WEATHER EFFECT ON PREVALENCE OF MUSCULOSKELETAL PAIN AND ITS ATTRIBUTES: A CROSS-SECTIONAL STUDY

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Abstract

Background: Majority of patients with musculoskeletal pain (MSP) relates their pain to weather changes especially cold one. However, there is inconsistency in the previous literature about that.

Objective: to investigate the difference between winter and summer seasons in the occurrences of MSP and its attributes.

Methods: A hospital-based cross-sectional study included 680 patients with musculoskeletal disorders collected from medical records of physiotherapy referrals to an Orthopedic out-patient clinic at a large university hospital in Egypt was conducted. The patients were divided into two groups based on season of their referral; winter group (N=350, from 8/12/2019 to 23/3/2019) and summer group (N=330, from 8/6/2019 to 23/8/2019). Prevalence of MSP (non-specific pain in muscles, tendons, and joint) was compared between the two seasons which. Chi-squared test (significance at $p<0.05$) was used.

Results: MSP prevalence was 30.6% among the total sample. There is no significant difference in the prevalence of MSP between winter and summer seasons (31 % vs. 30%, $p>0.05$). Moreover, the attributes including body region, gender, and affected side had non-significant effect ($p>0.05$) on this prevalence.

Conclusion: weather has no significant effect on prevalence of MSP.

Keywords: osteoarthritis, spondylosis, prevalence, disorders, climate, temperature

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Introduction

Musculoskeletal pain (MSP) is a pain/discomfort arises from musculoskeletal tissues commonly of the cervical, lumbar, knee, and shoulder regions causing marked dysfunction and economic burdens (1-3). It affects 6.1-9.24% of the Egyptian population (4,5) and between 1.3-38.4% of other populations (varied by country and body region), mostly from female gender aged 30-50 years and due to non-traumatic or non-systemic cause (1,3,6).

Weather changes are commonly blamed for occurrence and increase of symptoms of musculoskeletal disorders including knee osteoarthritis among others by the affected patients (7). However, there is inconsistency in the previous literatures about the effect of cold temperature on MSP; whether increases (8), decreases (9), or does not affect (10) MSP prevalence. Moreover, a recent systematic review reported that the relation between weather and osteoarthritic pain is still unclear suggesting a need for further studies (11,12). This conflict may be due to differences in degree of temperature among countries, differences of temperature tolerance among patients/seasons (13), and differences in the affected body regions in the previous studies. Therefore, investigating other countries, patients, and body regions is needed.

Moreover, majority of the previous studies (10,11,13) measure the effects of weather on MSP intensity rather than number/frequency of body regions or number of patients with pain. Therefore, effect of weather on number of patients with MSP needs to be studied.

Furthermore, determination of effects of weather on MSP helps patients and healthcare professionals including physicians and physiotherapists to understand the fluctuations in MSP and prevent/manage this pain properly and early.

Therefore, the purpose of this study is to compare the effects of hot and cold weather on the prevalence of MSP among Egyptian population.

Methods

Study design and setting

This study is a hospital-based record research (cross-sectional) which included all patients referred to the physiotherapy outpatient clinic of Cairo University hospital, Egypt- from 8/12/2019 to 23/2/2019 (represents the winter season) and from 8/6/2019 to 23/8/2019 (Represents the summer season). Data were collected from records of the patients referred to Orthopedic physical therapy clinic. Data of one week and start and end of each season was excluded for two reasons; firstly, some of it was lost and secondly effect of weather at this time is little or irrelevant/not belongs to that season. The requirement of informed consent and ethical approval were waived owing to the retrospective nature of the study (14). This study was approved by the research ethical committee of faculty of physical therapy, Benha University (NO: PT.BU.EC.15).

Participants

All patients (N=680) who were referred to the hospital during winter (n=350) and summer (n=330) seasons were included. MSP patients (N=208; 109 in winter and 99 in summer) were identified as patients who had pain in any body region/joint which has no traumatic, carcinogenic, acute inflammatory or systemic cause. The common included causes were spondylosis, tendinopathy/impingement, disc prolapse, osteoarthritis, and plantar fasciitis. Body regions/joint which were included were neck, lower back, shoulder, and knee as the occurrences of MSP in others were found to be very rare (about 1-2 cases of carpal tunnel syndrome, tennis elbow, and de Quervain tenosynovitis). (Figure 1).

Statistical analysis

Categorical data was expressed as number (percent). Prevalence of MSP for the total sample and for each season was calculated as number of MSP patients in the total sample and in each season divided by total sample size and sample size of each season, respectively. Chi-squared test (significance at $p<0.05$) was used to compare differences in prevalence of MSP between winter and summer seasons before and after dividing the prevalence by body region, gender, and affected side (Likelihood ratio was reported in case of violation of assumption).

Results

Baseline characteristics

Baseline characteristics of the patients in both seasons were presented in (Table 1) which shows non-significant differences (p-value >0.05). (Figure 1).

a: side of pain in cases of knee, shoulder and heel and side of radicular pain in cases of back and neck (some data were not reported).

Prevalence of MSP among the sample (N=680) and seasonal effect on it

Number of cases who had MSP among the sample was 208. The prevalence of MSP was 30.6% (208/680=30.6%). There is no relation between season/

Table 1. Baseline characteristics of the patients in both seasons.

Variables	Winter (n=109) Frequency (Percentage)	Summer (n=99) Frequency (Percentage)	Chi-square test value (p-value)
Sex			
Male	32 (29.4)	23 (23.2)	1 (0.32)
Female	77 (70.6)	76 (76.8)	
Affected side[a]			
Unilateral	13 (43.3)	15 (53.6)	0.61 (0.44)
Bilateral	17 (56.7)	13 (46.4)	
Affected body region			
Lower back	43 (39.45)	33 (33.3)	3.5 (0.48)
Knee	15 (13.8)	15 (15.2)	
Neck	30 (27.52)	35 (35.4)	
Shoulder	19 (17.43)	12 (12.1)	
Heel	2 (1.8)	4 (4)	

a: side of pain in cases of knee, shoulder and heel and side of radicular pain in cases of back and neck (some data were not reported).

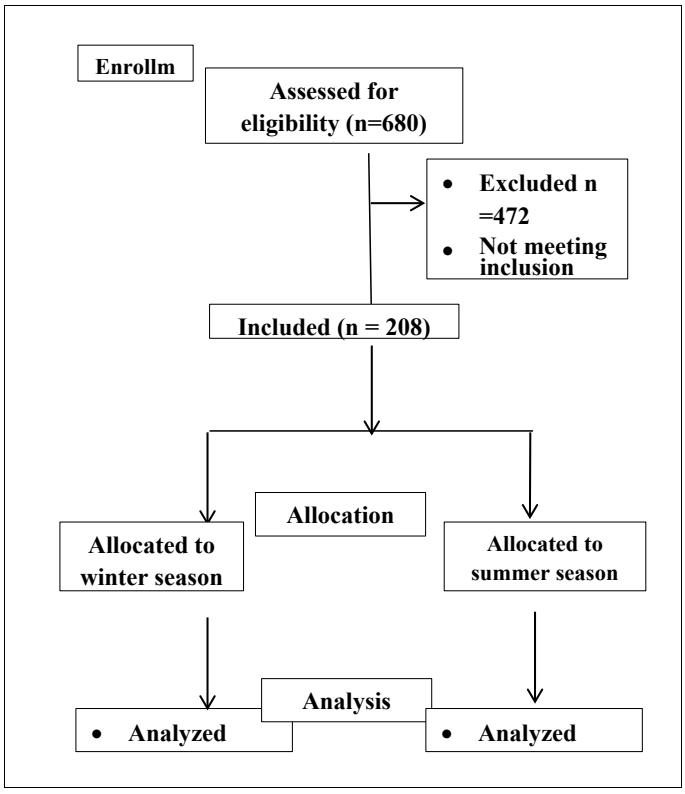

Figure 1. Flow chart of the participants.

weather variation (winter or summer) and presence or absence of MSP; MSP prevalence does not differ significantly between winter and summer seasons (p=0.75) (Table 2 and Figure 2).

Effect of body region, sex, and affected side on prevalence of MSP

There were non-significant effects for body regions, sex, and affected side on prevalence of MSP (p>0.05) (Table 1). Moreover, combined effect of body region and sex on effect of season on MSP prevalence was non-significant (p-value>0.05) (Table 3). Furthermore, combined effect of body region and affected side on effect of season on MSP prevalence was non-significant (p-value>0.05) (Table 4).

Discussion

This study investigated prevalence of MSP (excluding traumatic, infectious, acute inflammatory, systemic, and carcinogenic causes) during two seasons (winter and summer). The result showed that the overall prevalence of MSP was 30.6% which was higher among female (about 73.5%) and higher in the lower back region (about 37.5%). In addition, there was non-significant difference in prevalence of MSP between winter and summer seasons (31.14% vs. 30% respectively, p>0.05). Moreover, controlling for body region, gender, and affected side showed no significant differences between winter and summer seasons in MSP prevalence (p>0.05).

Table 2. Prevalence of MSP by season.

Season	Type		Chi-square test value (p-value)
	MSP (n=208)	Non-MSP (n=472)	
Winter (n=350)	109 (52.4)	241 (51.1)	0.1 (0.75)
Summer (n=330)	99 (47.6)	231 (48.9)	

Table 3. Effect of body region and sex on season effect on MSP prevalence.

MSP type	Sex	Season		Chi-square test value (p-value)
		Winter (n=109)	Summer (n=99)	
Lower back	Male	17	12	0.08 (0.78)
	Female	26	21	
Neck	Male	2	0	2.9 (0.09)
	Female	13	15	
Knee	Male	6	8	0.08 (0.78)
	Female	24	27	
Shoulder	Male	7	2	1.5 (0.22)
	Female	12	10	
Heel	Male	0	1	0.91 (0.34)
	Female	2	3	

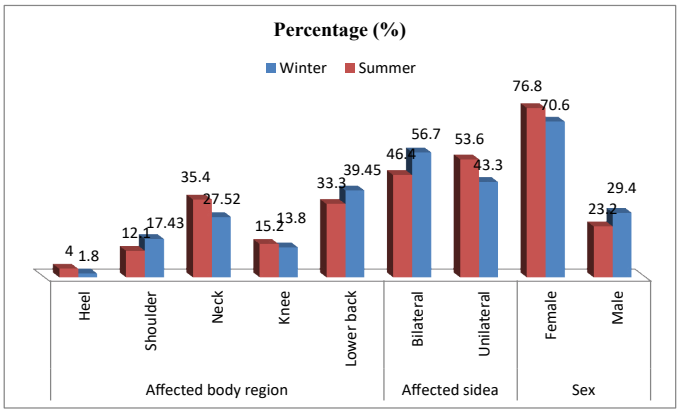

Figure 2. Baseline characteristics of patients in both seasons (percentage).

Findings of the present study are supported by Mesa-Castrillon et al. (2024) who reported that the 3-month mean prevalence of musculoskeletal pain was approximately 32.5% among the populations; 19% for back pain, 18% for knee pain, and 7% for each of shoulder pain and neck pain. However, LBP prevalence seems to be higher in the present study compared to the previous one; this may be due to smaller sample of the present study and difference in definition of back pain among studies (15).

In the current study women affected with MSP were higher than men this came in agreement with Safiri et al. (2021) and Vrouva et al. (2023) who found that musculoskeletal pain was higher in women than in men (3,8). Moreover, the current study also agreed with Safiri et al. (2021) who found a higher

Table 4. Effect of body region and affected side on effect of season on MSP prevalence.

Body region	Affected side	Season		Chi-square test value (p-value)
		Winter (n=109)	Summer (n=99)	
Knee pain	**Unilateral**	7	12	1.6 (0.2)
	Bilateral	13	10	
Shoulder pain	**Unilateral**	6	1	2.81 (0.094)
	Bilateral	2	3	
Heel pain	**Unilateral**	0	2	1 (0.3)

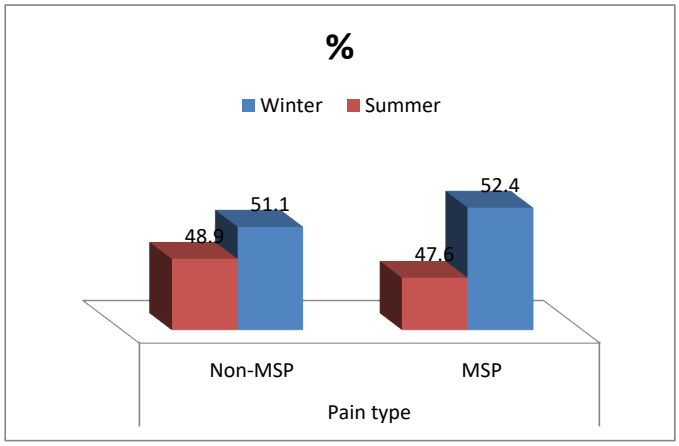

Figure 3. Prevalence (%) of MSP and non-MSP in both seasons.

prevalence of MSDs in the lower back (36.8%) and neck (18.4%) regions (3).

Findings of the present study contradict with the studies that found a significant effect (positive or negative) for seasonal variation on MSP prevalence. Ferreira et al. (2024) found that high temperatures may increase the likelihood of gout flare (10). The contradiction here may be due to difference in measured outcome; frequency versus severity of MSP. Another contrasting study by Vrouva et al. (2023) showed that low temperature was associated with an increased number of referrals to physiotherapy (8). Furthermore, high temperature is associated with increased pain severity (16). Finally, back pain (17) and arthritic pain (11) both decrease in summer season. A common explaining difference for this contradiction is the measured variable; pain severity or dissemination. Another explanation is the different effects of weather on the pain tolerance. For example, cold pain tolerance was highest in the winter (13).

This study supports the conclusion that relation between weather and pain is complex with lack of consensus due to the presence of several factors (12). In addition, finding of the current study came in concordance with Pezot et al. (2024) who found that temperature was not associated with pain in hand osteoarthritis (18).

The current study result aligned with Yimer et al. (2022) who found that 1 in 10 patients with chronic pain were sensitive to the temperature (19). This study demonstrated that weather sensitivity among patients with chronic pain is more apparent in some subgroups of participants. In addition, among those sensitive to the weather, the direction of the weather–pain association can differ.

In agreement with the present study, Abeler et al. (2020) found a modest seasonality effect was in pain severity (highest in summer), but not in pain dissemination (20). Moreover, and in agreement with our study, Abeler and colleagues (20) showed that the season–pain association was not significantly moderated by any of the pain-associated conditions.

This study was not in line with previous reports (9,21) who showed that climate change (e.g. hot weather) significantly impact the physical health of the patients with chronic pain (e.g. osteoarthritis) and the healthy-care services (e.g. physiotherapy resources).

This study may suggest that weather changes neither increase frequency of patients with MSP nor number of affected body regions in the same patient. However, previous studies showed that weather changes can affect intensity of MSP.

The findings of this study should be taken and applied with caution because of being cross-sectional in nature with no measured causality relationships. In addition, there were limited data about demographics due to the record-based nature of the study. Therefore, further higher quality prospective studies with larger sample (more hospitals/research sites) are needed to validate the results.

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