FİZİKSEL TIP VE REHABİLİTASYON BİLİMLERİ DERGİSİ
Journal of Physical Medicine and Rehabilitation Sciences

ORIGINAL RESEARCH ORİJİNAL ARAŞTIRMA

DOI: 10.31609/jpmrs.2024-104141

Determination of the Risk Factors Related to Co-Occurrence of Low Back and Neck Pain Based on Gender in Türkiye

Türkiye'de Bel ve Boyun Ağrısının Birlikte Görülmesiyle İlişkili Risk Faktörlerinin Cinsiyete Göre Belirlenmesi

Fatih BAYGUTALP[a], Faruk URAK[b], Abdulbaki BİLGİÇ[c], Ayhan KUL[a]

[a]Atatürk University Faculty of Medicine, Department of Physical Therapy and Rehabilitation, Erzurum, Türkiye
[b]Atatürk University Faculty of Agriculture, Department of Agricultural Economics, Erzurum, Türkiye
[c]Uludağ University, Faculty of Agriculture, Department of Agricultural Economics, Bursa, Türkiye

This study was presented as an oral presentation at 4th FTR Course Days Congress, March 16-19, 2023, Antalya, Türkiye.

ABSTRACT Objective: This study determined risk factors affecting the co-occurrence of low back pain and neck pain according to sex. **Material and Methods:** The face-to-face survey of the Turkish Statistical Institute (TSI) covers 8,163 families with 16,253 individuals aged ≥18 in 2019. The dependent variable consisted of those who had both low back pain and neck pain within the last 12 months using the random-effects ordered probit model. **Results:** The 1-year total prevalence of low back pain and neck pain in the Turkish population in 2019 was 39.49%. The dual burden of the two diseases was 2.34 times higher in women than in men. Increasing age, marital status, low education level, obesity, walking for less than an hour a day, smoking, consuming less than one serving of fruit per day, and a history of depression are risk factors for dual disease in both genders. Additionally, active working, low income, low number of children aged 0-6, and living in the western Marmara and Central Anatolian regions were identified as risk factors for dual pain in women. **Conclusion:** Disease prevalence can be decreased by identifying and improving modifiable risk factors. Identifying distinctions regarding other personal factors and gender differences in low back pain and neck pain may also be beneficial in patient planning to prevent pain and disability.

Keywords: Gender; low back pain; neck pain; probit model; risk factors

ÖZET Amaç: Bu çalışmada, bel ağrısı ve boyun ağrısının birlikte görülmesinde etkili olan risk faktörlerinin cinsiyete göre belirlenmesi amaçlandı. **Gereç ve Yöntemler:** Türkiye İstatistik Kurumunun yüz yüze anket uygulanması, 2019 yılında 18 yaş ve üzeri 16.253 kişiden oluşan 8.163 aileyi kapsamaktadır. Bağımlı değişken, rastgele etkiler sıralı probit modelinde son 12 ay içinde bel ağrısı ve boyun ağrısının her ikisini de geçirmek olarak belirlenmiştir. **Bulgular:** 2019 yılında Türk toplumunda bel ağrısı ve/veya boyun ağrısının 1 yıllık toplam yaygınlığı %39,42 idi. Her iki hastalığın birlikte görülmesi kadınlarda erkeklere göre 2,34 kat daha fazlaydı. İleri yaş, evli olmak, düşük eğitim düzeyi, obezite, günde bir saatten az yürümek, sigara içmek, günde bir porsiyondan az meyve tüketmek ve depresyon öyküsü her iki cinsiyette de dual ağrı için risk faktörleri olarak belirlendi. Kadınlarda ayrıca aktif çalışma, düşük gelire sahip olma, 0-6 yaş arası çocuk sayısının az olması, Batı Marmara ve Orta Anadolu bölgelerinde yaşamanın dual ağrı için risk faktörleri olduğu belirlendi. **Sonuç:** Değiştirilebilir risk faktörlerinin belirlenmesi ve iyileştirilmesiyle hastalık prevalansı azaltılabilir. Bel ağrısı ve boyun ağrısında etkili olan diğer kişisel faktörler ve cinsiyet farklılıklarına ilişkin ayrımların belirlenmesi, ağrı ve disabilitenin önlenmesine yönelik hasta planlamasında da daha faydalı olabilir.

Anahtar Kelimeler: Cinsiyet; bel ağrısı; boyun ağrısı; probit modeli; risk faktörleri

Low back pain (LBP) and neck pain (NP) are the most common musculoskeletal disorders, and create a great hurdle for individuals, families, and countries.[1] LBP and NP are among the leading causes of the global burden of disease, and the global burden of these diseases has been increasing in recent years.[2] The onset and the prognosis of LBP and NP are associated with many demographic, psychological, and

TO CITE THIS ARTICLE:
Baygutalp F, Urak F, Bilgiç A, Kul A. Determination of the Risk Factors Related to Co-Occurrence of Low Back and Neck Pain Based on Gender in Türkiye. Turkiye Klinikleri Journal of Physical Medicine and Rehabilitation Sciences. 2025;28(1):38-47.

Correspondence: Fatih BAYGUTALP
Atatürk University Faculty of Medicine, Department of Physical Therapy and Rehabilitation, Erzurum, Türkiye
E-mail: drbaygutalp@gmail.com

Peer review under responsibility of Journal of Physical Medicine and Rehabilitation Science.

Received: 28 May 2024 ***Received in revised form:*** 17 Oct 2024 ***Accepted:*** 05 Nov 2024 ***Available online:*** 26 Nov 2024

social factors, such as aging, female gender, work-related factors, daily computer use time, lack of physical activity, mental disorders, alcohol consumption, family, and work problems; some of which are preventable.[3-5] Since these pains tend to become chronic, it is important to identify risk factors for different populations to enable prevention and early diagnosis.

In recent years, the relationship between these two diseases and gender has been the focus of the attention of researchers.6 Gender is a known risk factor for pain, and women generally experience more intense and prolonged physical pain.[6,7] Reasons such as fluctuations in the menstrual cycle, pregnancy, childbearing, raising children, and abdominal weight gain are the main features that distinguish women from men in terms of musculoskeletal diseases.[8] Studies referencing different layers of the population, for example, in working women in Norway and Sweden, in a national study of musculoskeletal disease burden in Spain, in China in approximately 14,000 adults under 60 years of age, and in Brazil that investigated the relationship of LBP and related factors with gender, found the prevalence of LBP to be higher in women.[9-12] In a systematic analysis including 195 countries in 2020, the global point prevalence, global annual incidence, and years of disability of NP were again found to be higher in women.[13]

Each disease is generally handled separately in the literature, and the possible relationship between its prevalence and risk factors is explained.[1,12] A limited number of studies on risk factors and gender differences have evaluated the burden of these two diseases together.[14,15] However, no study has considered the relationship between the prevalence of those who experience both, those who experience one of these two pains, and those who do not experience either, and the risk factors for individuals. In addition, the literature lacks studies that consider the existence of heterogeneity among family members. In the current study, the relationship between the 1-year prevalence of individuals without both diseases, with a single disease, and with both diseases in the past year and risk factors was statistically analyzed. By dividing the population into vertical (male and female) and horizontal strata (risk factors such as age, education-income level, obesity, and depression), the statistical relationship between the prevalence of sequentially determined burdens of these two diseases and the characteristics of individuals has been empirically demonstrated for the first time in the literature. In addition to controlling for the presence of heterogeneity, which includes genetic transmission between family members and unobservable behaviors such as motivation and reactions among family members, gender-based awareness was statistically elicited.

MATERIAL AND METHODS

DATA COLLECTION AND PARTICIPANTS

The face-to-face survey of the Turkish Statistical Institute (TSI) for 2019 consists of four parts ("basic characteristics of the household", "0-6 age group", "7-14 age group" and "15+ age group") using a computer-assisted face-to-face interview system. The "National Address Data (NAD)" base, which forms the basis of the "Address Based Population Registration System (ABPRS)", is used to reach families. The codes of the addresses in the NAD determine the addresses where at least one person is a permanent resident and simultaneously match the ABPRS. The data were collected using a two-stage stratified cluster sampling method. The first sampling unit is a cluster, while the second stage includes households. The first-stage sampling units comprised 947 clusters (94,700 families), each containing 100 families. In the second stage, 10 families were selected from each cluster; thus, the total sample size was 9,470. However, because some families did not participate in the survey by paying administrative fines and some families could not be reached in home at the time of the survey, a total of 8,325 families were interviewed, and a participation rate of 88% was obtained. Individuals aged 18 and over were included in the study, and individuals under 18 years of age were excluded. A total of 8,163 families with individuals aged 18 and over and 16,253 individuals were included in the study.

RISK FACTORS (DEMOGRAPHIC, SOCIOECONOMIC, AND PSYCHOLOGICAL FACTORS)

The definitions of these risk factors and their corresponding statistical values are presented in Table 1. Because the rate of heavy physical work status

TABLE 1: Descriptive statistics of all variables.

Variables	Frequency (n=16,253)	Percent	Frequency (n=16,253)	Percent	Frequency (n=16,253)	Percent
Discrete variables	**Full sample**		**Male**		**Female**	
Gender:						
Female (reference group)	8874	56.60	-	-	-	-
Male	7379	45.40	-	-	-	-
Age Categories:						
Age <30 (ref. group)	3361	20.68	1582	21.44	1779	20.05
30-44	5003	30.78	2237	30.32	2766	31.17
45-64	5432	33.42	2460	33.34	2971	33.48
Age >64	2457	15.12	1100	14.90	1358	15.30
Diseases						
Only LBP	2618	16.11	1145	15.52	1473	16.60
Only NP	1019	6.27	348	4.72	671	7.56
LBP or NP	3637	22.38	1478	20.03	2144	24.16
(only one disease from two)						
LBP and NP (both LBP and NP)	2781	17.11	732	9.92	2064	23.26
No LBP or no NP	9835	60.51	5169	70.05	4666	52.58
Marital Status:						
Never married	2794	17.19	1575	21.34	1218	13.73
Married (ref. group)	11712	72.06	5442	73.75	6271	70.66
Divorced/Spouse died	1747	10.75	362	4.91	1385	15.61
Education Levels:						
Not finishing a school (ref. group)	2174	13.38	384	5.20	1790	20.18
Primary school	5572	34.28	2489	33.73	3083	34.74
Secondary school	2223	13.68	1227	16.63	997	11.23
High school	3217	19.79	1701	23.05	1515	17.07
College	3067	18.87	1578	21.39	1489	16.78
Employment types:						
Working	6469	39.80	4436	60.12	2032	22.90
Job seeking	1588	9.77	980	13.28	608	6.85
Retired	2438	15.00	1788	24.23	651	7.33
Other employment type	5758	35.43	175	2.37	5584	62.93
(disabled people, housewives, housekeepers, and compulsory military service) (ref. group):						
Body mass index:						
Normal Weight (ref. group)	6456	39.72	2816	38.16	3638	41.00
Over weight	6012	36.99	3150	42.69	2862	32.25
Obese	2794	17.19	1150	15.59	1645	18.53
Over obese	991	6.10	263	3.56	729	8.22
Compulsory health insurance:						
Yes	14966	92.08	6682	90.55	8283	93.34
No (ref. group)	1287	7.92	687	9.45	591	6.66
Private health insurance:						
No (ref. group)	15634	96.19	7066	95.76	8568	96.55
Walking time:						
No (ref. group)	13529	83.24	5653	76.61	7876	88.75
Sports:						
No (ref. group)	15029	92.47	6615	89.65	8414	94.82
Resting:						
No (ref. group)	10459	64.35	4767	60.60	5692	64.14
Muscles building:						
No (ref. group)	15575	95.83	6800	92.15	-	-
No (ref. group)	14585	89.74	6913	93.68	7672	86.45

TABLE 1: Descriptive statistics of all variables *(contunied)*.

Variables	Frequency (n=16,253)	Percent	Frequency (n=16,253)	Percent	Frequency (n=16,253)	Percent
Discrete variables	**Full sample**	**Male**	**Female**			
Tobacco:						
No (ref. group)	8513	52.38	2161	29.29	6353	71.59
Alcohol:						
No (ref. group)	15400	94.75	6758	91.58	8641	97.37
Fruit consumption:						
No (ref. group)	1541	9.48	690	9.35	851	9.59
Vegetables consumption:						
No (ref. group)	624	3.84	330	4.47	295	3.32
Fruit juice:						
No (ref. group)	12266	75.47	5507	74.63	6750	76.06
Soft drink:						
No (ref. group)	10641	65.47	4396	59.57	6245	70.37
Depression:						
Yes	1668	10.26	466	6.32	1202	13.55
Income levels:						
Income <3,400 Turkish lira (₺) (ref. group)	7787	47.91	3299	44.71	4489	50.58
Income 3,400-6,900 ₺	5846	35.97	2790	37.81	3056	34.44
Income >6,900 ₺	2620	16.12	1280	17.48	1329	14.98
Household type::						
One-person household	1278	7.86	466	6.31	812	9.15
Couple without kids	2916	17.94	1418	19.22	1499	16.89
Other family type (ref. group)	12059	74.20	5495	74.48	6563	73.96
Regions:						
İstanbul	2090	12.86	945	12.81	1145	12.90
West Marmara	1732	10.66	799	10.83	934	10.53
East Marmara	763	4.70	358	4.85	405	4.56
Aegean	917	5.61	395	5.35	517	5.82
Mediterranean	1654	10.18	767	10.39	887	10.00
West Anatolia	385	2.37	155	2.10	230	2.59
Central Anatolia	2292	14.11	1059	14.35	1235	13.92
West Black Sea	1121	6.90	417	5.65	704	7.93
East Black Sea	3445	21.20	1657	22.46	1788	20.15
Southeastern Anatolia	684	4.21	295	4.00	391	4.40
Other Region (ref. group)	1170	7.20	532	7.21	638	7.20
Continuous variables						
Variable:	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
Numbers of kids aged 0-6	0.35	0.68	0.33	0.66	0.36	0.69
Numbers of kids aged 7-14	0.42	0.76	0.39	0.73	0.44	0.78
Numbers of adults	2.51	1.12	2.61	1.11	2.43	1.12

Ref: The category taken as reference for the relevant variable; SD: Standard deviation; LBP: Low back pain; NP: Neck pain.

among women was very low, this work variable was excluded from the analysis of women.

STATISTICAL MODEL

The dependent variable consists of disease burden as follows: those without LBP and NP, those with one, and those with both. This dependent variable consists of two basic questions that the subjects were asked about. In the questionnaire, questions such as "Have you experienced lumbar problems (LBP, herniated disc, and other low back diseases) in the last 12 months?" for LBP and "Have you experienced neck region problems (NP, neck hernia, and other neck diseases) in the last 12 months?" for NP were asked.

They cover nonspecific of these two diseases. Those who had one and those who had both were sequentially divided into three groups: those who did not have LBP and NP were coded as 0, those who had one were coded as 1, and those who had both were coded as 2.

Every individual 18 years and older in a family was questioned in terms of these two diseases. In this case, while families are included in one dimension as a cluster, some data types in which family members are included as subjects in the other dimension are longitudinal, defined as "panel data". Heterogeneity in family members is inevitable. Analyses that do not consider such family-specific heterogeneity with no observed counterfactuals lack many statistical features (such as bias, consistency, and efficacy of parameter estimates). In addition, because not every family has the same number of individuals, the present data have an unbalanced (unequal) panel structure. Because the family includes individuals aged 18 years and older, the burden of disease differs from individual to individual within the family, and the burden of disease also varies between families.

A wide range of independent variables were considered, including gender, age, marital status, education, employment, body mass index, health insurance, sports, occupation, tobacco, alcohol, walking, sports duration, fruit and vegetable consumption, depression, income status, child status, and geographical region of residence. The maximum likelihood estimates of the panel random-effects ordered probit model are presented in Table 2.

TABLE 2: Maximum likelihood estimates of the panel random-effects ordered probit model.

	Pooled sample		Male sample		Female sample	
Variables	**Coefficient*100**	**Prob.**	**Coefficient*100**	**Prob.**	**Coefficient*100**	**Prob.**
Constant	-27.572**	0.012	-23.492	0.235	-40.400**	0.004
			Individual characteristics			
Age 30-44	36.012**	0.000	16.640*	0.014	40.740**	0.000
Age 45-64	59.872**	0.000	36.846**	0.000	67.992**	0.000
Age >64	72.144**	0.000	45.040**	0.000	82.721**	0.000
Unmarried	-25.563**	0.000	-21.980**	0.033	-30.293**	0.000
Elementary school	-16.671**	0.000	-24.750**	0.002	-10.877**	0.011
Secondary school	-23.864**	0.000	-26.285**	0.003	-21.593**	0.000
High school	-29.790**	0.000	-30.797**	0.000	-28.918**	0.000
College	-33.466**	0.000	-35.089**	0.000	-32.343**	0.000
Working	1.845	0.585	-38.970**	0.000	7.507	0.063
Job seeking	-5.571	0.293	-43.973**	0.000	-4.651	0.564
Retired	-3.963	0.330	-35.024**	0.001	8.133	0.165
Overweight	16.606**	0.000	12.716**	0.001	18.655**	0.000
Obese	25.820**	0.000	19.761**	0.000	26.825**	0.000
Overobese	33.819**	0.000	42.952**	0.000	28.512**	0.000
Walking	-10.136**	0.001	-10.339*	0.014	-10.125*	0.029
Resting	5.920*	0.015	4.877	0.182	8.908**	0.005
Tobacco	6.358*	0.012	3.390	0.375	11.051**	0.001
Fruit consumption	-19.477**	0.000	-14.685*	0.013	-22.932**	0.000
Carbonated drinks	-6.097*	0.017	-4.353	0.246	-7.352*	0.027
Depression	62.613**	0.000	65.164**	0.000	62.144**	0.000
			Family characteristics			
Income >6,900	-5.317	0.191	-0.325	0.956	-12.257*	0.017
# of kids aged 0-6	-8.489	0.000	0.031	0.992	-12.102**	0.000
İstanbul	12.237**	0.028	28.569**	0.000	0.773	0.911
Eastern Marmara	-13.144	0.066	12.542	0.221	-31.160**	0.001
Aegean	20.509**	0.003	36.701**	0.000	10.083	0.226
Western Anatolia	10.428	0.235	30.693*	0.018	-3.305	0.757
Central Anatolia	-3.219	0.564	12.374	0.121	-13.678*	0.049
Eastern Black Sea	12.471*	0.020	27.504**	0.000	1.139	0.864
Threshold parameter (μ)	87.056	0.000	91.150**	0.000	84.041**	0.000
Sigma (σ)	51.182	0.000	47.575**	0.000	49.023**	0.000

**Statistically significant difference at 1% level; *Statistically significant difference at 5% level.

A crucial statistical test in the analysis of waist-neck burden prevalence is undoubtedly gender equality, that is, the test for equality of parameters of all risk factors between men and women. The likelihood ratio (LR) test was performed based on the log-likelihood values of the grouped and pooled samples to test this hypothesis. To obtain such test results, pooled data were first analyzed by applying the random-effects ordered probit model, and the log-likelihood value of the model was stored as LL, and the number of relevant parameters as kp. Then, the data were divided into male and female observations, and the random-effects ordered probit model was adapted to each data set. The likelihood values of each model were recorded as LLm and LLw, and the number of parameters for each model was recorded as km and kw, respectively. Then, the null hypothesis claiming that there is no gender-specific differential was tested by calculating the likelihood ratio (OO) test under χ^2 distribution and with (sd=km+kw-kp) degrees of freedom [OO test=2*(LLm+LLw-LLp)]. The OO test result rejected the null hypothesis, showing a significant difference in the prevalence of waist-neck disease burden in terms of gender differential (OO statistical value=11197.28, Sd=47, and p<0.0001). All results were obtained for "pain free", "single pain (NP and LBP)", and dual pain (NP & LBP) participants. Only results of dual pain (NP & LBP) are presented in Table 3 under the aim of the study, and in order not to create a large and complicated table. The unitary (or marginal) effects of risk factors on the prevalence of dual pain (NP & LBP) are presented in Table 3.

ETHICS APPROVAL

The study was approved by the TSI (authorization number: August 23, 2019/19496. The study was also approved by the Atatürk University Faculty of Medicine Ethics Committee (approval number: November 05, 2020/B.30.2.ATA.0.01.00

RESULTS

The descriptive statistics of all variables are presented in Table 1. A total of 45.40% (n=7,379) of 8,163 families and 16,253 individuals who were formed by individuals aged 18 and over were male, and 54.60% (n=8,874) were female. While 60.51% (n=9,835) of these individuals did not experience any of the two diseases in the last 12 months, 22.38% (n=3,637) experienced only one of the two diseases (16.11% of these patients had LBP, and 6.27% had NP) and 17.11% (n=2,781) of the subjects had both diseases. The 1-year prevalence of these two diseases was 39.49%. A total of 70.05% of the men had neither of the two diseases, 20.03% had a single disease, and 9.92% had a dual disease. A total of 52.58% of women had neither of these two diseases, 24.16% had a single disease, and 23.26% had both diseases. Compared with men, the burden of a single disease in women was 1.20 times that of men, and the burden of a double disease was 2.34 times higher. On the other hand, since both the pooled data and descriptive statistical values by gender for the independent variables are detailed in Table 1, they will not be detailed here.

A random-effects ordered probit regression model was used to demonstrate the determinants of LBP and NP in association with gender. The outputs of the regression model are presented in Table 2. The marginal effects of covariates on the different prevalences of male, female, and pooled samples are presented in Table 3.

All results were obtained for "pain free", "single pain (NP and LBP)", and dual pain (NP & LBP) participants. Only results of dual pain (NP & LBP) are presented in Table 3 under the aim of the study, and in order not to create a large and complicated table. The unitary (or marginal) effects of risk factors on the prevalence of dual pain (NP & LBP) are presented in Table 3 according to the coefficient and p values. All results are described and discussed in detail in the discussion section.

DISCUSSION

This is the first study to evaluate the prevalence of LBP and NP by sex in all regions of the Turkish population. In the Turkish population sample, the prevalence of NP alone in 1 year in 2019 was 6.27%, LBP alone was 16.11%, and both LBP and NP were 17.11%. A total of 39.49% of the samples were exposed to LBP and/or NP. The 1-year prevalence of NP was 34% in the British population, the 1-year

TABLE 3: Marginal effects of covariates on the different prevalences of male, female, and pooled samples.

	Pooled sample		Male sample		Female sample	
	Dual pain (NP & LBP)		Dual pain (NP & LBP)		Dual pain (NP & LBP)	
Variables	Coeff.*100	Coeff.*100	Coeff.*100	Coeff.*100	Coeff.*100	Coeff.*100
Individual characteristics						
Age 30-44	7.655**	0.000	2.400*	0.017	10.849***	0.000
Age 45-64	13.067**	0.000	5.518**	0.000	18.457***	0.000
Age >64	17.754**	0.000	7.546**	0.000	24.691***	0.000
Unmarried	-4.692**	0.000	-2.813*	0.021	-7.009***	0.000
Elementary school	-3.240**	0.000	-3.263**	0.001	-2.713***	0.010
Secondary school	-4.368**	0.000	-3.259**	0.001	-5.106***	0.000
High school	-5.436**	0.000	-3.847**	0.000	-6.772***	0.000
College	-6.020**	0.000	-4.288**	0.000	-7.498***	0.000
Working	0.368	0.585	-5.687**	0.001	1.925*	0.066
Job seeking	-1.087	0.282	-4.966**	0.000	-1.157	0.558
Retired	-0.779	0.323	-4.338**	0.000	2.107	0.176
Overweight	3.379**	0.000	1.782**	0.001	4.826***	0.000
Obese	5.565**	0.000	2.975**	0.000	7.191***	0.000
Over obese	7.699**	0.000	7.526**	0.000	7.820***	0.000
Walking	-1.955**	0.001	-1.383*	0.011	-2.481**	0.024
Sports time	-0.878	0.330	-1.490*	0.048	0.330	0.854
Resting	1.190*	0.016	0.681	0.186	2.271***	0.006
Tobacco	1.269*	0.012	0.465	0.371	2.841***	0.001
Fruit consumption	-4.176**	0.000	-2.188*	0.021	-6.183***	0.000
Carbonated drinks	-1.204*	0.016	-0.600	0.243	-1.836**	0.025
Comorbidity						
Depression	15.396**	0.000	12.500**	0.000	18.083***	0.000
Income >6,900	-1.042	0.183	-0.045	0.955	-2.995**	0.014
# of kids aged 0-6	-1.692**	0.000	0.001	-0.992	-3.057***	0.000
İstanbul	2.545*	0.035	4.503**	0.001	0.196	0.911
Western Marmara	-0.002	0.986	0.717	0.557	-0.785	0.663
Aegean	4.445**	0.006	6.181**	0.002	2.631	0.241
Western Anatolia	2.178	0.256	5.069*	0.042	-0.825	0.754
Central Anatolia	-0.635	0.559	1.809	0.140	-3.325**	0.040
Eastern Black Sea	2.571*	0.024	4.183**	0.001	0.288	0.865

*Statistically significant difference at 5% level; **Statistically significant difference at 1% level; ***Statistically significant difference at 0.1% level, Prob: Probability value; LBP: Low back pain; NP: Neck pain.

prevalence of LBP was 42.4% in Sweden, and the 1-year prevalence of LBP in Africa was 33% in adolescents and 50% in adults.[16-18]

In this study, the prevalence of dual pain increased as the age of individuals of both sexes increased. For example, when compared with individuals aged 30 years, >30 years, >45 years, and >65 years, the double disease burden increased significantly by 2.4%, 5.52%, and 7.55%, respectively. However, the prevalence of dual diseases has increased markedly in females than in males (10.85%, 18.46%, and 24.69%, respectively) (for all comparisons $p<0.05$). In this context, female individuals aged 65 years and over have a 3.27 times higher risk of contracting the dual disease than males, with a very differential potential. The findings are consistent with the literature. In a study investigating the global prevalence of LBP, LBP was found more frequently in elderly individuals and women.[19]

Compared with individuals who were married, the prevalence of unmarried (never married, widowed, or divorced) was significantly reduced in both men (2.81%) and women (7.01%) ($p<0.05$ for all comparisons). The incidence of dual disease was 2.49

times lower in unmarried women than in unmarried men. Similar findings have been reported in the literature, with unmarried men and women (never married, widowed, or divorced) having a lower prevalence of LBP than married men and women.[12-20] In another study, the risk of NP in singles was 76% less than that in married people.[21]

Our results showed that as the education level of individuals increases, the prevalence of dual pain. Particularly, as the education level of women increases, the prevalence of LBP. One study and three systematic reviews reported that LBP is less affected in individuals with higher education than in individuals with secondary or lower education.[22,23] Similar to the study findings, a previous study evaluating NP and LBP also found that subjects with lower education levels were more likely to develop NP and LBP.[19]

When the employment categories (disabled people, homemakers, cleaners, and those in compulsory military service) and employees were compared, a significant negative relationship was found between the likelihood of working men who have dual pain (5.69%), and a positive relationship was found between the active work of women and their probability of having dual pain (1.93%). Working women are 3.94 times more likely to have a dual illness than men. The findings are consistent with the literature results, in which acute and chronic diseases are more common in working women than in non-working women.[24] For men seeking a job, the odds of catching a single or dual illness were 7.34% and 4.97%, respectively, and for men who received a pension were 5.91% and 4.34%, respectively, less than those who did not ($p<0.05$ for all comparisons).

As the weight of individuals increases, the prevalence of dual disease increases significantly in both men and women. Compared with individuals with normal weight, the proportions of overweight, obese, and extremely obese males increased significantly by 1.78%, 2.96%, and 7.53%, respectively. The prevalence of dual pain was 7.75% in extremely obese men and 7.82% in extremely obese women. Excessive obesity increases the risk of developing dual pain at approximately the same rate in men and women. The relationship between obesity and LBP is well known, but it should be kept in mind that it also increases the risk of developing NP. The consensus supported by studies and systematic reviews is that obesity (body mass index >30 kg/m^2) is associated with musculoskeletal diseases, including chronic NP and LBP, and is directly related to chronic spinal pain (CSP).[25-29]

Compared with individuals who did not walk for more than one hour a day, a negative association was obtained between individuals walking for more than one hour a day and their probability of developing back and/or neck disease. Male and female patients had 1.38% and 2.48% lower risks of contracting dual pain, respectively. On the other hand, as the time (minutes) devoted to sports by male individuals per week increases, the prevalence of dual pain is significantly mitigated by 1.49% ($p<0.05$). The burden of carrying a double dual pain in women walking for more than 1 hour is approximately twice that of a single disease. Again, women who walk for more than an hour a day are 1.79 times less likely to contract the same disease than men. Considering the large number of studies investigating the relationship between LBP and walking and exercise, walking and exercise have a neutral or beneficial effect on the risk of LBP.[30,31] The coexistence of NP and LBP is associated with not performing physical exercise and obesity.[19]

The study found that the probability of catching dual pain was 0.47% in men who consumed tobacco and 2.84% in women compared with nonsmokers ($p<0.05$ for both comparisons). The risk of developing the dual pain among female smokers was 6 times higher among female smokers than among male smokers. The findings are consistent with the literature. In studies investigating risk factors in people with LBP and in a meta-analysis, the incidence of LBP was higher in smokers.[32-34]

As the consumption of one or more fruits per day increases in individuals, the prevalence of dual pain is significantly alleviated in both sexes. In this context, female individuals who consume one or more fruits per day have a 2.83 times lower risk of developing dual pain than males. On the other hand, women who consume carbonated beverages have a

significantly lower risk of developing dual pain (1.84%) than those who do not ($p<0.05$). These findings are also consistent with the literature. In a recent study, a higher daily consumption of fruits, whole grains, and dairy products was associated with a 20%-26% lower probability of CSP (for all trends $p<0.028$).[28]

As the socioeconomic level of women increases, the probability of carrying dual pain decreases. As the monthly income of women increases, the probability of developing a dual-pain decreases by 2.2 times compared with the probability of developing a single disease. A study conducted on a population over the age of 65 found that low socioeconomic status was associated with high LBP.[22] On the other hand, as the number of children aged 0-6 years increased in the family, the probability of developing dual pain among women decreased significantly by 3.06% ($p<0.05$). A previous study reported that LBP was linearly associated with being married and increasing the number of children.[20]

Compared with male individuals living in the Eastern Anatolian region, the prevalence of dual pain in males living in the İstanbul, Aegean, Mediterranean, Western Anatolian, and Eastern Black Sea regions was significantly higher. These results are consistent with the literature. These findings may be associated with the lower socioeconomic level and education level of those living in Eastern Anatolia in interregional comparisons in Türkiye.[35] There was also a significant positive relationship between the probability of both male and female individuals having depression and the probability of developing dual pain. Women with depression were 1.5 times more likely to have dual pain. There is increasing evidence that pain increases the risk of depression. Depression is a strong and independent predictor of the onset of episodes of intense and/or disabling of these two diseases.[36] In another study, depression and somatization disorder had a significantly positive association with LBP.[37] According to a systematic review, initial symptoms of depression were found to worsen the prognosis of LBP.[38]

This study has limitations. The survey conducted by the TSI asked participants whether they had LBP or NP in the last 12 months. A detailed medical history including the causes of persistent back/NP (past musculoskeletal system operations, spondyloarthropathy, etc.) was not obtained from the participants.

CONCLUSION

The evidence for general personal risk factors for LBP and NP, which are important components of the global burden of these diseases, was synthesized, and the determinants of the co-existence of these two pains in terms of gender were indicated. Putting these modifiable personal risk factors with quantitative values in terms of gender differentials will help to develop appropriate and dynamic health policies to alleviate disability and contribute to their treatment.

Suggestions such as physical activity, consumption of fruits, quitting smoking, reaching a healthy weight, and treating depression will be effective in the prevention of LBP and NP as well as in the prevention of many chronic diseases. To prevent these two diseases from becoming chronic and causing disability, detailed risk factors should be shared with the patient to facilitate treatment.

Acknowledgements

We thank the Turkish Statistical Institute for providing the data. Inferences in the text belong to the authors, not necessarily reflecting the view point of the Institution.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

REFERENCES

1.Fehrmann E, Tuechler K, Kienbacher T, et al. Comparisons in muscle function and training rehabilitation outcomes between avoidance-endurance model subgroups. Clin J Pain. 2017;33:912-20. [Crossref] [PubMed]

2.GBD 2016 Disease and Injury Incidence and Prevalence Collaborators. Global, regional, and national incidence, prevalence, and years lived with disability for 328 diseases and injuries for 195 countries, 1990-2016: a systematic analysis for the Global Burden of Disease Study 2016. Lancet. 2017;390:1211-59. Erratum in: Lancet. 2017;390:e38. [PubMed] [PMC]

3.Dunn KM, Hestbaek L, Cassidy JD. Low back pain across the life course. Best Pract Res Clin Rheumatol. 2013;27:591-600. [Crossref] [PubMed]

4.Hogg-Johnson S, van der Velde G, Carroll LJ, et al. The burden and determinants of neck pain in the general population: results of the Bone and Joint Decade 2000-2010 Task Force on Neck Pain and Its Associated Disorders. J Manipulative Physiol Ther. 2009;32:S46-60. [PubMed]

5.Haldeman S, Carroll L, Cassidy JD. Findings from the bone and joint decade 2000 to 2010 task force on neck pain and its associated disorders. J Occup Environ Med. 2010;52:424-7. [Crossref] [PubMed]

6.Fillingim RB, King CD, Ribeiro-Dasilva MC, et al. Sex, gender, and pain: a review of recent clinical and experimental findings. J Pain. 2009;10:447-85. [Crossref] [PubMed] [PMC]

7.Glambek M, Nielsen MB, Gjerstad J, et al. Gender differences in the relationship between workplace bullying and subjective back and neck pain: a two-wave study in a Norwegian probability sample. J Psychosom Res. 2018;106:73-5. [Crossref] [PubMed]

8.Wijnhoven HA, de Vet HC, Picavet HS. Prevalence of musculoskeletal disorders is systematically higher in women than in men. Clin J Pain. 2006;22:717-24. [Crossref] [PubMed]

9.Ihlebaek C, Hansson TH, Laerum E, et al. Prevalence of low back pain and sickness absence: a "borderline" study in Norway and Sweden. Scand J Public Health. 2006;34:555-8. [Crossref] [PubMed]

10.Carmona L, Ballina J, Gabriel R, et al; EPISER Study Group. The burden of musculoskeletal diseases in the general population of Spain: results from a national survey. Ann Rheum Dis. 2001;60:1040-5. [Crossref] [PubMed]

11.Barrero LH, Hsu YH, Terwedow H, et al. Prevalence and physical determinants of low back pain in a rural Chinese population. Spine (Phila Pa 1976). 2006;31:2728-34. [Crossref] [PubMed]

12.Bento TPF, Genebra CVDS, Maciel NM, et al. Low back pain and some associated factors: is there any difference between genders? Braz J Phys Ther. 2020;24:79-87. [Crossref] [PubMed] [PMC]

13.Safiri S, Kolahi AA, Hoy D, et al. Global, regional, and national burden of neck pain in the general population, 1990-2017: systematic analysis of the Global Burden of Disease Study 2017. BMJ. 2020;368:m791. [Crossref] [PubMed] [PMC]

14.Angst F, Angst J, Ajdacic-Gross V, et al. Epidemiology of back pain in young and middle-aged adults: a longitudinal population cohort survey from age 27-50 years. Psychosomatics. 2017;58:604-13. [Crossref] [PubMed]

15.Shariat A, Cardoso JR, Cleland JA, et al. Prevalence rate of neck, shoulder and lower back pain in association with age, body mass index and gender among Malaysian office workers. Work. 2018;60:191-9. [Crossref] [PubMed]

16.Louw QA, Morris LD, Grimmer-Somers K. The prevalence of low back pain in Africa: a systematic review. BMC Musculoskelet Disord. 2007;8:105. [Crossref] [PubMed] [PMC]

17.Palmer KT, Walker-Bone K, Griffin MJ, et al. Prevalence and occupational associations of neck pain in the British population. Scand J Work Environ Health. 2001;27:49-56. [Crossref] [PubMed]

18.Bergman S, Herrström P, Högström K, et al. Chronic musculoskeletal pain, prevalence rates, and sociodemographic associations in a Swedish population study. J Rheumatol. 2001;28:1369-77. [PubMed]

19.Fernández-de-Las-Peñas C, Alonso-Blanco C, Hernández-Barrera V, et al. Has the prevalence of neck pain and low back pain changed over the last 5 years? A population-based national study in Spain. Spine J. 2013;13:1069-76. [Crossref] [PubMed]

20.Kääriä S, Laaksonen M, Rahkonen O, et al. Risk factors of chronic neck pain: a prospective study among middle-aged employees. Eur J Pain. 2012;16:911-20. [Crossref] [PubMed]

21.Zick SM, Murphy SL, Colacino J. Association of chronic spinal pain with diet quality. Pain Rep. 2020;5:e837. [Crossref] [PubMed] [PMC]

22.Ikeda T, Sugiyama K, Aida J, et al. Socioeconomic inequalities in low back pain among older people: the JAGES cross-sectional study. Int J Equity Health. 2019;18:15. [Crossref] [PubMed] [PMC]

23.Meucci RD, Fassa AG, Faria NM. Prevalence of chronic low back pain: systematic review. Rev Saude Publica. 2015;49:1. [Crossref] [PubMed] [PMC]

24.Ahmad-Nia S. Women's work and health in Iran: a comparison of working and non-working mothers. Soc Sci Med. 2002;54:753-65. [Crossref] [PubMed]

25.Van Nieuwenhuyse A, Crombez G, Burdorf A, et al; BelCoBack Study Group. Physical characteristics of the back are not predictive of low back pain in healthy workers: a prospective study. BMC Musculoskelet Disord. 2009;10:2. [Crossref] [PubMed] [PMC]

26.Silman AJ, Ferry S, Papageorgiou AC, et al. Number of children as a risk factor for low back pain in men and women. Arthritis Rheum. 1995;38:1232-5. [Crossref] [PubMed]

27.Dario AB, Ferreira ML, Refshauge KM, et al. The relationship between obesity, low back pain, and lumbar disc degeneration when genetics and the environment are considered: a systematic review of twin studies. Spine J. 2015;15:1106-17. [Crossref] [PubMed]

28.Madadizadeh F, Vali L, Rafiei S, et al. Risk factors associated with musculoskeletal disorders of the neck and shoulder in the personnel of Kerman University of Medical Sciences. Electron Physician. 2017;9:4341-8. [Crossref] [PubMed] [PMC]

29.Meucci RD, Fassa AG, Paniz VM, et al. Increase of chronic low back pain prevalence in a medium-sized city of southern Brazil. BMC Musculoskelet Disord. 2013;14:155. [Crossref] [PubMed] [PMC]

30.Hendrick P, Te Wake AM, Tikkisetty AS, et al. The effectiveness of walking as an intervention for low back pain: a systematic review. Eur Spine J. 2010;19:1613-20. [Crossref] [PubMed] [PMC]

31.Shiri R, Coggon D, Falah-Hassani K. Exercise for the prevention of low back pain: systematic review and meta-analysis of controlled trials. Am J Epidemiol. 2018;187:1093-101. [Crossref] [PubMed]

32.Yang H, Haldeman S. Behavior-related factors associated with low back pain in the US adult population. Spine (Phila Pa 1976). 2018;43:28-34. [Crossref] [PubMed]

33.Shemory ST, Pfefferle KJ, Gradisar IM. Modifiable risk factors in patients with low back pain. Orthopedics. 2016;39:e413-6. [Crossref] [PubMed]

34.Shiri R, Karppinen J, Leino-Arjas P, et al. The association between smoking and low back pain: a meta-analysis. Am J Med. 2010;123:87.e7-35. [Crossref] [PubMed]

35.Sahin İ, Gümez Y. Efficiency of education: the case in eastern and south-eastern Turkey. Social Indicators Research. 2000;49:213-36. [Crossref]

36.Carroll LJ, Cassidy JD, Côté P. Depression as a risk factor for onset of an episode of troublesome neck and low back pain. Pain. 2004;107:134-9. [Crossref] [PubMed]

37.Robertson D, Kumbhare D, Nolet P, et al. Associations between low back pain and depression and somatization in a Canadian emerging adult population. J Can Chiropr Assoc. 2017;61:96-105. [PubMed] [PMC]

38.Pinheiro MB, Ferreira ML, Refshauge K, et al. Symptoms of depression as a prognostic factor for low back pain: a systematic review. Spine J. 2016;16:105-16. [Crossref] [PubMed]