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The Seasonal and Meteorological Relationships of Diagnostic Distribution of Patients Presenting with Musculoskeletal Complaints According to Gender

Kas İskelet Sistemine Ait Şikayetlerle Başvuran Hastaların Cinsiyete Göre Tanısal Dağılımlarının Mevsimsel ve Meteorolojik İlişkisi

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Abstract

Objective: The seasonal relationship of incidence of musculoskeletal system (MSS) pathologies according to gender and their meteorological variability has not been investigated satisfactorily. The aim of this study is to determine diagnostic distribution of patients with MSS-related complaints and the seasonal relationship of these diagnoses.

Materials and Methods: This study was conducted on 45541 patients having MSS-related complaints. Female/male ratios of eleven diagnosis groups were considered and monthly/seasonal incidences were evaluated and relations with climatic factors were searched.

Results: While number of patients for both genders admitted to polyclinics increased more in winter, lowest number of patients were admitted in summer. While knee-related pathologies were increased in April (9.4%) and rheumatologic disorders were increased in September (13.3%) for female patients, lumbar pathologies were most frequent in December (9.6%) and rheumatologic disorders were most frequent in September (13.0%) for male patients. Negative correlation was found between average temperature and knee pathologies for all the patients (r=-0.952, p=0.048). There were positive correlations between humidity and knee (r=0.980, p=0.020), elbow (r=0.951, p=0.049), hip (r=0.957, p=0.043), hand-wrist (r=0.963, p=0.037) and pathologies requiring rehabilitation (r=0.954, p=0.046).

Conclusion: The number of admissions increased for both genders in winter months, and decreased in summer months. Moreover, relationships of some MSS pathologies with seasonal/meteorological changes should be considered.

Keywords: Musculoskeletal system, diseases, prevalence, gender, seasons

Öz

Amaç: Kas-iskelet sistemi (KİS) ile ilgili patolojilerin cinsiyete göre görülme sıklığının mevsimsel ilişkisi ve meteorolojik değişkenlik göstermesi konusu yeterince araştırılmamıştır. Bu çalışmanın amacı KİS şikayetleriyle başvuran hastaların cinsiyetlerine göre tanısal dağılımlarını ve bu tanıların mevsimsel ilişkisini belirlemektir.

Gereç ve Yöntem: Bu çalışma KİS şikayeti ile başvuran toplam 45541 hasta üzerinde yapıldı. On bir tanı grubunun kadın ve erkek hasta oranları dikkate alınarak aylara ve mevsimlere göre sıklığı değerlendirilerek bazı iklim faktörleri ile ilişkisi araştırıldı.

Bulgular: Polikliniğe başvuran hasta sayısı her iki cinste de en fazla kış aylarında artış gösterirken, yaz aylarında ise en az başvuru yapılmıştı. Kadın hastalarda, diz ile ilgili patolojiler nisan ayında (%9,4), romatolojik hastalıklar Eylül (%13,3) ayında artış gösterirken erkek hastalarda, bel ile ilgili patolojiler Aralık (%9,6), romatolojik hastalıklar ise Eylül (%13,0) ayında artış gösteriyordu. Tüm hastalarda; ortalama sıcaklık değerleri ile diz patolojileri arasında negatif bir korelasyon olduğu saptandı (r=-0,952, p=0,048). Nem ile diz (r=0,980, p=0,020), dirsek (r=0,951,p=0,049), kalça (r=0,957, p=0,043), el bileği (r=0,963, p=0,037) ve rehabilitasyon gereken patolojiler (r=0,954, p=0,046) arasında ise pozitif yönlü bir korelasyon saptandı.

Sonuç: Her iki cinste de kış aylarında hastalık başvuruları artarken, yaz aylarında azalmaktadır. Ayrıca bazı KİS patolojileri ile mevsimsel ve meteorolojik değişimler arasındaki ilişki göz önünde bulundurulmalıdır.

Anahtar kelimeler: Kas-iskelet sistemi, hastalıklar, prevalans, cinsiyet, mevsimler

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Introduction

Musculoskeletal system (MSS) disorders are a group of diseases characterized by pain, limitation of movement and impairment in structure and function of MSS (1). Although MSS disorders consist of a large group of diseases in pathophysiological aspect, they meet at a common point, since they all lead to pain and reduction in physical functions (2). MSS disorders are among the most common diseases in the community. MSS disorders, which hold a significant place among causes for admission to health facilities, also have importance for their burden on quality of life (QOL) and the national economy. MSS disorders are important public health issues, which affect entire age groups and genders, creating disabilities and loss of power (3). In developed countries, bone and joint problems have been reported to constitute half of all chronic disorders in patients aged 50 years and over (4). Although MSS disorders are not fatal, they reduce the QOL and economic productivity (3). World Health Organization, within the scope of a project, suggested all countries to follow and report the prevalence of findings and diseases related to MSS, together with their causes, for early diagnosis and particularly for prevention of complications and additionally, declared the 2000-2010 years as the bone and joint decade. In the literature, there have been very few studies on the relationship of prevalence of MSS disorders with months and seasons and they were performed with limited number of disorders. For example, in the study on 2030 workers conducted by Hildebrandt et al. (5) in 2002, the relationships of lumbar, neck and shoulder pain with climate were investigated and poor climatic factors and particularly air currents and wind were found to be triggering factors for MSS pathologies such as lumbar region, neck and shoulder. One aim of our study was to investigate the diagnostic distribution of patients who had presented to our outpatient clinic with musculoskeletal symptoms according to their genders and also the relationships with months and seasons according to these diagnoses. Another aim was to assist planning of the health services with obtained data.

Materials and Methods

This study was conducted retrospectively on a total of 45541 patients who had presented with MSS complaints to the department of physical therapy and rehabilitation outpatient clinics over two years, between the dates of January 1st 2013 and December 31st 2014. The study was approved by the Local Ethics Committee of Atatürk University (Protocol No: 01/24.10.2016). The musculoskeletal pathological diagnoses were based on clinical, laboratory and radiological findings and they were classified and grouped as neck-back, lumbar, shoulder, elbow, hand-wrist, hip knee and foot-ankle pathologies, rheumatologic disorders, osteoporosis, central and peripheral nervous system (PNS) disorders necessitating rehabilitation. No inclusion criteria was regarded for pain characteristics of the patients such as the duration, frequency, intensity (mild, moderate, intense, severe, etc.) and quality of the pain (continuous, intermittent, etc.) in the classified regions mentioned above, except only existence of pain in these regions was considered in this study. Data on gender and diagnoses of the patients were acquired from the hospital computer records. The recurrent admissions of any patient were evaluated as new admissions. The prevalence's of the diagnostic groups were evaluated in terms of months and seasons, taking the numbers and ratios of female and male patients into consideration. December, January and February were considered as winter, March, April and May as spring, June, July and August as summer, September, October and November as autumn. The analysis of months and seasons were made separately, according to diagnostic groups. Additionally, with the purpose of revealing the relationship of months and seasons with some environmental conditions, meteorological data such as average weather temperature, humidity, atmospheric pressure and wind speed of the region were used. The data used in the study were evaluated, which were demanded officially from the 12th Regional Directorate of Meteorology. The descriptive statistics for the distribution of diagnostic groups analyzed in this study in terms of gender, months and seasons was performed using Statistical Package for Social Sciences for Windows 20.0 statistical software package. The relationships of diagnostic groups, gender, months and seasons were evaluated using correlation and chi-square analysis. Pearson's correlation coefficient analysis was used to observe the relation ship between the climatic factors (weather temperature, humidity, atmospheric pressure and wind speed) and diagnostic groups. The significance level was established as a p-value <0.05.

Results

A total of 45541 patients were subjected to evaluation, of whom 29960 (65.8%) were female and 15581 (34.2%) were male ($p<0.01$). The average age of the patients was 45.07±20.43 years; this ratio was found as 47.83±21.04 years for females and 43.22±18.71 years for males. The average number of admissions was 92 people per day in total. The monthly distribution of outpatient clinic admissions in terms of gender was shown in (Figure 1). The highest number of admissions was in November (4209 people, 9.2%), and the lowest was in October (3122 people, 6.9%). While female patients presented mostly in November (9.5%), and least in July (6.6%), male patients mostly presented in January (10.1%), and least in October (6.6%). There were significant differences in patient admission count and gender distribution, according to months ($p<0.01$). In both genders, while the number of patients presenting to the outpatient clinic showed the highest increase in winter, spring and autumn followed respectively. The lowest number of admissions was in summer. In both genders, the highest numbers of admissions being in winter and the lowest being in summer were found to be statistically significant ($p<0.01$) (Figure 2). The gender distribution of patients according to the diagnostic groups, their total numbers and yearly overall distribution ratios of all diagnoses were shown in (Figure 3).

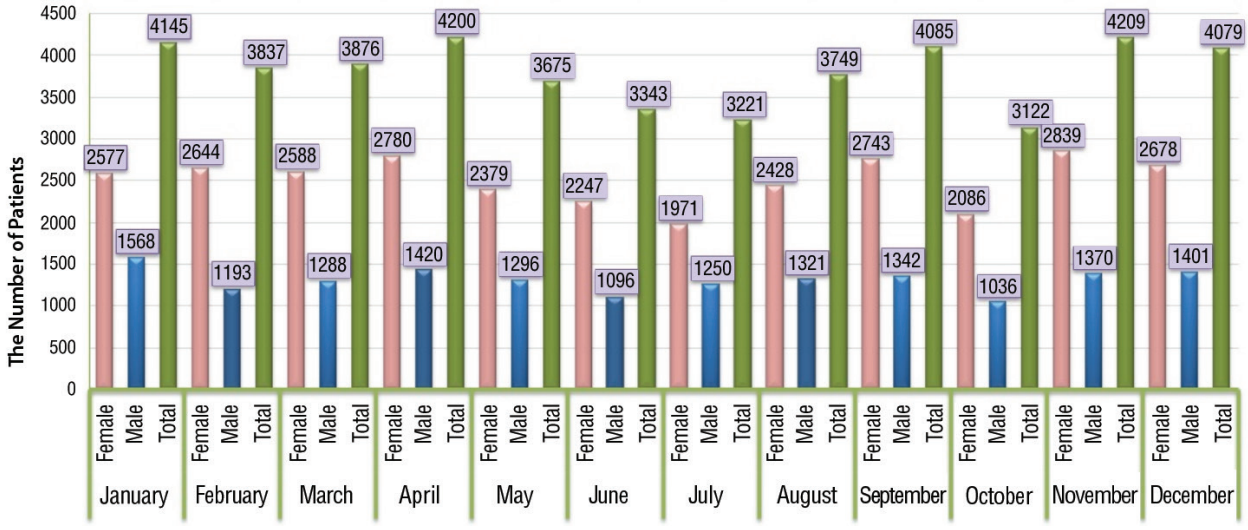

Figure 1. Distribution of the female-male and total number of patients according to the months of 2013-2014

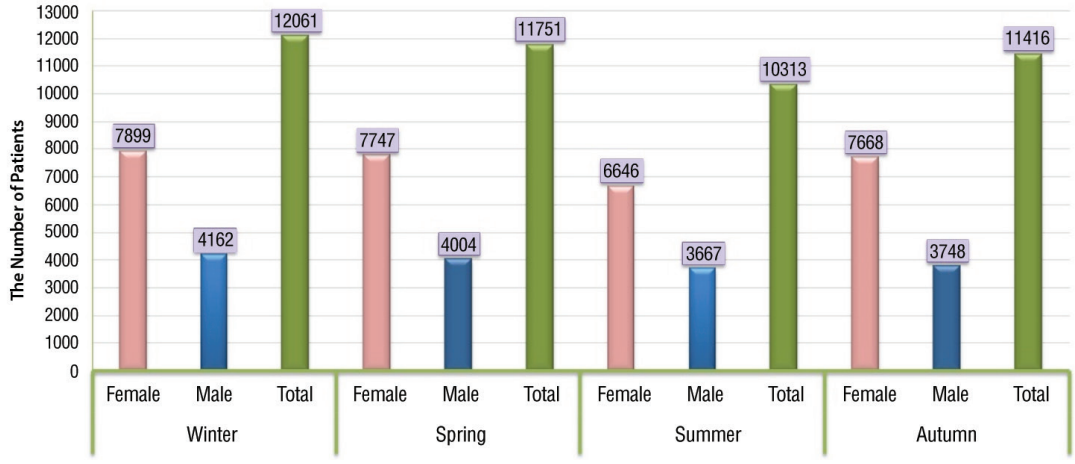

Figure 2. Distribution of the female-male and total number of patients according to the seasons of 2013-2014

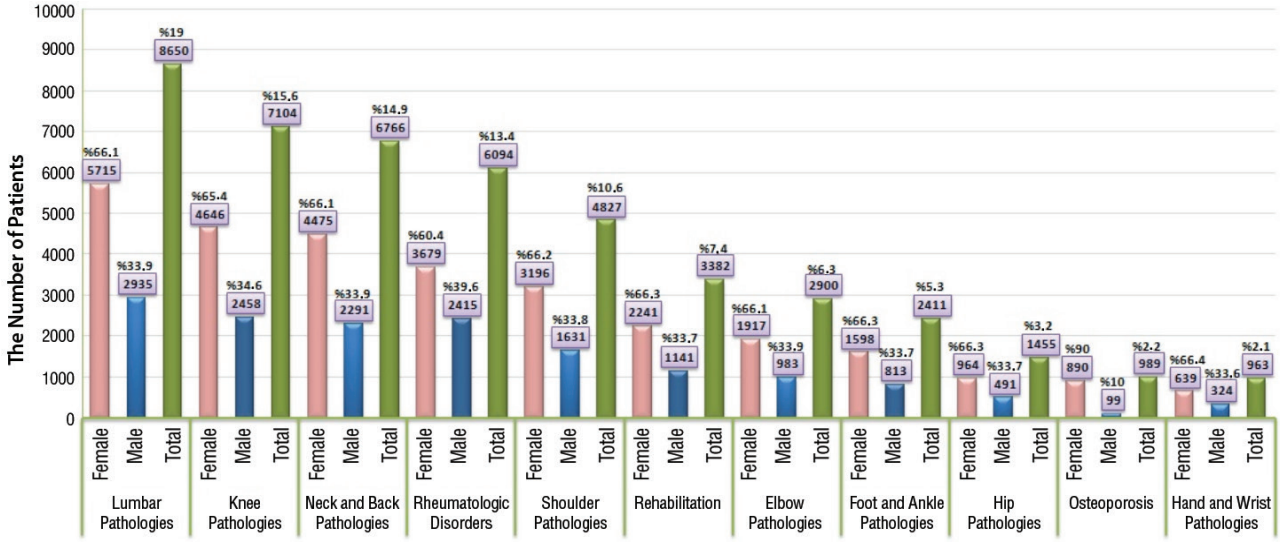

Figure 3. Distribution of the female-male and total number of patients according to the diagnosis groups of 2013-2014

When seasonal distribution of the patients was analyzed; the distribution of female patients according to winter, spring, summer and autumn were 26.4%, 25.9%, 22.2% and 25.6% and the distribution of male patients were 26.7%, 25.7%, 23.5% and 24.1% respectively (p<0.01). In both genders, the number of patients having lumbar pathology constituted the highest number of admissions (females 19.1%, males 18.8%). While, the lowest number of admissions was for hand-wrist complaints in females (2.1%), it was osteoporosis diagnostic group in males (0.6%). When the monthly distribution of diagnoses was analyzed, lumbar pathologies were highest in both genders and in all months, admission for osteoporosis had the lowest number throughout all months in male gender. However, while hand-wrist pathologies was the diagnostic group having the lowest number in January, February, March, April, May, June, August and September in female gender, osteoporosis group was the lowest in July, October, November and December. The relationships of diagnostic groups with gender and number of patients were found to be statistically significant (p<0.01). In female patients, while knee-related pathologies increased in April (9.4%), they decreased in July (7%), rheumatologic disorders increased in September (13.3%) and admissions of patients in osteoporosis group increased in February (12.7%). Additionally, in October, reductions in admissions of patients with rheumatologic disorders (4.8%) and osteoporosis group (3.6%) were observed. In female patients, while the other disease groups reached the highest levels in November, these ratios were determined to be lowest in July (Table 1). In female patients, while the monthly distributions of lumbar, neck-back, knee, shoulder, osteoporosis, rheumatologic disorders (p<0.01) elbow and rehabilitation patients (p<0.05) were found to be statistically significant, the distributions of other disorders were not significant statistically (p>0.05). In male patients, while lumbar pathologies increased in December (9.6%), they decreased in October (6.9%). Rheumatologic disorders increased in September (13.0%) and patient admission were observed to be reduced in October and December (5.2%). The other disease groups reached their highest levels in January. The lowest levels for admission rates were in June for neck pathologies (7.1%), in November for osteoporosis patients (2%), and in October for other pathologies (Table 1). In male patients, while the monthly distributions of lumbar, knee, osteoporosis and rheumatologic disorders (p<0.01), neck-back and shoulder disorders (p<0.05) were found to be statistically significant; the distributions of other disorders were not significant statistically (p>0.05). When the seasonal distributions of the diagnoses were analyzed; in male patients, the seasonal distributions of neck, back (p<0.05) and osteoporosis group (p<0.001) were found to be statistically significant, the seasonal distributions of other pathologies were not significant statistically (p>0.05). In female patients, while seasonal distributions of lumbar, neck, osteoporosis, rheumatologic disorders (p<0.001) and elbow, knee, shoulder, rehabilitation pathologies (p<0.05) were found to be statistically significant, the seasonal distributions of other diagnoses were not significant statistically (p>0.05). When various climatic data such as monthly average temperatures, humidity, wind speed and atmospheric pressures in 2013 and 2014 were analyzed; the hottest month was August, the coldest was January; the highest humidity was in December, the lowest was in August; the highest wind speed was in May, the lowest was in February; the highest atmospheric pressure was in October and December, the lowest was in March (Table 2). When seasonal averages were taken into consideration; the hottest season was summer; the highest atmospheric pressure was in autumn; the highest humidity was in winter; the highest wind speed was in spring (Table 3). Regarding monthly average values of various climatic factors such as temperature, humidity, average atmospheric pressure and average wind speed and diagnostic groups; in female patients, while there were negative correlations between temperature and hip (r=-0.580, p=0.048) and foot-ankle pathologies (r=-0.578, p=0.049), positive correlations were determined between humidity and neck-back (r=0.612, p=0.034), shoulder (r=0.613, p=0.34), elbow (r=0.620, p=0.031), hand-wrist (r=0.622, p=0.031), hip (r=0.611, p=0.035), foot- ankle (r=0.627, p=0.029) and rehabilitation patients (r=0.609, p=0.036). No correlation was determined between pathologies and atmospheric pressure, average wind speed (p>0.05). In male patients, no relationship was found between diagnoses and monthly average temperature, humidity, atmospheric pressure and average wind speed (p>0.05). When all patients were taken into consideration, negative correlations were determined between monthly average temperatures and neck-back (r=-0.626, p=0.029), shoulder (r=-0.607, p=0.036), elbow (r=-0.615, p=0.033), hand-wrist (r=-0.623, p=0.030), hip (r=-0.613, p=0.034), foot-ankle (r=-0.616, p=0.033) and central nervous system (CNS) and PNS pathologies necessitating rehabilitation (r=-0.612, p=0.034). Positive correlations were determined between humidity and neck-back (r=0.674, p= 0.016), shoulder (r=0.658, p=0.020), elbow (r=0.664, p=0.018), hand-wrist (r=0.678, p=0.015), hip (r=0.649, p=0.022), knee (r=0.596, p=0.041), foot-ankle (r=0.667, p=0.018) and CNS/PNS pathologies necessitating rehabilitation (r=0.653, p=0.021). No relationship was determined between diagnoses with average wind speed and atmospheric pressure (p>0.05) (Table 4). In female patients, no relationship was found between diagnoses and average seasonal temperature, humidity, wind speed, atmospheric pressure (p>0.05). In male patients, positive correlations were determined between seasonal average humidity values and neck-back (r=0.985, p=0.015), shoulder (r=0.967, p=0.033), elbow (r=0.963, p=0.037), foot-ankle (r=0.963, p=0.037), hip (r=0.976, p=0.024) and CNS/PNS pathologies necessitating rehabilitation (r=0.965, p=0.035). No relationship was found between other pathologies with temperature, wind speed and atmospheric pressure (p>0.05). When all patients were taken into consideration, a negative correlation was found between average temperature and knee pathologies (r=-0.952, p=0.048).

Table 1. Distribution of the percentage and number of female-male patients of the diagnosis groups according to the months of 2013-2014

	January		February		March		April		May		June		July		August		September		October		November		December	
	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M
Lumbar pathologies	469	280	466	208	513	231	541	264	454	252	439	213	383	246	440	250	487	231	407	203	566	274	550	283
Percent (%)	8.2	9.5	8.2	7.1	9	7.9	9.5	9	7.9	8.6	7.7	7.3	6.7	8.4	7.7	8.5	8.5	7.9	7.1	6.9	9.9	9.3	9.6	9.6
Knee pathologies	391	245	407	169	342	205	438	230	378	210	370	178	327	203	366	185	407	193	355	168	434	228	431	244
Percent (%)	8.4	10	8.8	6.9	7.4	8.3	9.4	9.4	8.1	8.5	8	7.2	7	8.3	7.9	7.5	8.8	7.9	7.6	6.8	9.3	9.3	9.3	9.9
Neck and back pathologies	363	229	381	166	398	192	409	206	353	195	346	162	303	191	342	174	379	179	332	164	441	213	428	220
Percent (%)	8.1	10	8.5	7.2	8.9	8.4	9.1	9	7.9	8.5	7.7	7.1	6.8	8.3	7.6	7.6	8.5	7.8	7.4	7.2	9.9	9.3	9.6	9.6
Rheumatologic disorders	388	253	381	256	330	203	327	227	274	170	225	147	202	148	378	295	488	314	177	126	300	150	209	126
Percent (%)	10.5	10.5	10.4	10.6	9	8.4	8.9	9.4	7.4	7	6.1	6.2	5.5	6.1	10.3	12.2	13.2	13	4.8	5.2	8.2	6.2	5.7	5.2
Shoulder pathologies	260	163	271	116	285	137	293	147	252	140	247	117	215	137	244	123	271	128	237	112	315	153	306	158
Percent (%)	8.1	10	8.5	7.1	8.9	8.4	9.2	9	7.9	8.6	7.7	7.2	6.7	8.4	7.6	7.5	8.5	7.8	7.4	6.9	9.9	9.4	9.6	9.7
Rehabilitation	183	114	190	81	200	96	204	102	176	98	173	83	155	96	171	86	190	89	165	79	220	107	214	110
Percent (%)	8.2	10	8.5	7.1	8.9	8.4	9.1	8.9	7.9	8.7	7.7	7.3	6.9	8.4	7.6	7.5	8.5	7.8	7.4	6.9	9.8	9.4	9.5	9.6
Elbow pathologies	156	98	163	69	171	83	175	88	151	84	149	71	129	82	146	75	162	77	143	68	189	91	183	97
Percent (%)	8.1	10	8.5	7	8.9	8.4	9.1	9	7.9	8.5	7.8	7.2	6.7	8.3	7.6	7.7	8.5	7.8	7.5	6.9	9.9	9.3	9.5	9.9
Foot and ankle pathologies	131	81	136	58	143	68	146	73	126	70	123	59	106	68	122	62	136	64	119	56	157	76	153	78
Percent (%)	8.3	10	8.5	7.1	8.9	8.4	9.2	9	7.9	8.6	7.7	7.3	6.6	8.4	7.6	7.6	8.5	7.9	7.4	6.9	9.8	9.3	9.6	9.5
Hip pathologies	79	49	82	35	86	41	88	44	75	42	74	36	67	41	74	37	81	39	71	34	95	46	92	47
Percent (%)	8.2	10	8.4	7.1	8.9	8.4	9.1	8.9	7.8	8.6	7.7	7.3	7	8.4	7.7	7.5	8.4	7.9	7.4	6.9	9.9	9.4	9.5	9.6
Osteoporosis	105	24	113	10	63	5	100	10	90	7	51	6	41	11	97	9	88	3	32	5	59	2	51	7
Percent (%)	11.8	24.2	12.7	10.1	7.1	5.1	11.2	10.1	10.1	7.1	5.7	6.1	4.6	11.1	10.9	9.1	9.9	2.9	3.6	5.1	6.7	2	5.7	7.1
Hand and wrist pathologies	52	32	54	25	57	27	59	29	50	28	50	24	43	27	48	25	54	25	48	21	63	30	61	31
Percent (%)	8.1	9.9	8.6	7.7	8.9	8.3	9.2	9	7.8	8.6	7.8	7.4	6.7	8.3	7.5	7.7	8.5	7.7	7.5	6.5	9.9	9.3	9.5	9.6

F: Female, M: Male

Positive correlations were determined between humidity and knee (r=0.980, p=0.020), elbow (r=0.951, p=0.049), hip (r=0.957, p=0.043), hand-wrist (r=0.963, p=0.037) and CNS/PNS pathologies necessitating rehabilitation (r=0.954, p=0.046). No relationship was found between diagnoses with average wind speed and atmospheric pressure (p>0.05) (Table 5).

Table 2. Summary of monthly average meteorological observation in 2013-2014 years

Month	Atmospheric pressure (mb)	Weather temperature (°C)	Wind speed (m/s)	Humidity (%)
January	811.5	-6.3	1.0	78.1
February	813.0	-3.9	0.8	74.8
March	810.0	1.4	1.7	66.8
April	811.5	9.8	1.5	66.0
May	812.5	12	2.3	66.0
June	811.0	15.9	1.5	52.0
July	810.6	16	1.6	44.1
August	811.9	21	1.7	40.2
September	810.0	14.9	1.8	47.8
October	815.1	8	1.3	61.2
November	814.8	2.7	1.2	68.3
December	815.1	-5	1.0	78.7

°C: Celcius, m/s: Meter/second, mb: Milibar

Table 3. Summary of seasonal average meteorological observation in 2013-2014 years

Season	Atmospheric pressure (mb)	Weather temperature (°C)	Wind speed (m/s)	Humidity (%)
Winter	813.2	-5.1	0.9	77.2
Spring	811.3	4.1	1.8	66.3
Summer	811.2	17.6	1.6	45.4
Autumn	813.0	8.2	1.4	59.1
°C: Celcius, m/s: Meter/second, mb: Milibar				

Table 4. The correlation between musculoskeletal system pathologies and monthly average values of some seasonal date in 2013-2014 years

	Weather temperature (°C)			Wind speed (m/s)			Humidity (%)			Atmospheric pressure (mb)		
R	F	M	T	F	M	T	F	M	T	F	M	T
Lumbar pathologies	-.491	-.295	-.476	-.240	-.090	-.213	.561	.341	.545	.246	.166	.245
Knee pathologies	-.402	-.460	-.493	-.390	-.141	-.328	.515	.517	.596*	.404	.107	.321
Neck and back pathologies	-.562	-.537	-.626*	-.334	-.201	-.324	.612*	.565	.674*	.336	.152	.306
Rheumatologic disorders	-.031	.135	.038	.048	.087	.065	-.051	-.224	-.124	-.467	-.522	-.497
Shoulder pathologies	-.561	-.496	-.607	-.328	-.158	-.301	.613*	.530	.658*	.330	.106	.280
Rehabilitation	-.571	-.496	-.612*	-.338	-.158	-.306	.609*	.530	.653*	.309	.108	.265
Elbow pathologies	-.570	-.495	-.615*	-.340	-.158	-.309	.620*	.525	.664*	.339	.119	.292
Foot and ankle pathologies	-.578*	-.481	-.616*	-.335	-.145	-.304	.627*	.519	.667*	.330	.097	.280
Hip pathologies	-.580*	-.489	-.613*	-.364	-.158	-.324	.611*	.524	.649*	.319	.094	.266
Osteoporosis	-.140	-.343	-.190	-.017	-.335	-.078	.198	.287	.232	-.288	-.201	-.297
Hand and wrist pathologies	-.567	-.528	-.623*	-.344	-.205	-.333	.622*	.563	.678*	.334	.067	.271

*p<0.05, **p<0.01, F: Female, M: Male, T: Total, mb: Milibar, °C: Celcius, m/s: Meter/second, mb: Milibar

Table 5. The correlation between musculoskeletal system pathologies and seasonal average values of some seasonal date in 2013-2014 years

	Weather temperature (°C)			Wind speed (m/s)			Humidity (%)			Atmospheric pressure (mb)		
R	**F**	**M**	**T**	**F**	**M**	**T**	**F**	**M**	**T**	**F**	**M**	**T**
Lumbar pathologies	.742	-.862	-.822	-.187	-.496	-.271	.857	.901	.928	.496	.215	.466
Knee pathologies	.901	-.857	-.952*	-.628	-.350	-.562	.887	.948	.980*	.844	.256	.667
Neck and back pathologies	-.801	-.922	-.870	-.321	-.462	-.379	.879	.985*	.946	.626	.395	.575
Rheumatologic disorders	-.834	-.915	-.925	-.484	-.794	-.598	.856	.851	.930	.790	.453	-.781
Shoulder pathologies	-.796	-.894	-.864	-.310	-.420	-.359	.877	.967*	.946	.618	.321	.551
Rehabilitation	-.814	-.893	-.876	-.333	-.424	-.377	.890	.965*	.954*	.624	.314	.552
Elbow pathologies	-.798	-.896	-.873	-.319	-.441	-.376	.876	.963*	.951*	.628	.309	.558
Foot and ankle pathologies	-.805	-.889	-.866	-.326	-.414	-.367	.882	.963*	.946	.629	.306	.561
Hip pathologies	-.828	-.908	-.884	-.356	-.442	-.396	.900	.976*	.957*	.634	.356	.569
Osteoporosis	-.761	-.579	-.756	-.322	-.616	-.406	.842	.504	.805	.044	.025	.041
Hand and wrist pathologies	-.782	-.852	-.884	-.296	-.456	-.383	.864	.903	.963*	.620	.195	.530

*p<0.05, **p<0.01, F: Female, M: Male, T: Total, mb: Milibar, °C: Celcius, m/s: Meter/second, mb: Milibar

In addition, considering all the patients, male or female, no relationship was found between the rheumatologic disorders and climatic parameters such as monthly and seasonal average temperature, humidity, atmospheric pressure and wind speed (p>0.05).

Discussion

The most common complaint for presentation of patients with MSS pathologies to the clinicians is pain. Pain is more prevalent in certain patient groups. In a general community survey, 80% of the population, aged between 15-84 years, was determined to have MSS symptoms, in 13% of which the pain was severe. MSS problems are seen more frequently in females, when compared to males (6). In our study, being consistent with the literature, number of female patients was found higher than number of male patients in all months and seasons. Hormonal factors, higher level of sensitivity to pain and weaker strength of muscles and tendons of the female patients may be possible reasons for this finding (7). In the literature, MSS pain is most frequently observed at the lumbar region and it is within the chronic disorders, which restrict daily activities of people (8). The second most frequent complaint following low back pain in patients presenting to pain clinics is neck pain (9). Neck pain is more common in females than males (10). In the community, shoulder pain is in the third place, following low back pain and neck pain (11). However, in the elderly age group, knee pathologies have been reported to be second most common, following lumbar pathologies (12). In female patients, the prevalence of diagnostic groups, which were consistent with the literature, were determined to be lumbar region, knee, neck, rheumatologic, shoulder, rehabilitation, elbow, foot and ankle, hip, osteoporosis, hand and wrist pathologies in order of frequency, whereas in male patients, the diagnostic group of rheumatologic pathologies was in the third place, before neck pathologies. The knee pathologies being the second most frequent diagnostic group in our study might have been due to particularly the incidence of degenerative diseases being high in our region, the average age of our patient group being middle-age and higher, our patients being over-weight and their exposure to chronic trauma. In our study, while the number of female patients showed the highest increase in November, in which the temperatures averaged 2.7 °C in our region, which had humidity value above the yearly average, and had a high average value of atmospheric pressure, it showed a significant decrease in July, in which high temperature was dominant, and humidity and atmospheric pressure had their lowest levels (p<0.01). While the number of male patients showed the highest increase in January, in which cold and high humidity was dominant, in October, which had more moderate humidity and wind speed, the lowest numbers were determined. This situation may explain the increase in MSS pathologies with cold climate and high humidity and the decrease with hot climate and low humidity, in general. In our study, in female patients, knee-related pathologies, rheumatologic diseases and other pathologies excluding osteoporosis were found to have their highest incidences in November, which is the month of autumn that the cold weather starts and humidity level is high, where as, they were diagnosed with the lowest incidence in July, in which the weather is hot and humidity is at the lowest level. In female patients, while knee pathologies had their highest incidence in April, the month of spring which has a high wind speed and humidity level, the highest rainfall and an average temperature of +9 °C, their incidence was lowest in July, which has a hot climate with lowest humidity level. In male patients, while lumbar pathologies showed an increase in December, the month of winter in which cold weather is

dominant and the humidity is at the highest level, the other diagnostic groups were found to be increased in January, which is the coldest month with humidity being at the second highest level. Neck pathologies had their lowest incidence in June, which is the second hottest month, having the second lowest humidity level, where as in other diagnostic groups, the lowest incidence was determined in October, which has an average humidity, average temperature of 8 °C and low wind speed. In workers working as video display terminal operators, the relationships of MSS pain and discomfort with weather temperature, air pressure, humidity and wind speed were investigated. Negative correlation was found with air pressure, but no correlation was found with humidity, wind speed and temperature (13). In one review study, it was found that the highest number of outpatients was in autumn and onset of winter when the number of 826 people who had presented to family practitioners with back pain was analyzed. And it has been reported that of the workers in wide range of fields the prevalence of back and low back pain was the highest during the cold and humid months while neck and shoulder pain was the highest in autumn (5). Rheumatologic disorders (rheumatoid arthritis, juvenile chronic arthritis, spondyloarthropathies, undifferentiated arthritis, familial Mediterranean fever, vasculitis, crystal arthropathies, connective tissue disorders, fibromyalgia, acute rheumatic fever, etc.) were gathered and investigated under one group. In the literature review, we were not able to find a prevalence study which classified all rheumatologic disorders under one group in this way and which was able to show seasonal changes. However, investigations were made in a limited number of diseases such as rheumatoid arthritis, systemic lupus erythematosus (SLE) and ankylosing spondylitis. According to the literature, rheumatoid arthritis (RA) begins more often in winter months, when compared to summer. In the epidemiologic studies conducted in northern hemisphere, the onset of RA was found to be two-fold increased between October and March, when compared to the other months (14,15). It is accepted that the activity and severity of RA varies with regional and climatic differences (16). In literature, there are studies which state that rheumatic symptoms increase because of cold and humidity decrease because of warm and humidity and can only increase because of cold and humidity and can not be related to many weather conditions (5). Recent studies indicated that exacerbation or development of the autoimmune diseases such as RA and SLE may be related with seasonality (17). According to some authors, RA started abruptly more often in springtime, and more insidiously in autumn, whereas in summer and winter there was an equal number of patients with acute or insidious onset of the disease (18). Similar seasonal effects were reported for hand osteoarthritis (19). However, others stated that onset juvenile RA is not related with seasonal changes, but onset of the disease subtype such as chronic or the polycyclic types tends to be more common in winter and spring (20). Another study revealed that disease activity of the psoriatic arthritis determined by active joints, inflammatory back pain, psoriasis and patients perspective of their disease doesn't change significantly between summer and winter (21). It has been claimed that two potentially synergistic mechanisms may have a role in the seasonality of PMR. Firstly, the infectious-like onset of PMR suggests a precipitating environmental factor as one of the causes. Secondly, some authors have reported seasonal variation of the immune system and inflammatory responsiveness (22). Silman et al. (23), in their study conducted on 687 cases with inflammatory joint disease, stated that no consistent seasonal variation had been determined at the onset of the disease. A recent study examined the links between the QOL and season and weather conditions in ankylosing spondylitis (AS) patients, and found some evidences supporting association between health status and perceived QOL, with season and weather conditions (24). This recent study revealed that lumbar flexibility was higher in hot climate and low wind speed in patients with AS (24). The connective tissue disorders, which are met in a large population among the rheumatologic pathologies, are much more common in females. In patients with SLE, the joint-related findings increase in spring and summer months. These seasonal variations show the relationship with the environmental factors (25). When the monthly distribution ratios of rheumatologic patients were evaluated, it was observed that the number of diagnosed patients had reached their peak values twice within one year in both genders; the first increase was in August and September, when the weather was hot, the humidity was lowest, the wind speed was below the yearly average value and the second increase was in January and February, when the weather was coldest, the humidity was high and wind speed was low. In female patients, the lowest number of admissions was found in October, when the humidity level was at the level of monthly average of other months, the weather temperature and wind speed were low. In male patients, the lowest number of admissions was found in October and December, when the temperature and wind speed were low, but humidity level was high ($p<0.01$). However, in our study, there were no correlations between rheumatologic disorders and climatic data such as weather temperature, humidity, atmospheric pressure and wind speed ($p>0.05$). One of the significant results in our study was the incidence of osteoporosis being 90% in females and 10% in males, which was consistent with the literature. When the monthly distribution of patients with osteoporosis was evaluated, in female patients, the number of admissions was found to be highest in February (12.7%) and January (11.8%) and significantly lower than the other months in October (3%) and July (4.6%). In male patients, the highest number of admissions was in January (24.2%) and the lowest numbers were in November (2%) and September (3%). However, no significant correlations were found between number of admissions and various climatic data such as weather temperature, humidity, atmospheric pressure and wind speed ($p>0.05$). According to the literature, serum 25 vitamin D

[25(OH)D] level shows seasonal variations and reaches its highest level in summer (26,27). Additionally, in a conducted study, serum 25(OH)D level was found to be statistically significantly higher in late summer, when compared to the level in late winter and also, bone resorption markers such as pyridinoline and deoxypyridinoline were found to have their lowest levels in late summer, showing seasonal variations (27). However, similar to our study population, insufficient vitamin D levels were associated with advanced age, female gender, high latitudes, winter season, dark skin color, living in indoor environment and clothing style (28). There are variations in the prevalence of osteoporosis patients' apply to hospital according to seasons and months. However, it should also be known that there exists social, medical reasons and many biochemical parameters including 25(OH)D vitamin the levels of which we did not look in.

Conclusion

Consequently, in both genders, the number of MSS pathologies increase in winter whereas it decreases in summer. In female patients, while there positive middle level correlations were determined between humidity and neck-back, shoulder, elbow, hand-wrist, hip, foot- ankle and rehabilitation patients. In male patients, positive very high correlations were determined between seasonal average humidity values and neck-back, shoulder, elbow, foot-ankle, hip and CNS/PNS pathologies necessitating rehabilitation. In females, humidity showed positive correlation at medium levels with neck-back, shoulder, elbow, foot-ankle, hip and rehabilitation patients. In males, mean seasonal humidity values showed significant positive correlations with neck-back, shoulder, elbow, foot-ankle, hip and CNS/PNS pathologies necessitating rehabilitation. Therefore, in order to avoid these pathologies, it may be beneficial to stay away from excessive cold and humidity. Rheumatologic pathologies and osteoporosis patients do not have any correlations with climatic data such as weather temperature, humidity, atmospheric pressure and wind speed. Therefore, the investigated climatic factors are not effective in these pathologies. It is thought that more comprehensive studies are needed, which will investigate the relationship between the disease and climatic changes and which will be conducted in a wider geographical region with different climatic characteristics and a different altitude. Our study is not free from limitation. We found that the monthly and seasonal disease percentages have been correlated with climatic conditions. But, other potential conditions such as social or medical conditions of the patients may also have an influence on patients' applications to hospitals. However, primary aim of this study was to assess distributions of musculoskeletal symptoms in monthly and seasonal basis. Possible effects of social or medical conditions of the patients may be subjected to another study. In addition, reasons of an increase in number of the osteoporotic patients during winter and a decrease in number of the osteoporotic patients during winter must be evaluated with biomarker studies in future.

Ethics

Ethics Committee Approval: The study was approved by the Atatürk University of Local Ethics Committee (Protocol No: 01/24.10.2016), **Informed Consent:** Consent form was filled out by all participants.

Peer-review: Internally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: A.K., M.U., Concept: A.K., M.U., Design: A.K., M.U., Data Collection or Processing: A.K., M.U., Analysis or Interpretation: A.K., M.U., Literature Search: A.K., M.U., Writing: A.K., M.U.

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