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The burden of neck pain among adults aged 70 years and older in Iran, 1990–2019

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Abstract

Background: Neck pain is a complex musculoskeletal disorder that can result in substantial morbidity. The present article presents the neck pain burden in Iranians who were at least 70 years old, from 1990 to 2019, by sex, age group, and province.

Methods: Publicly available information on the prevalence, incidence, and years lived with disability (YLD) caused by neck pain was extracted from the Global Burden of Disease study 2019. The estimates were all provided as counts and age-standardized rates (per 100,000), and included 95% uncertainty intervals.

Results: The point prevalence of neck pain in 2019 was 8710.6, while the incidence rate was 1334.7 per 100,000 population. That same year, there were number of 27.8 thousand YLDs and an YLD rate of 801.7 per 100,000. The prevalence, incidence, and YLD rates did not change substantially over the measurement period (1990–2019). The highest YLD rate was found in Tehran (960.9 per 100,000), while Kohgiluyeh and Boyer-Ahmad had the lowest (730.5 per 100,000). Females had slightly higher prevalent cases, incident cases, and YLDs, as well as their corresponding rates in 2019. In 2019, the number of prevalent cases, incident cases, and YLDs peaked in the 70–74 age group, for both sexes, and in all cases they reduced with age. In both 1990 and 2019, Iran had a higher YLD rate than that found among elderly adults in the Middle East and North Africa region.

Conclusions: The burden of neck pain in Iran has decreased slightly over the last three decades, but it still imposes a substantial burden and is higher than that found in the rest of the region. Therefore, preventive programs should be initiated at a young age to reduce the attributable burden later in life.

KEYWORDS

elderly adults, epidemiology, global burden of disease, Iran, neck pain, years lived with disability

1 | INTRODUCTION

Neck pain is a relatively common and debilitating musculoskeletal disorder that has been associated with a broad range of biological (e.g., sex and age) and psychological (e.g., sleep problems and depression) risk factors.[1] In a study of community-dwelling adults in Iran, the researchers found that 15.3% of the participants had chronic neck pain.[2] In 2017, neck pain accounted for the second largest (21.7%) proportion of musculoskeletal-related disability-adjusted life-years (DALYs) in Iran, with only low back pain being larger (50.1%).[3] The direct and indirect costs associated with neck pain are substantial.[4] In 2016, the combination of neck pain and lower back pain cost the United States $134.5 billion, which was the highest cost incurred from the 154 conditions measured.[5] In addition, neck pain is associated with several mental and physical diseases, such as depression and autoimmune diseases.[1]

In 2019, the age-standardized years lived with disability (YLDs) due to neck pain were higher in the Middle East and North Africa (MENA) region than the global average (303.0 vs. 267.4 per 100,000).[6] Moreover, in 2019 Iran had the highest age-standardized YLD rate (423.5 per 100,000) in MENA.[6] Globally, the burden of neck pain was higher among the middle aged and elderly females, and its burden was found to be higher in countries with a higher socioeconomic status.[6]

Iran is a multi-ethnic country with wide socioeconomic inequalities, where large changes in the food industry, social support, and healthcare systems have recently taken place.[7] These changes can lead to increases in the life expectancy of the population, as well as in the number of elderly adults in the future.[8] A study in Iran, which took place between 2014 and 2015, found the lifetime prevalence of neck pain to be 62.1%.[9] Several risk factors have been identified for musculoskeletal and neck pain in Iran, such as living in urban areas, low socioeconomic status, obesity, poor mental health, place of work, and being married.[10–12] Understanding the neck pain burden among Iranians aged 70 and above is of great importance to health policy makers for planning, resource allocation, and providing better medical and social care. Previous research has reported the worldwide burden of neck pain in 2019[6] and 2017,[13] as well as the burden of musculoskeletal disorders in the Eastern Mediterranean Region (EMR) in 2013[14] and in Iran in 2017.[3] Also, the burden of low back pain among the elderly in Iran over 1990–2019 has been previously reported.[15] However, the burden of neck pain among Iranians aged 70 and above has not previously been investigated. This research reports the prevalence, incidence, and YLDs due to neck pain in those aged at least 70 years old, from 1990 to 2019, by sex, age group, and province.

2 | METHODS

2.1 | Overview

The Global Burden of Disease Study (GBD) aims to monitor and report the burden of diseases and injuries all over the world. This enormous undertaking is led by the Institute for Health Metrics and Evaluation, with the 2019 iteration reporting the worldwide burden, from 1990 to 2019, of almost 370 diseases and injuries.[16,17] The present article reports the prevalence, incidence, and YLDs due to neck pain among the elderly in Iran, along with its 31 provinces (i.e., Alborz, Ardebil, Bushehr, Chahar Mahaal and Bakhtiari, East Azarbayejan, Fars, Gilan, Golestan, Hamadan, Hormozgan, Ilam, Isfahan, Kerman, Kermanshah, Khorasan-e-Razavi, Khuzestan, Kohgiluyeh and Boyer-Ahmad, Kurdistan, Lorestan, Markazi, Mazandaran, North Khorasan, Qazvin, Qom, Semnan, Sistan and Baluchistan, South Khorasan, Tehran, West Azarbayejan, Yazd, and Zanja). The data can be viewed at the following website: http://ghdx.healthdata.org/gbd-results-tool. It should be noted that this study used extant data that was collected and made publicly available through the GBD project.

2.2 | Case definition and data sources

The definition of neck pain was *pain in the neck that lasts at least 1 day, and may also include referred pain in the upper limb(s)*. The International Classification of Diseases codes from Version 9 (723.1) and version 10 (M54.2) were used to determine neck pain. Systematic reviews of the literature were carried out in GBD 2010 (i.e., Ovid MEDLINE, EMBASE, CINAHL, CAB abstracts, WHOLIS, and SIGLE) and in GBD 2017 (i.e., PubMed) up to October 2017, without language constraints. The appropriate terms (i.e., "neck pain," "neck ache," "neckache," and "cervical pain") were searched separately and in combination with study types (i.e., cross-sectional, cross-sectional, epidemiol*, inciden*, prevalen*, population-based, population based, population sample, population study, survey). Published articles that did not use a population-based sampling strategy to obtain a representative sample, included less than 150 individuals, were only reviews, or only studied a particular category of neck pain (e.g., pain after a car crash) were all excluded. The GBD team members conducted the literature review and the sources used are available from this website: https://ghdx.healthdata.org/gbd-2019/data-input-sources.[16]

2.3 | Data processing and disease model

All prevalence estimates were separated into sex and age categories, whenever possible. When the prevalence of neck pain was provided for wide age ranges by sex, or smaller age ranges with the two sexes combined, the sex ratios reported and bounds of uncertainty were utilized to create separate age-specific estimates for both sexes. If there was no within-study sex ratio provided, the prevalence statistics were separated using a sex ratio generated by meta-analyzing the sex-specific data with meta-regression (Bayesian, Regularized and Trimmed—MR-BRT).[16] Following bias correction, the DisMod-MR 2.1 tool was utilized to disaggregated broad age groupings (i.e., >25 years) into more refined 5-year age categories. In

addition, MR-BRT was utlized to correct for bias due to the use of different neck pain criteria. There were assumed to be no cases of neck pain before the age of 5 and there were no instances of mortality due to neck pain.[16]

2.4 | Severity and years lived with disability

There were four sequelae (i.e., mild, moderate, severe, and most severe) that had disability weights (DWs) of 0.052, 0.112, 0.226, and 0.300, respectively. The YLDs were estimated by multiplying the DWs for the four sequelae by their respective prevalence estimates. YLDs measure the burden of a disease, with one YLD corresponding to the loss of 12 months of healthy life due to the disease or disability. The YLDs are also commonly added to the years of life lost to estimate the DALYs for a particular disease. As no mortality was attributable to neck pain, the YLDs and DALYs were the same.[16]

2.5 | Compilation of results

All estimates were accompanied by 95% uncertainty intervals (UIs), generated by undertaking 1000 iterations at every computation step and integrating this with uncertainty sourced from the input data, measurement error, and non-sampling error. The 1000 estimates were arranged in numerical order, with the 95% UIs ranging from the 25th to the 975th values. All figures were created using the statistical package R (Version 3.6.1).

3 | RESULTS

3.1 | National level

The number of prevalent cases of neck pain among Iranians aged 70 and older were 302.4 thousand cases (95% UI: 201.5–441.5 thousand), which corresponded to a point prevalence of 8710.6 per 100,000 (95% UI: 5804.0–12717.4). The number of incident cases were 46.3 thousand (95% UI: 27.5–81.9) and the incidence rate was 1334.7 per 100,000 (95% UI: 793.2–2358.8). In addition, there were 27.8 thousand (95% UI: 16.7–43.9) YLDs and a YLD rate of 801.7 per 100,000 (95% UI: 480.7–1264.7). Table 1 shows there were no substantial changes in the prevalence, incidence, and YLD rates from 1990 to 2019 (Table 1).

3.2 | Provincial level

The largest number of prevalent cases in 2019 were found in Tehran (71,505 [95% UI: 47,860–103,712]), Khorasan-e-Razavi (21,988 [95% UI: 14,460–32,420]), and Isfahan (20,807 [95% UI: 13,700–30,616]), while the lowest were found in Ilam (1549 [95% UI: 1016–2291]), Kohgiluyeh and Boyer-Ahmad (1680 (95% UI: 1118–2455]) and Semnan (2832 [95% UI: 1860–4187]). That same year, the point prevalence rates (per 100,000 population) were highest in Tehran (10444.4 [95% UI: 6990.7–15148.6]), Bushehr (8596.5 [95% UI: 5620.1–12877.4]), and West Azarbayejan (8495.6 [95% UI: 5570.8–12611.2]). Conversely, the lowest point prevalence were reported in Kohgiluyeh and Boyer-Ahmad (7891.4 [95% UI: 5251.4–11530.3]), Sistan and Baluchistan (8008.4 [95% UI: 5320.0–11717.2]) and Markazi (8063.0 [95% UI: 5390.2–11633.3]) (Figure 1A and Table S1). Figure S1 presents the point prevalence estimates (per 100,000) of neck pain among Iranians aged 70 or older, by sex, at the provincial level.

The incidence rates of neck pain (per 100,000) in 2019 were highest in Tehran (1475.8 [95% UI: 881.9–2650.4]), Bushehr (1356.9 [95% UI: 774.0–2469.4]), and Alborz (1344.2 [95% UI: 760.6–2439.5]) and lowest in Kohgiluyeh and Boyer-Ahmad (1243.5 [95% UI: 769.2–2161.4]), Markazi (1254.1 [95% UI: 779.8–2169.3]), and Sistan and Baluchistan (1260.3 [95% UI: 774.4–2187.4]) (Figure 1B and Table S2). Figure S2 displays the provincial-level sex-specific estimations of the neck pain incidence rates (per 100,000) for the year 2019. This shows there were no significant sex differences in any of the provinces.

In 2019, the highest YLD rates of neck pain (per 100,000) were found in Tehran (960.9 [95% UI: 572.3–1530.9]), Bushehr (794.1 [95% UI: 470.4–1280.8]), and West Azarbayejan (783.2 (95% UI: 462.7–1248.0]). Conversely, Kohgiluyeh and Boyer-Ahmad (730.5 [95% UI: 437.0–1152.2]), Sistan and Baluchistan (740.1 [95% UI: 441.3–1174.1]), and Markazi (742.0 [95% UI: 444.0–1184.1]) had the lowest YLD rates (Figure 1C and Table S3). Figure S3 presents the 2019 sex-specific YLD estimates (per 100,000) by province. Figure S3 also shows that there were no differences between males and females in the YLD rates.

3.3 | Age and sex patterns

In 2019, the number of prevalent cases, incident cases, and YLDs in Iran, along with their associated rates, had no significant sex differences, although the number of prevalent cases, incident cases, and YLDs were higher for females. The number of prevalent cases was highest in the 70–74 age group for both males and females, but the number of cases declined with age. The point prevalence was highest in the 70–74 age group, for both sexes, but then declined with increasing age (Figure 2A). Moreover, the point prevalence decreased in all provinces from 1990 to 2019, except for a nonsignificant increase among females in Ilam. In addition, the point prevalence did not change significantly for either sex in any of the provinces over the period 1990–2019 (Figure S4).

The incidence rates of neck pain were highest in the 70–74 age group for both sexes, declined to the 90–94 age group, and then increased slightly in the 95+ age group. Furthermore, the largest number of incident cases, for both males and females, were found in the 70–74 age group and these declined with increasing age (Figure 2B). There were no significant sex differences, at the

TABLE 1 Prevalent cases, incident cases, and YLDs due to neck pain for adults aged 70 and older in 1990 and 2019 for both sexes and the percentage change in the rates per 100,000 in Iran.

	Prevalence (95% UI)			Incidence (95% UI)			YLDs (95% UI)		
	Counts (2019)	Rate (2019)	Pcs in rate 1990–2019	Counts (2019)	Rate (2019)	Pcs in rate 1990–2019	Counts (2019)	Rate (2019)	Pcs in rate 1990–2019
Iran	302,427 (201,511, 441,540)	8710.6 (5804, 12717.4)	−4.8 (−13.1, 5.8)	46,339 (27,541, 81,896)	1334.7 (793.2, 2358.8)	−9.2 (−19.5, 14.2)	27834 (16690, 43908)	801.7 (480.7, 1264.7)	−5.1 (−13.3, 5.4)
Alborz	9136 (5965, 13,695)	8438.9 (5510.1, 12649.9)	−3.2 (−9.1, 4.4)	1455 (823, 2641)	1344.2 (760.6, 2439.5)	−5.5 (−13.3, 11.4)	844 (500, 1353)	779.5 (461.8, 1249.4)	−3.7 (−10.2, 5.1)
Ardebil	4677 (3082, 6901)	8302 (5471.7, 12250.7)	−1.4 (−9.6, 8.3)	733 (435, 1293)	1300.9 (771.8, 2295.4)	−5.8 (−16.2, 15.8)	432 (256, 687)	766.2 (453.9, 1218.6)	−1.2 (−10.2, 9.7)
Bushehr	3173 (2075, 4754)	8596.5 (5620.1, 12877.4)	−2 (−8.6, 6.3)	501 (286, 912)	1356.9 (774, 2469.4)	−5.2 (−14.3, 12.9)	293 (174, 473)	794.1 (470.4, 1280.8)	−2.2 (−9.9, 6.9)
Chahar Mahaal and Bakhtiari	3085 (2042, 4473)	8189.2 (5421.2, 11874.9)	−5.7 (−15.9, 6.9)	479 (295, 834)	1270.8 (783.7, 2212.9)	−10.7 (−22.7, 16.2)	286 (172, 457)	758.5 (455.4, 1214.1)	−5.7 (−16.3, 8.2)
East Azarbayejan	15,637 (10,226, 23,186)	8458.4 (5531.2, 12542)	−2.2 (−11.7, 9.4)	2449 (1426, 4361)	1324.7 (771.5, 2359.2)	−7.1 (−19.3, 18.8)	1442 (856, 2332)	780 (463.1, 1261.4)	−2.9 (−12.9, 9.6)
Fars	16,522 (10,921, 24,450)	8271.7 (5467.5, 12240.8)	−6.7 (−14.4, 3.4)	2604 (1533, 4599)	1303.7 (767.5, 2302.5)	−10 (−19.4, 11.3)	1525 (906, 2423)	763.7 (453.4, 1213.3)	−6.5 (−14.8, 4.4)
Gilan	12,908 (8508, 18,987)	8276.5 (5455.2, 12174)	−8.3 (−17.8, 4.9)	2020 (1216, 3546)	1295.5 (779.4, 2273.3)	−12.3 (−24, 15.7)	1189 (706, 1912)	762.3 (452.4, 1225.9)	−8.7 (−18.9, 4.2)
Golestan	5170 (3410, 7676)	8419.2 (5553.1, 12501.4)	−3.6 (−11.2, 5.8)	815 (473, 1464)	1327.4 (769.5, 2385)	−7.4 (−16.5, 13.4)	476 (281, 754)	775.8 (457.5, 1228.4)	−4.3 (−12.9, 6.3)
Hamadan	7741 (5122, 11,352)	8197.1 (5423.4, 12020)	−6.8 (−17.2, 6.7)	1213 (738, 2115)	1284.1 (782, 2239.4)	−11.8 (−23.7, 16.7)	716 (427, 1132)	758.3 (451.9, 1198.1)	−6.8 (−17.7, 6.8)
Hormozgan	4143 (2745, 6131)	8242.4 (5461.2, 12196.3)	−5.7 (−12.5, 2.8)	654 (388, 1154)	1300.3 (772.2, 2296.2)	−8.8 (−17, 9.7)	384 (229, 609)	762.9 (455.6, 1211)	−5.9 (−12.9, 3.5)
Ilam	1549 (1016, 2291)	8301 (5443.9, 12282.5)	1.2 (−5.4, 8.6)	243 (144, 433)	1305 (769.3, 2319.9)	−2.3 (−11.8, 14)	144 (86, 232)	769.5 (460.5, 1241.4)	1.1 (−6.5, 9.4)
Isfahan	20,807 (13,700, 30,616)	8243.4 (5427.6, 12129.3)	−7.6 (−16.6, 4.2)	3262 (1956, 5731)	1292.2 (774.8, 2270.6)	−11.4 (−22.5, 13.9)	1920 (1141, 3044)	760.5 (452.2, 1206)	−8.4 (−17.4, 3.4)
Kerman	9041 (5966, 13,138)	8164.1 (5387, 11863.4)	−7.9 (−18.3, 5.7)	1408 (867, 2456)	1271.4 (782.9, 2217.3)	−12.7 (−25.3, 16.3)	828 (491, 1323)	747.7 (443.4, 1194.4)	−8.5 (−19.1, 5.3)
Kermanshah	7019 (4658, 10,334)	8172.8 (5424.4, 12032.8)	−4.4 (−12.9, 6.2)	1107 (662, 1946)	1288.7 (770.4, 2266.5)	−8.7 (−18.6, 13.8)	648 (386, 1027)	754.2 (449.3, 1195.9)	−4.8 (−13.7, 6)
Khorasan-e-Razavi	21988 (14,460, 32,420)	8319 (5470.8, 12266.2)	−6.3 (−16.2, 6.3)	3445 (2052, 6065)	1303.3 (776.3, 2294.5)	−11.1 (−22.4, 15.9)	2000 (1193, 3165)	756.6 (451.4, 1197.3)	−7.4 (−17.2, 5.9)
Khuzestan	13,467 (8872, 19,885)	8364.6 (5510.6, 12350.3)	−4.8 (−10.6, 2.5)	2110 (1245, 3735)	1310.8 (773.4, 2319.7)	−7.2 (−14.6, 8)	1236 (735, 1961)	767.6 (456.6, 1218.3)	−4.6 (−11.4, 3.7)
Kohgiluyeh and Boyer-Ahmad	1680 (1118, 2455)	7891.4 (5251.4, 11530.3)	−10.3 (−18.4, 0)	265 (164, 460)	1243.5 (769.2, 2161.4)	−12.8 (−22.8, 9.3)	156 (93, 245)	730.5 (437, 1152.2)	−9.5 (−18.5, 2.2)
Kurdistan	5574 (3693, 8228)	8205.3 (5437, 12111.5)	−2.2 (−9.5, 6.7)	880 (520, 1556)	1295.6 (765.8, 2290.7)	−6.1 (−14.9, 13)	517 (309, 818)	760.5 (455.3, 1204.8)	−2.3 (−10.3, 7.4)
Lorestan	6004 (3971, 8827)	8228.6 (5442, 12098.2)	−4.4 (−12.6, 5.6)	943 (566, 1651)	1292.6 (776.3, 2263.3)	−8.3 (−18, 12.9)	556 (329, 879)	762.3 (450.7, 1204.7)	−3.9 (−12.7, 6.8)
Markazi	6759 (4518, 9752)	8063 (5390.2, 11633.3)	−8.2 (−19, 5.5)	1051 (654, 1818)	1254.1 (779.8, 2169.3)	−13.2 (−25.6, 15.5)	622 (372, 993)	742 (444, 1184.1)	−8.2 (−19.1, 5.8)
Mazandaran	14,508 (9571, 21,347)	8250.1 (5442.8, 12139.3)	−7 (−15.8, 4.4)	2276 (1359, 3998)	1294.5 (772.8, 2273.5)	−11 (−21.5, 13.2)	1327 (799, 2110)	754.7 (454.3, 1200.1)	−7.1 (−16.4, 5.8)
North Khorasan	2891 (1917, 4262)	8186.7 (5426.9, 12067.3)	−7.2 (−16.8, 5.3)	456 (270, 803)	1291.2 (764.9, 2273.8)	−11.6 (−22.6, 15.2)	266 (159, 420)	751.9 (450.6, 1190.3)	−7.6 (−17.1, 5.1)
Qazvin	4556 (2993, 6732)	8380.9 (5505.8, 12382.4)	−5 (−14.4, 7.2)	714 (418, 1265)	1312.9 (769.8, 2327.4)	−9.7 (−20.9, 16.8)	421 (251, 673)	775.3 (462, 1237.9)	−5 (−15.1, 8.1)
Qom	3915 (2583, 5795)	8201.5 (5411.4, 12140.4)	−7.6 (−15.3, 2.7)	619 (365, 1092)	1296.9 (765.1, 2288)	−10.7 (−20.4, 11.3)	361 (215, 570)	756.1 (449.8, 1194.2)	−6.8 (−15.6, 4.1)

TABLE 1 (Continued)

	Prevalence (95% UI)			Incidence (95% UI)			YLDs (95% UI)		
	Counts (2019)	Rate (2019)	Pcs in rate 1990–2019	Counts (2019)	Rate (2019)	Pcs in rate 1990–2019	Counts (2019)	Rate (2019)	Pcs in rate 1990–2019
Semnan	2832 (1860, 4187)	8378.6 (5502.3, 12387)	−6.3 (−15.2, 5.9)	444 (259, 789)	1313.9 (765.3, 2333.7)	−10.5 (−21.5, 14.9)	261 (156, 416)	772.9 (461.9, 1232)	−5.9 (−16. 7)
Sistan and Baluchistan	4553 (3025, 6662)	8008.4 (5320, 11717.2)	−6.6 (−15.6, 4.8)	717 (440, 1244)	1260.3 (774.4, 2187.4)	−11 (−21.6, 12.5)	421 (251, 668)	740.1 (441.3, 1174.1)	−6.8 (−16.6, 5.6)
South Khorasan	3271 (2165, 4749)	8145.1 (5391, 11826)	−7.1 (−17.4, 6)	510 (315, 891)	1269.1 (784.8, 2217.6)	−11.9 (−24, 15.5)	299 (179, 477)	744.8 (445.7, 1188.3)	−7.8 (−17.9, 5.7)
Tehran	71,505 (47,860, 103,712)	10444.4 (6990.7, 15148.6)	−6.2 (−13.2, 2.1)	10,103 (6037, 18,145)	1475.8 (881.9, 2650.4)	−9 (−18.2, 11.1)	6579 (3918, 10481)	960.9 (572.3, 1530.9)	−6.5 (−14.1, 2.2)
West Azarbayejan	10,103 (6625, 14,997)	8495.6 (5570.8, 12611.2)	−2.2 (−11.4, 9.3)	1580 (920, 2808)	1328.6 (773.9, 2361.2)	−7.2 (−18.6, 17.9)	931 (550, 1484)	783.2 (462.7, 1248)	−2.6 (−12.6, 10.1)
Yazd	3855 (2544, 5633)	8225 (5428.1, 12018.5)	−8.9 (−17.9, 3.2)	602 (367, 1053)	1283.7 (783.2, 2246.9)	−12.7 (−24, 13.5)	354 (210, 568)	755.8 (449.1, 1212.9)	−9 (−19.1, 3.3)
Zanjan	4357 (2875, 6415)	8290 (5469.8, 12204)	−5 (−15, 8.2)	682 (409, 1200)	1297.9 (778.8, 2282.2)	−10 (−22, 18.6)	402 (239, 640)	764.3 (454.6, 1218.1)	−5.1 (−15.7, 8.5)

provincial level, with regard to the incidence rate of neck pain among the elderly in Iran from 1990 to 2019 (Figure S5).

The 70–74 age group had the highest YLD rate of neck pain, which declined with age. Moreover, the largest number of YLDs, for both males and females, were found in the 70–74 age group and this rate declined with age (Figure 2C). In addition, when examined at the provincial level, there were no substantial changes in the YLD rates attributable to neck pain for either males or females from 1990 to 2019 (Figure S6).

The rate ratio (Iran YLD/MENA YLD), which compared the age-standardized YLD rates in Iran with those of the MENA region, by sex and age group in both 1990 and 2019, revealed that there were large differences between Iran and the MENA region. In particular, Iran had YLD rates of neck pain that were 1.3–1.4 times higher than in MENA in 1990 and 2019 among both males and females. In 2019, the highest Iran/MENA ratios (1.4) were found in the 70–74 age group for both males and females, and among females who were ≥90 years old (Figure 3).

4 | DISCUSSION

The results of the current study, which used GBD 2019 data, showed that the neck pain burden in Iran was larger than it was in the MENA region. In 2019, Tehran and Kohgiluyeh and Boyer-Ahmad had the highest and lowest age-standardized point prevalence, incidence, and YLD rates, respectively. In addition, the largest burden was found among those aged 70–74 years old.

In 2019, the age-standardized point prevalence, incidence, and YLD rates of neck pain at the global level were 2696.5, 579.1, and 267.4 per 100,000, respectively.[6] In 2017, the same values at the global level were 3551.1, 806.6, and 352.0 per 100,000 population.[13] The results of the current research also revealed that the age-standardized point prevalence, incidence, and YLD rates were higher in Iran than they were globally. In addition, the Iran/MENA YLD ratios were over one in every age group reported here and for both sexes. Furthermore, Al-Ajlouni et al. reported the age-standardized DALY rate of neck pain in MENA as 303 (95% UI: 202, 439) per 100,000 in 2019,[18] which was also lower than the age-standardized YLD rate among elderly adults in Iran. That same study also reported that Turkey and Jordan were among the MENA countries with the largest burden of musculoskeletal disorders, while Afghanistan was one of the lowest in 2019.[18] The variations observed between our results and the studies mentioned earlier are likely as a result of the current study only including elderly adults from Iran. Evidence indicates that the occurrence of neck pain is related to both advancing age and having a past medical history of neck and lower back disorders.[19] As these risk factors are more common among the elderly, this is the likely cause of the higher burden found in our study. A meta-analysis with 6560 participants revealed that diabetes can raise the chances of having neck pain by around 1.24 times (95% confidence interval [CI]: 1.05–1.47).[20] Furthermore, research has also shown that in 2019 the age-standardized point prevalence of type 2 diabetes mellitus in Iran was higher than the global

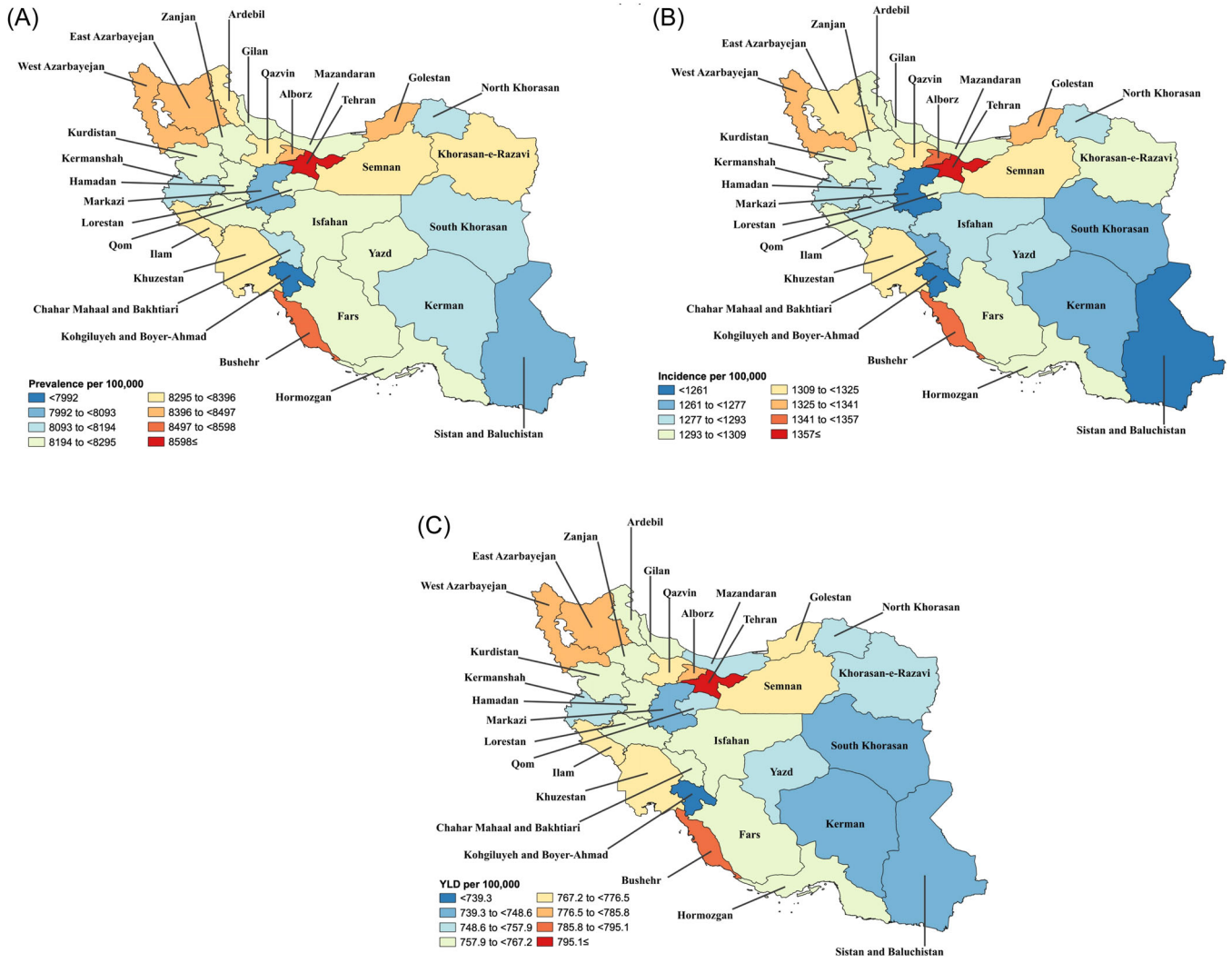

FIGURE 1 Point prevalence (A), incidence (B), and YLD rates (C) for neck pain (per 100,000 population) in 2019 for Iranians aged 70 and older, by province. YLD, years-lived-with-disability. (generated from data available from http://ghdx.healthdata.org/gbd-results-tool).

averages for both sexes (6312.9 vs. 5282.9 per 100,000).[21] In addition, according to a study conducted in 2019, a high body mass index emerged as a prominent factor contributing to musculoskeletal pain in Iran.[21] In addition, a study conducted in Iran showed that having a high body mass index was one of the largest contributors to musculoskeletal pain.[22] This finding may be one of the reasons why Iran has a high neck pain burden. Having a history of smoking has also been found to be related to impairment of the musculoskeletal system, lower bone marrow density,[23] as well as higher instances of lower back pain,[24] as well as neck pain.[19] The age-standardized point prevalence of smoking in Iran increased in both males (2.3%) and females (8.3%) between 1990 and 2019, whereas globally smoking decreased over the last three decades in both females (−37.7%) and males (−27.5%).[25] Furthermore, the average number of cigarettes smoked each day in Iran has grown from 10.4 in 2016 to 12.4 in 2021.[26] This finding may also be a factor in the higher prevalence and burden of neck pain in Iran over the 1990–2019 period, as well as into the future. There are a number of additional risk factors for neck pain that should be examined in future observational studies and meta-analyses, including low socio-occupational level, high job demands, and having a history of underlying diseases.[1]

At the subnational level, Tehran had the largest burden attributable to neck pain, while Kohgiluyeh and Boyer-Ahmad had the lowest. Another factor related to the higher incidence of neck pain in Tehran may be the prevalence of inappropriate working conditions. For example, a cross-sectional study of 586 school teachers in Tehran showed the annual prevalence of neck pain was 37%.[27] However, an intervention grounded in the health beliefs model resulted in improvements in health-promoting practices related to neck well-being among school children in Tehran.[28] In addition, a systematic review found there was a lower risk of nonspecific neck pain in those who frequently engage in physical activity.[29] Furthermore, in 2021, a large-scale survey showed that Tehran had one of the lowest levels of physical activity in Iran, while Kohgiluyeh and Boyer-Ahmad was among the highest.[30] Moreover, not engaging in sufficient physical activity was most problematic among adults aged ≥75 years of age in Iran (68.1%).[30]

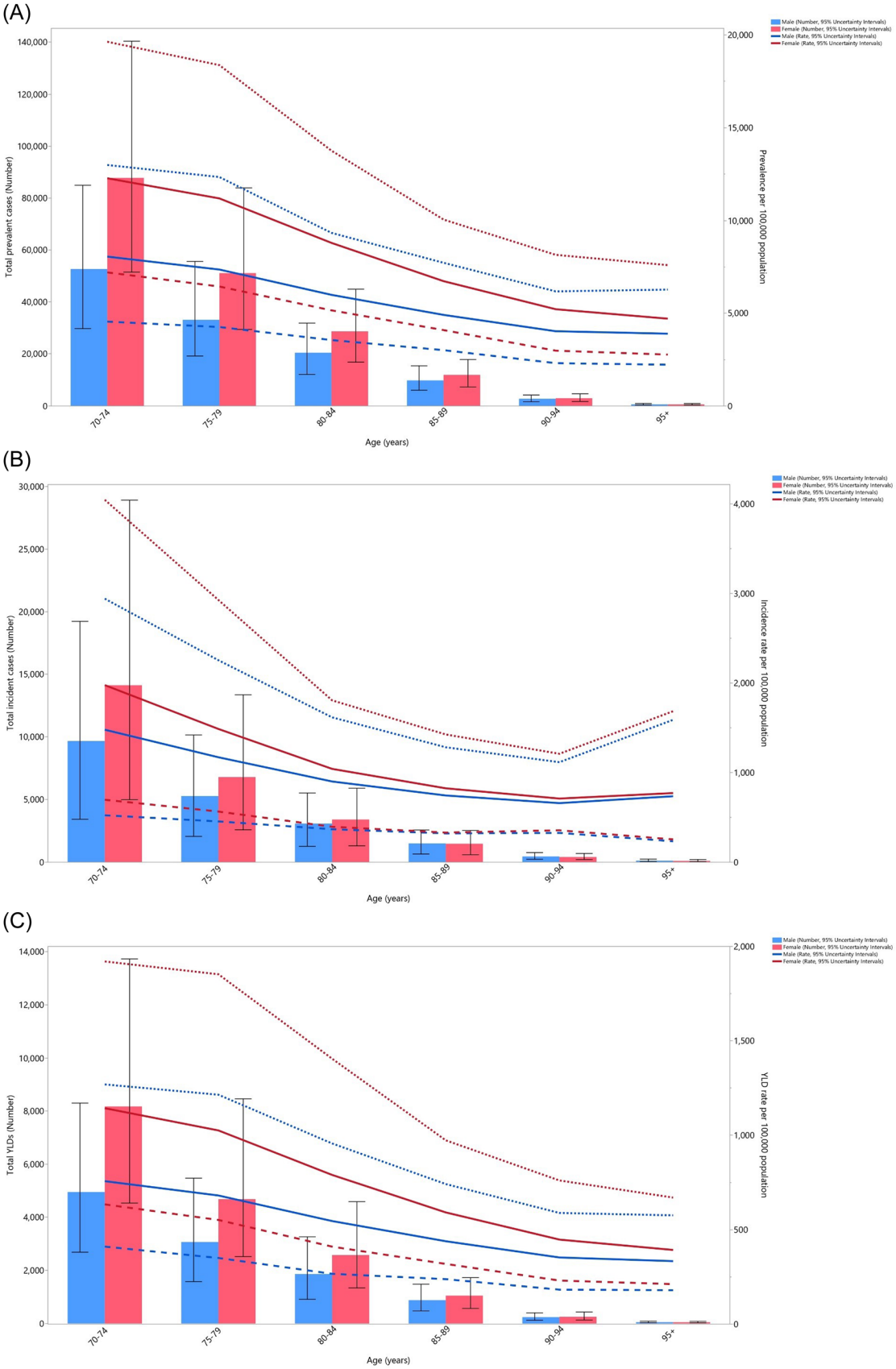

FIGURE 2 Number of prevalent cases and prevalence (A), number of incident cases and incidence rate (B), and the number of YLDs and YLD rate (C) for neck pain (per 100,000 population) in Iran in 2019, by age and sex; dotted and dashed lines indicate 95% upper and lower uncertainty intervals, respectively. YLD, years-lived-with-disability. (generated from data available from http://ghdx.healthdata.org/gbd-results-tool).

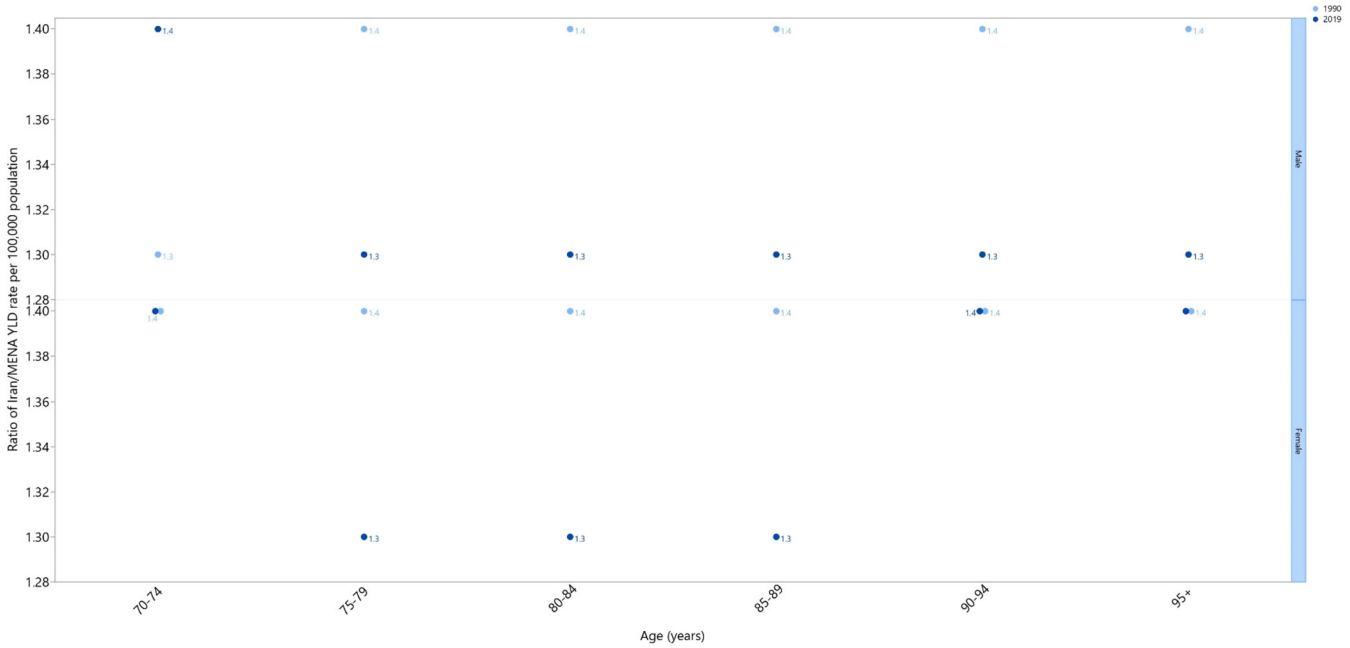

FIGURE 3 Neck pain YLD rate ratio of Iran to the Middle East and North Africa region by age and sex, 1990 and 2019. YLD, years lived with disability. (generated from data available from http://ghdx.healthdata.org/gbd-results-tool).

There are several barriers among the elderly in Iran that should be addressed in any interventions aimed at increasing physical activity to prevent neck pain, including social pressure, a lack of interest, fear of falling, walking problems, and not having enough time.[31] In addition, the development of conceptual models for increasing physical exercise in middle-aged Iranian women has produced promising outcomes, such as increased physical activity and a lower average body mass index.[32]

In agreement with the current results, studies using the GBD 2019 and GBD 2017 data showed that the global burden of neck pain was higher among females and in those aged 70–74 years old.[6,13] Similarly, in 2017 the global point prevalence of musculoskeletal disorders rose with advancing age and was lower in men than it was in women.[33] In MENA, the DALY rate of musculoskeletal disorders increased with age and was highest in the 70–74 age group in both 1990 and 2019.[18] The elevated occurrence of neck pain in the elderly could potentially be due to a heightened prevalence of several risk factors, including smoking tobacco. This connection is underscored by evidence indicating that the prevalence of tobacco smoking in Iran increases with advancing age for both sexes in Iran.[34] The elderly population also has a higher prevalence of neck pain due to the degenerative changes that take place in the cervical spine with advancing age and the increased prevalence of osteoarthritis with age.[1,35] The finding that females have a higher prevalence of neck pain can be explained by different biological, psychological, and cultural factors, along with higher exposure to work-related factors, such as engaging more often in repetitive and monotonous activities than men.[36]

The current research found that the neck pain burden reduced between 1990 and 2019, although the changes were not statistically significant. Similarly, the age-standardized DALY rate of neck pain in MENA hardly changed from 1990 to 2019 (304 to 303 per 100,000 population).[18] Nevertheless, neck pain still has a very high number of YLDs and prevalent cases. Therefore, the implementation of healthcare measures that target the relevant risk factors at the country and provincial levels is needed to reduce this burden. Furthermore, a comprehensive systematic review and meta-analysis showed that engaging in exercise could lead to a substantial 68% reduction in the risk of experiencing a fresh episode of neck pain (odds ratio: 0.32; 95% CI: 0.12–0.86).[37] In addition, ergonomic interventions for young workers can be useful in preventing neck pain later in life.[38,39] Targeting the psychosocial risk factors for neck pain, like a depressed mood and perceived muscular tension, using physical leisure activities and increasing the endurance of the cervical extensor are recommended.[40]

The findings of the present research are important from the clinical, research, and public health perspectives. Physicians and researchers can use the results to determine the mechanisms of neck pain development, discover the important risk factors, and design interventions to control pain and increase life quality in affected individuals. Moreover, public policymakers can use the findings to prepare preventive programs for neck pain and rehabilitative interventions for the elderly population in Iran and its provinces. In addition, these findings can help with resource allocation by sex and age group.

4.1 | Strengths and limitations

The current research was the first to utilize GBD 2019 data to evaluate the burden of neck pain among older adults in Iran and its provinces. Nevertheless, this research has a number of shortcomings that need to

be taken into account. Data sparsity is one of the main limitations of the current research, which is shared by other GBD publications. Data sparsity is especially problematic in low- to middle-income countries, like Iran, that do not have registration systems for most of the diseases, including neck pain. The absence of a comprehensive registration system can result in a lack of real data and the need to model the neck pain burden in Iran, along with its provinces. Secondly, using different definitions for neck pain can affect the overall burden estimated, although models were used to adjust for the different definitions of neck pain. Thirdly, the survey that was used to determine the DWs might lead to recall bias, as a result of the long-term follow-up periods, and these DW were not developed specifically for Iran. Fourthly, the burden of neck pain due to each risk factor, as well as by to race/ethnicity, severity, and onset (i.e., acute or chronic), were not estimated in the current study. Fifthly, the statistical analyses were mainly conducted by the GBD study. We were not able to perform any additional analyses on this data (e.g., analyses of time trends or testing for significant demographic/regional variations and their stability over time), since the study was conducted at the national level, in a specific age groups, and the estimates for this subgroup may be more severely affected by data sparsity. These points should be taken into consideration and integrated into forthcoming GBD projects.

5 | CONCLUSIONS

Although the burden of neck pain among elderly Iranians has decreased in the last 30 years, the number of prevalent cases and YLDs attributable to neck pain remains high. The current research highlights the need to implement preventive strategies and therapeutic interventions during the early phases of this disorder, especially in females and in provinces like Tehran.

AUTHOR CONTRIBUTIONS

Seyed Aria Nejadghaderi: Conceptualization; investigation; methodology; resources; validation; writing—original draft; writing—review & editing. **Seyed Ehsan Mousavi**: Methodology; visualization; writing—original draft; writing—review & editing. **Mark Sullman** and **Ali-Asghar Kolahi**: Writing—original draft; writing—review & editing. **Alireza Namazi Shabestari**: Conceptualization; data curation; project administration; resources; supervision; writing—review & editing. **Saeid Safiri**: Conceptualization; data curation; formal analysis; methodology; project administration; supervision; validation; visualization; writing—review & editing

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

This study utilized publicly accessible data and exclusively presents the viewpoints of the authors, rather than those of the Institute for Health Metrics and Evaluation. All data used in this study can be publicly accessed from https://vizhub.healthdata.org/gbd-results/

ETHICS STATEMENT

Ethical approval was obtained from the Tehran University of Medical Sciences, Tehran, Iran (IR.TUMS.MEDICINE.REC.1402.041).

TRANSPARENCY STATEMENT

The lead authors Alireza Namazi Shabestari and Saeid Safiri affirm that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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