Original Article

The epidemiology of osteoporosis in Türkiye: A comprehensive analysis using the e-Nabız database

Mustafa Mahir Ülgü[1] [iD], Şuayıp Birinci[2] [iD]

[1]Ministry of Health of Türkiye, Acting Director-General, Ankara, Türkiye
[2]Ministry of Health of Türkiye, Vice-Minister, Ankara, Türkiye

ABSTRACT

Objectives: The study aimed to define the epidemiology of osteoporosis and low bone mass based on bone mineral density at the femoral neck and the lumbar spine in adults 50 years and older in Türkiye.

Patients and methods: The retrospective study included all patients diagnosed with osteoporosis with a bone mineral density scan between January 2016 and May 2023 in the e-Nabız database, a government-run online healthcare database including over 68 million of active users. The data was categorized according to patient demographics, presentation age (0-17, 18-64, and >65 years), geographic regions, and healthcare levels.

Results: A total of 4,253,039 patients (723,863 [17.0%] males, 3,529,176 [83.0%] females) were diagnosed with osteoporosis. Of the patients, 2,432,607 (57.2%) belonged to the 18-64 years age group, 1,783,690 (41.9%) were in the >65 years group, and 36,742 (0.9%) were in the 0-17 years group. The mean age at presentation was 61.1±14.4 (range, 0 to 110) years. The Marmara region had the highest number of cases with 1,330,325 (31.3%), and the Aegean region had the lowest with 194,009 (4.6%). Istanbul had the highest rate of osteoporosis as a province (18.4%), followed by Ankara (7.5%). The lowest rates were recorded in Bayburt (0.0%) and Tunceli (0.1%), respectively.

Conclusion: Registry studies provide reliable information in epidemiological studies. In this study, the first of its kind in Türkiye, we reported the geographical distribution of osteoporosis. As expected, there were more osteoporosis patients in the more densely populated areas of the country. Secondary and tertiary care centers had more entries compared to primary care centers. The annual incidence of osteoporosis showed a declining trend over the years.

Keywords: Big data, national health, osteoporosis.

Osteoporosis is a disease defined by low bone mineral density (BMD), which commonly affects postmenopausal women and the elderly population. It is a cause of preventable hospital admissions, surgeries, and patient mortality as a result of fragility fractures. As the worldwide population continues to age, the burden of osteoporosis on the population and healthcare systems is expected to become heavier in the upcoming decades. According to the National Center of Health Statistics (NCHS) report collected from the National Health and Nutrition Examination Survey data, the prevalence of osteoporosis at the femoral neck, lumbar spine, or both was 12.6% in the USA (19.6% in females and 4.4% in males) in

2017-2018.[1] A registry study showed an osteoporosis rate of 3.09% and a fragility fracture rate of 4.86% among inpatient admissions in the USA in 2014.[2] To analyze the public health effects of this common diagnosis more accurately, similar registry studies with large populations are invaluable.

Despite having historically lower osteoporosis rates compared to other European countries due to its relatively younger population, Türkiye has been experiencing an increase in the incidence of this disease in the last 20 years.[3] A population-based survey study revealed an estimate of approximately 24,000 hip fractures in Türkiye in 2009 and predicted

Cite this article as: Ülgü MM, Birinci Ş. The epidemiology of osteoporosis in Türkiye: A comprehensive analysis using the e-Nabız database. Turk J Phys Med Rehab 2024;70(1):47-52. doi: 10.5606/tftrd.2024.13505.

64,000 cases in 2035 with the maintenance of the demographic trends.[4] A more recent systematic review conducted in 2019 showed a five-year expectation of 1.35 million fragility fractures in Türkiye with a cost of 2.42 billion USD.[5] They also found that osteoporosis was undertreated despite most patients getting diagnosed early in the disease course, as >75% of high-risk patients failed to undergo appropriate treatment. Currently, there are no nationwide registry studies that report the incidence and prevalence of osteoporosis in Türkiye.

The advent of e-Nabız, a government-run online healthcare database of medical records, has allowed patients and care providers to access healthcare information remotely. This platform records the diagnoses of all the patients registered in the national healthcare system in Türkiye.[6] Registry studies can be performed by querying International Classification of Diseases (ICD) codes and other pertinent information in the database. The aim of our study was to define the epidemiology of osteoporosis and low bone mass based on BMD at the femoral neck and the lumbar spine in adults 50 years and older in Türkiye.

PATIENTS AND METHODS

In this retrospective study, the data was collected from the e-Nabız database, a nationwide medical records system designed to provide online access to healthcare information for patients (both Turkish and foreign citizens) treated in hospitals affiliated with the Turkish Ministry of Health.[6] At the time of writing this manuscript, the number of registrants in this system was over 68 million. Patients who presented to healthcare facilities between January 2016 and May 2023 were included in the study population. The database was queried for diagnoses of osteoporosis using the ICD codes based on the previously recorded entries. The ICD codes M80 (osteoporosis with pathological fracture), M81 (osteoporosis without pathological fracture), and M82 (osteoporosis in diseases classified elsewhere) and their subcategories were filtered out from the dataset. Each entry corresponded to one patient, and repeating ICD code recordings of individuals were not counted as separate diagnoses. Since osteoporosis is diagnosed with BMD measurement with dual-energy X-ray absorptiometry, patients without BMD measurements were excluded from the study.

The population was divided into three groups according to the age at presentation (0-17, 18-64, and

>65 years). The number of males and females were recorded. Basic health information, such as body mass index (BMI), and the number of BMD measurements were collected from the dataset. The incidence of osteoporosis was compared by the geographical regions of Türkiye: Marmara (MA), Central Anatolia, Black Sea, Aegean, Mediterranean, Southeastern Anatolia, and Eastern Anatolia (EA). The data was further categorized based on the setting/level of healthcare and treatment with/without surgery.

Statistical analysis

Data were analyzed using IBM SPSS version 25.0 software (IBM Corp., Armonk, NY, USA). Frequency and percentage statistics were used for descriptive measures.

RESULTS

Between the query dates of January 2016 and May 2023, a total of 4,253,039 patients were extracted from the data source. Of these, 723,863 (17.0%)

TABLE 1		
The annual cases of osteoporosis		
Years	n	%
2016	81,3149	19.1
2017	79,1532	18.6
2018	67,8274	15.9
2019	62,0238	14.6
2020	34,4647	8.1
2021	35,9562	8.5
2022	43,0559	10.1
2023	21,5078	5.1
Total	42,53039	100.0

TABLE 2		
Distribution of osteoporosis by geographical region		
Geographical Region	n	%
Marmara	1,330,325	31.3
Central Anatolia	707,544	16.6
Aegean	682,934	16.1
Mediterranean	595,543	14.0
Black Sea	478,711	11.3
Southeastern Anatolia	258,698	6.1
Eastern Anatolia	194,009	4.6
Missing information	5,275	0.1
Total	4,253,039	100.0

TABLE 3 Distribution of osteoporosis by provinces					
Province	n	%	Province	n	%
İstanbul	782,769	18.4	Niğde	25,341	0.6
Ankara	320,350	7.5	Osmaniye	24,933	0.6
İzmir	268,048	6.3	Uşak	27,314	0.6
Antalya	160,323	3.8	Adıyaman	21,558	0.5
Bursa	158,933	3.7	Bolu	23,368	0.5
Mersin	119,991	2.8	Burdur	19,781	0.5
Adana	109,011	2.6	Düzce	20,717	0.5
Konya	101,673	2.4	Kastamonu	22,947	0.5
Manisa	97,122	2.3	Kırıkkale	20,968	0.5
Aydın	87,105	2	Yalova	19,650	0.5
Gaziantep	86,679	2	Amasya	15,342	0.4
Balıkesir	82,497	1.9	Karaman	16,218	0.4
Denizli	81,329	1.9	Rize	16,640	0.4
Hatay	81,283	1.9	Yozgat	17,067	0.4
Kocaeli	80,218	1.9	Ağrı	11,652	0.3
Samsun	79,936	1.9	Aksaray	13,237	0.3
Eskişehir	61,789	1.5	Bartın	10,725	0.3
Diyarbakır	60,788	1.4	Batman	10,822	0.3
Kayseri	57,296	1.3	Bilecik	12,418	0.3
Muğla	55,568	1.3	Karabük	14,558	0.3
Ordu	53,510	1.3	Kırşehir	13,976	0.3
Sakarya	52,645	1.2	Nevşehir	12,567	0.3
Tekirdağ	49,346	1.2	Sinop	14,557	0.3
Kahramanmaraş	44,349	1.00	Artvin	9,726	0.2
Tokat	43,053	1.00	Bingöl	8,232	0.2
Trabzon	41,744	1.00	Çankırı	10,194	0.2
Zonguldak	43,143	1.00	Erzincan	10,521	0.2
Çanakkale	36,553	0.9	Iğdır	8,596	0.2
Sivas	36,868	0.9	Kars	7,764	0.2
Afyonkarahisar	34,423	0.8	Muş	6,637	0.2
Erzurum	34,782	0.8	Şırnak	8,503	0.2
Isparta	35,872	0.8	Other	5,275	0.1
Kütahya	32,025	0.8	Ardahan	3,122	0.1
Malatya	34,424	0.8	Bitlis	5,447	0.1
Şanlıurfa	33,506	0.8	Gümüşhane	5,276	0.1
Çorum	30,801	0.7	Hakkari	6,069	0.1
Edirne	30,646	0.7	Kilis	4,273	0.1
Giresun	30,978	0.7	Siirt	6,020	0.1
Van	28,092	0.7	Tunceli	2,671	0.1
Elazığ	26,000	0.6	Bayburt	1,690	0.0
Kırklareli	24,650	0.6	*Total*	4,253,039	100.0
Mardin	26,549	0.6			

were males, and 3,529,176 (83.0%) were females. Of the patients, 2,432,607 (57.2%) belonged to the 18-64 years group, 1,783,690 (41.9%) were in the >65 years group, and 36,742 (0.9%) were in the 0-17 years group. Six patients in the registry were classified as newborns. The mean age at presentation was 61.1±14.4 (range, 0 to 110) years, and the median age was 62 years. Of the participants, 14,122 (0.3%) were foreign nationals. The mean BMI was 29.12±5.48 kg/m² (range, 15 to 60). The highest annual incidence was observed in 2016 with 813,149 (19.1%) presentations per year, and incidences showed an overall trend of decrease over the years (Table 1). Marmara had the highest number of cases with 1,330,325 (31.3%), and EA had the lowest with 194,009 (4.6%; Table 2). Istanbul had the highest rate of osteoporosis as a province (18.4%), followed by Ankara (7.5%). The lowest rates were recorded in Bayburt (0.0%) and Tunceli (0.1%), respectively (Table 3).

The most common ICD code recorded in the registry was M81.8, with 1.609.704 (37.85%). Other osteoporosis without current pathological fracture category is attached (Table 4). In the same category, the code was followed by M81.0 with 960,447 (22.58%), M81.9 with 769,837 (18,10%), M81 with 422,216 (9.93%), and M81.05 with 138,788 entries (3.26%). The code M80 had 137,751 entries (3.24%). These were followed by M80.8 and M81.4 with 51,749 (1.22%) and 47.983 entries (1.13%), respectively. The majority of

the records were logged in at secondary and tertiary care centers (47.9%), followed by primary care centers (34.2%; Table 5).

DISCUSSION

Nationwide registry studies provide a reliable source of information to illustrate the epidemiological investigation of diseases in the population of a country. The present study evaluated the distribution of osteoporosis over different geographical areas in Türkiye. According to the most recent official census data by the Turkish Statistical Institute, the population of Türkiye was announced as 85,279,553.[7] In this preliminary study, we found 4,253,039 patients with osteoporosis, which corresponds to 4.9% of the country's population. The size of the study population we derived our data from and the number of osteoporosis patients filtered out from the dataset allowed the study results to be noteworthy for the international research community, as well as the Turkish society.

According to our findings, the prevalence of osteoporosis in Türkiye is 4.9%. In a recent study, the prevalence of lumbar spine osteoporosis in Japan was estimated to be 9.7% (1.4% of males, 13.9% of females).[8] The 2012 NCHS reported the prevalence of osteoporosis as 9% in either the femoral neck or the lumbar spine regions in adults over 50 years in the USA.[9] Although these countries showed higher prevalence figures, Türkiye has a relatively younger population, which might explain a lower rate. As a city from a neighboring country with a similarly young population, the prevalence in Tehran was 4% in a survey study conducted on 45,990 adults

TABLE 4 Distribution of osteoporosis by ICD codes		
	n	%
M81.8	1,609,704	37.85
M81.0	960,447	22.58
M81.9	769,837	18.10
M81	422,216	9.93
M81.5	138,788	3.26
M80	137,751	3.24
M80.8	51,749	1.22
M81.4	47,983	1.13
M80.5	44,752	1.05
M80.9	16,372	0.38

M81.8 : Other osteoporosis without current pathological fracture
M81.0 : Postmenopausal osteoporosis
M81.9 : Osteoporosis, unspecified
M81   : Osteoporosis without pathological fracture
M81.5 : Idiopathic osteoporosis
M80   : Osteoporosis with pathological fracture
M80.8 : Other osteoporosis with pathological fracture

TABLE 5 Distribution of osteoporosis by healthcare center		
Healthcare center	n	%
Secondary and tertiary care center	2,038,410	47.9
Primary care center	1,455,766	34.2
Private hospital	465,045	10.9
University hospitals	157,596	3.7
Private clinics	75,159	1.8
Private and public universities	36,321	0.9
Other private	10,382	0.2
Other	8,008	0.2
Missing information	5,329	0.1
Hidden	1,023	0.0
Total	4,253,039	100.0

over 20 years.[10] Based on a previous survey study conducted on 26,424 Turkish citizens over age 50, the prevalence of femoral neck osteoporosis was estimated as 7.5% in males and 33.3% in females.[4] Of note, the same study reported a 3.3% prevalence in the age group of 50-54, closer to the overall prevalence of osteoporosis in our results. Although middle-income countries may show lower rates of osteoporosis due to shorter life expectancy, there can be exceptions. A survey study reported the prevalence of osteoporosis in the Chinese population over 40 years as 16.1%, a higher percentage contrary to Iran and Türkiye.[11]

Istanbul was the province with the highest number of osteoporosis patients, followed by Ankara, according to the results of this study. Similarly, MA had the highest number as a geographical region. These findings were in line with our expectations as those are the most populated areas in Türkiye. In contrast, Tunceli and Bayburt, the two provinces with the smallest populations, had the lowest prevalence. A rather unexpected finding in this study was the predominance of the diagnostic records from advanced care centers (secondary and tertiary). The failure to place primary care centers as the initial point of diagnosis for osteoporosis may cause problems in the management of more complicated diseases due to overloading advanced care centers. It may also lead to underdiagnosis due to potential accompanying diseases or acute conditions that may divert the attention of physicians and overshadow osteoporosis. Therefore, more resources should be allocated to preventive medicine to achieve a more efficient and comprehensive healthcare system.

The incidence of osteoporosis in Türkiye showed a declining trend over the years. A study from Taiwan showed an increase in prevalence between 2008 and 2015, followed by a plateau until 2019.[12] However, they noted that the age-standardized incidence of osteoporosis and fracture rates decreased remarkably from 2008 to 2019. A Japanese study also reported a declining trend of osteoporosis prevalence between 2005 and 2015.[8] The main reasons thought to be behind this trajectory around the world are government programs and healthcare initiatives aimed at preventing osteoporosis, increased awareness of the disease in populations, and improved calcium intake. Although a falling incidence is a favorable metric, healthcare providers should remain vigilant when encountering an osteoporosis patient. Data from the

National Health and Nutrition Examination Survey in the USA showed a decrease in the prescription of antiresorptive medications between 2008 and 2018, particularly bisphosphonates.[13] This may indicate less optimal care in the management of postmenopausal women over time and should be a warning sign for physicians who are regularly involved in the treatment of this demographic.

There are some limitations to this study. Although we reported the annual incidence of osteoporosis via the registry data, patients who had diagnoses before the study interval were also counted as newer diagnoses, thereby distorting and potentially increasing the incidence values in our report. This might have also affected the trend over the years by allowing more individual entries in the first years. Regardless, the study provides invaluable insight into the epidemiology of osteoporosis, as it is the first registry-based osteoporosis study in Türkiye. The number of official records that are reported in this study is unique in the entire medical literature, a notable strength that would pioneer further studies in the future.

In conclusion, despite a notable decline in the age-standardized incidence of osteoporosis and fracture rates from 2016 to 2023, our data emphasize the continuous disparity in diagnosis and treatment across different provinces. This analysis sets the stage for a national dialogue on osteoporosis, calling for targeted public health interventions, enhanced screening procedures, and further research to better understand the underlying factors leading to these geographical and sex disparities. The findings may catalyze policy reforms and medical practices, enabling more precise and equitable healthcare delivery for osteoporosis patients across Türkiye.

REFERENCES

1. Sarafrazi N, Wambogo EA, Shepherd JA. Osteoporosis or low bone mass in older adults: United States, 2017-2018. NCHS Data Brief 2021;405:1-8.

2. Dhital R, Lynn T, Tachamo N, Poudel DR. The trend of osteoporosis and osteoporotic fragility fractures in inpatients: Results from a national database. J Community Hosp Intern Med Perspect 2019;9:211-4. doi: 10.1080/20009666.2019.1618660.

3. Kirazlı Y, Atamaz Çalış F, El Ö, Gökçe Kutsal Y, Peker Ö, Sindel D, et al. Updated approach for the management of osteoporosis in Turkey: A consensus report. Arch Osteoporos 2020;15:137. doi: 10.1007/s11657-020-00799-0.

4. Tuzun S, Eskiyurt N, Akarirmak U, Saridogan M, Senocak M, Johansson H, et al. Incidence of hip fracture and prevalence of osteoporosis in Turkey: The FRACTURK study. Osteoporos Int 2012;23:949-55. doi: 10.1007/s00198-011-1655-5.

5. Aziziyeh R, Garcia Perlaza J, Saleem N, Kirazlı Y, Akalın E, McTavish RK, et al. The burden of osteoporosis in Turkey: A scorecard and economic model. Arch Osteoporos 2020;15:128. doi: 10.1007/s11657-020-00801-9.

6. Birinci Ş. A digital opportunity for patients to manage their health: Turkey National Personal Health Record System (The e-Nabız). Balkan Med J 2023;40:215-21. doi: 10.4274/balkanmedj.galenos.2023.2023-2-77.

7. TUIK Türkiye Statistics Institution. Address Based Population Registration System Results, 2022. Available at: https://data.tuik.gov.tr/Bulten/Index?p=49685. [Accessed: 05.07.2023]

8. Yoshimura N, Iidaka T, Horii C, Muraki S, Oka H, Kawaguchi H, et al. Trends in osteoporosis prevalence over a 10-year period in Japan: The ROAD study 2005-2015. J Bone Miner Metab 2022;40:829-38. doi: 10.1007/s00774-022-01352-4.

9. Looker AC, Borrud LG, Dawson-Hughes B, Shepherd JA, Wright NC. Osteoporosis or low bone mass at the femur neck or lumbar spine in older adults: United States, 2005-2008. NCHS Data Brief 2012;93:1-8.

10. Asadi-Lari M, Salimi Y, Vaez-Mahdavi MR, Faghihzadeh S, Haeri Mehrizi AA, Jorjoran Shushtari Z, et al. Socio-economic status and prevalence of self-reported osteoporosis in Tehran: Results from a large population-based cross-sectional study (Urban HEART-2). J Urban Health 2018;95:682-90. doi: 10.1007/s11524-018-0246-6.

11. Li N, Ou P, Zhu H, Yang D, Zheng P. Prevalence rate of osteoporosis in the mid - aged and elderly in selected parts of China. Chin Med J (Engl) 2002;115:773-5.

12. Lee MT, Fu SH, Hsu CC, Chen HM, Lin JW, Tsai KS, et al. Epidemiology and clinical impact of osteoporosis in Taiwan: A 12-year trend of a nationwide population-based study. J Formos Med Assoc 2023;S0929-6646(23)00152-3. doi: 10.1016/j.jfma.2023.05.001.

13. LeBoff MS, Greenspan SL, Insogna KL, Lewiecki EM, Saag KG, Singer AJ, et al. The clinician's guide to prevention and treatment of osteoporosis. Osteoporos Int 2022;33:2049-102. doi: 10.1007/s00198-021-05900-y.