which made them having lower life experience about this disease. In the current study, better awareness was observed in higher educational levels, those who practice moderate physical exercise intensity, climbing more than 5 stairs/day, those with family history of knee OA and teachers with knee pain in addition to ≥4 risk factors, while walking >3km/day was associated with lower awareness levels. These results were comparable to results of Mukharrib et al., (2018) in Saudi Arabia reported that good knowledge was associated with higher educational levels, in addition obese patients had better knowledge. While Ganasegeran et al., (2014), reported that higher knowledge scores was observed in males, older individuals, higher educational levels, and family member with knee OA. Educational level may not only influence the knowledge about knee OA, but also risk for developing it, as shown by Callahan et al (2011) in United Sates, who reported that low educational levels was independent risk factor for knee OA. Having a family member with knee OA will increase the experience of individuals about the symptoms and management of the disease thus having better awareness scores. Those with sedentary life style and obesity (Lee et al., 2019) are at increased risk for developing chronic knee pain, but high intensity and high-risk exercises were associated with increased risk for Knee OA (Bosomworth, 2009), so that people who are unaware of these information might be unaware of their negative health behavior. Climbing stairs involves a subset of movements that are directly affected in patients with knee OA (Hicks-Little et al., 2011), so when there is difficulty in climbing the stairs, an individual might seek medical advice or start to search online for causes and solutions which intern enlighten them about the possibility for having knee OA. The scarcity of published articles regarding awareness and knowledge of individuals about knee OA was a limiting factor, as to the best of our knowledge, only two studies had investigated about this subject. In addition to recall bias which may case inaccuracy about the reported daily walking, standing, and climbing.

5. CONCLUSION

High school teachers had good total awareness about knee osteoarthritis, with highest score in prevention domain and lowest in management domain. Standing > 2hours/day was the most common risk factor for knee OA in high school teachers, and more than half of them had more than 4 risk factors in addition to knee pain. Higher educational level, climbing 5 or more flights of stairs daily family history of knee OA, and knee pain with ≥ 4 risk factors of knee OA increased the odds for better awareness about the disease.

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Conflict of Interest

The authors declare that they have no conflict of interest.

Informed consent

Written informed consent was obtained from all individual participants included in the study. Additional informed consent was obtained from all individual participants for whom identifying information is included in this manuscript.

Ethical approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards (Code: 2019/C081).

Author contribution

Huda Ghanim Hussien: Conception and design of the work, the acquisition, analysis, and interpretation of data for the work, and Drafting the work.

Yousif Abdul Raheem: Conception and design of the work, interpretation of data for the work, and revising it critically for important intellectual content

Data and materials availability

All data associated with this study are available upon request to the corresponding author.

Peer-review

External peer-review was done through double-blind method.

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