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The burden of neck pain in the Middle East and North Africa region, 1990–2019

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ABSTRACT

Background: Neck pain is a common cause of disability across the world. The objective of the present study was to present a thorough investigation of the burden caused by neck pain in the Middle East and North Africa (MENA) region, by country, sex, age group and socio-demographic index (SDI).

Methods: The data on the burden of neck pain, encompassing its prevalence, incidence and years lived with disability (YLDs), were extracted from the Global Burden of Disease (GBD) 2019 study. These findings are reported as age-standardised numbers and rates (per 100,000), accompanied by 95 % uncertainty intervals (UIs).

Results: The age-standardised point prevalence of neck pain in 2019 was 3066.7 (95 % UI: 2407.8 to 3894.3) per 100,000, with an age-standardised incidence rate of 649.2 (509.2–829.2) in the MENA region, neither of which have changed since 1990. The age-standardised YLD rate of neck pain was 303.0 (201.5–438.8) per 100,000 population in 2019. The highest YLD rate of neck pain was found in Iran [423.5 (280.3–609.8)] and the lowest in Kuwait [215.0 (141.0–314.1)]. The highest number of prevalent cases were seen in the 45–49 age-group for both sexes in 2019, but overall females had a higher point prevalence than males. Furthermore, over the study period (1990–2019) there was no clear and consistent relationship between the SDI and the burden of neck pain.

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Conclusion: Although the burden of neck pain has largely remained stable over the past three decades, the prevalence and morbidity in the MENA region remains high. Preventive and rehabilitative programs should be implemented that firstly target middle-aged females and males.

1. Introduction

Worldwide neck pain ranks among the leading contributors to disability. Biologically, neuromusculoskeletal disorders are the main underlying cause of neck pain. However, psychological factors, such as anxiety, stress, and depression, also make a considerable contribution [1]. In addition, working environments that result in sustained muscular tension and involve working in a constrained posture have been identified as potential risk factors of neck pain [2]. There are a number of non-pharmacologic approaches like yoga and aquatic therapy, as well as pharmacological treatments like nonsteroidal anti-inflammatory drugs that are useful for managing neck pain [3]. However, many individuals still suffer from daily episodes of neck pain. The economic burden of neck pain, both direct and indirect, is not only borne by the individuals and their families, but also costs society as a whole [1,4].

In 2017, the Middle East and North Africa (MENA) region had one of the highest burdens of neck pain in the world, having an age-standardised point prevalence of 4458.4, an incidence rate of 975.6 and a years lived with disability (YLD) rate of 437.4 (per 100,000) [5]. Additionally, neck pain ranked as the fourth most common musculoskeletal disorder globally in 2017, accounting for 18.4 % of all prevalent cases [6]. Neck pain had its highest prevalence among middle aged females and globally socioeconomic status was positively correlated with the burden of neck pain [6].

The social, cultural and economic levels of the countries in the MENA region are changing rapidly, which underscores the requirement for contemporary and comprehensive information on the burden of diseases and injuries in the region. Several studies have examined the burden of neck pain and other types of musculoskeletal disorders at the global level [5–7], including a recent study that examined the worldwide burden of neck pain from 1990 to 2019 [8]. However, these studies have solely concentrated on global figures and did not offer detailed estimates on the burden of neck pain by country, age, and sex within the MENA region. Furthermore, understanding the regional impact of neck pain has the potential to assist in preventing cases among high-risk patients, while also providing valuable insights that can be used for shaping country-level policy decisions. Therefore, the current study reports estimates of the point prevalence, incidence and YLDs that were associated with neck pain in MENA, from 1990 to 2019, by age group, sex, and socio-demographic index (SDI). This information will enable healthcare providers to identify where preventive interventions are needed and to allocate their available resource more efficiently.

2. Methods

2.1. Overview

The Global Burden of Disease (GBD) program was founded by the Institute of Health Metrics and Evaluation (IHME), and in 2019 measured the burden of 369 diseases and injuries over the period from 1990 to 2019 for all 21 regions of the world. The MENA region includes 21 countries (i.e., Afghanistan, Algeria, Bahrain, Egypt, Iran, Iraq, Jordan, Kuwait, Lebanon, Libya, Morocco, Oman, Palestine, Qatar, Saudi Arabia, Sudan, the Syrian Arab Republic, Tunisia, Turkey, the United Arab Emirates and Yemen), all of which were included in these analyses. A thorough explanation of the methodology utilised by GBD 2019 has previously been reported [9–11] and all data can be viewed using the two hyperlinks: http://ghdx.healthdata.org/gbd-results-tool and https://vizhub.healthdata.org/gbd-compare/.

2.2. Case definition and data sources

The definition of neck pain was: neck pain, which may also include pain referred to the upper limb(s), which lasts for one or more days. The International Classification of Diseases (ICD) codes for neck pain are M54.2 (Version 10) and 723.1 (Version 9). The following databases were searched during GBD 2010, in order to find data on the prevalence and incidence of neck pain: Ovid MEDLINE, EMBASE, CINAHL, CAB abstracts, WHOLIS, and SIGLE. Furthermore, in GBD 2017 a search was made in PubMed up to October 2017, without any language restrictions. The search terms used were “neck pain”, “neck ache”, “neckache”, and “cervical pain”, which were searched both individually and combined with the following: prevalen*, inciden*, cross-sectional, cross sectional, epidemiol*, survey, population-based, population based, population study, population sample. Any studies which were not based upon representative samples, included less than 150 individuals, were a review, did not ultilise a population-based approach or studied a particular type of neck pain (e.g., after whiplash) were not included. A complete account of all data used to calculate the neck pain burden is available from the following website: https://ghdx.healthdata.org/gbd-2019/data-input-sources [9].

2.3. Data processing and disease model

The prevalence estimates were divided by sex and age group, where possible. In instances where the prevalence of neck pain was reported for broad age ranges by sex (e.g., in 20–70 year old females and males individually), or for narrower age ranges with the sexes mixed (e.g., 18–29 year olds and 30–55 year olds, without separating the sexes), the reported sex ratio and bounds of uncertainty were

Table 1
Prevalent cases, incident cases and YLDs due to neck pain in 2019 and the percentage change in the age-standardised rates during the period 1990–2019.

	Prevalence (95 % UI)			Incidence (95 % UI)			YLDs (95 % UI)		
	Counts (2019)	**ASRs (2019)**	**Pcs in ASRs 1990–2019**	**Counts (2019)**	**ASRs (2019)**	**Pcs in ASRs 1990–2019**	**Counts (2019)**	**ASRs (2019)**	**Pcs in ASRs 1990–2019**
North Africa and Middle East	**17,380,168 (13535872, 22315483)**	**3066.7 (2407.8, 3894.3)**	**−0.1 (-0.3, 0.1)**	**3842558 (2969837, 5062070)**	**649.2 (509.2, 829.2)**	**−0.2 (-0.5, 0)**	**1729128 (1136538, 2521212)**	**303 (201.5, 438.8)**	**−0.2 (-0.9, 0.5)**
Afghanistan	**631668 (487330, 828693)**	**2872.2 (2250.5, 3640.5)**	**−0.8 (-1.6, 0)**	**148129 (110848, 194129)**	**600.7 (472.2, 770.3)**	**−1.4 (-2.2, -0.7)**	**62138 (40158, 90270)**	**277.7 (184.5, 403.6)**	**−1 (-3.7, 1.6)**
Algeria	**1183533 (917996, 1523923)**	**2865.2 (2243.8, 3627.9)**	**−0.4 (-0.6, -0.2)**	**255806 (197820, 335480)**	**601.9 (473.3, 773.8)**	**−0.2 (-0.3, 0)**	**117901 (76888, 172559)**	**284 (186.9, 411.3)**	**−0.5 (-3, 1.9)**
Bahrain	**48399 (36019, 64266)**	**2679.5 (2109.3, 3403.7)**	**−2 (-2.8, -1.3)**	**10705 (7959, 14829)**	**572 (449.8, 731.9)**	**−0.9 (-1.5, -0.4)**	**4834 (3128, 7160)**	**264.1 (175.4, 382.5)**	**−2.2 (-4.8, 0.5)**
Egypt	**2393781 (1858375, 3101067)**	**2834.6 (2219.4, 3593.2)**	**−1 (-1.4, -0.7)**	**529837 (410943, 693417)**	**598.1 (470.8, 768.4)**	**−0.5 (-0.7, -0.3)**	**239226 (156647, 353108)**	**281.2 (186.5, 412)**	**−1 (-3.7, 1.4)**
Iran (Islamic Republic of)	**3880233 (3041906, 5013340)**	**4288.7 (3391.7, 5448.4)**	**1 (0.6, 1.4)**	**865873 (668906, 1146824)**	**934.1 (732.9, 1189.9)**	**0.6 (0.3, 0.9)**	**385175 (253143, 558607)**	**423.5 (280.3, 609.8)**	**1.1 (0.4, 1.8)**
Iraq	**952368 (743005, 1235122)**	**2862.7 (2242.9, 3626.1)**	**0 (-0.1, 0)**	**215073 (165121, 281624)**	**600.2 (471.9, 770.6)**	**0 (-0.1, 0)**	**94611 (62326, 137968)**	**281.5 (186.8, 409.5)**	**0.3 (-2.1, 2.8)**
Jordan	**274036 (211611, 355009)**	**2815.8 (2209.2, 3566.8)**	**−1 (-1.3, -0.7)**	**61402 (47291, 80947)**	**592.9 (466.9, 759.5)**	**−0.8 (-1.1, -0.6)**	**27464 (17727, 40292)**	**279.6 (185.9, 407.1)**	**−0.8 (-3.3, 1.7)**
Kuwait	**108140 (81741, 145245)**	**2167.5 (1705.4, 2779.4)**	**3.2 (2.3, 4.1)**	**25771 (19075, 34888)**	**488.7 (379.9, 623.2)**	**2.8 (2.1, 3.5)**	**10850 (6978, 16599)**	**215 (141, 314.1)**	**2.8 (-0.2, 6.1)**
Lebanon	**156591 (123055, 199776)**	**2919.5 (2279.7, 3701)**	**1.1 (0.7, 1.6)**	**32865 (25813, 42572)**	**608.4 (477.5, 782.1)**	**0.4 (0.1, 0.8)**	**15453 (10266, 22581)**	**287.8 (189, 422.2)**	**1 (-1.6, 3.5)**
Libya	**201928 (154758, 264592)**	**2848.6 (2231.1, 3608.4)**	**1.8 (1.4, 2.3)**	**44327 (33933, 59598)**	**598.5 (470.8, 767.4)**	**1.4 (1.1, 1.8)**	**20061 (13013, 29523)**	**280.7 (187.7, 407.5)**	**1.2 (-1.3, 3.8)**
Morocco	**1049720 (809892, 1345815)**	**2874.2 (2251.3, 3637.4)**	**−0.2 (-0.3, -0.1)**	**223898 (174039, 290471)**	**602.8 (473.8, 775)**	**−0.2 (-0.3, -0.1)**	**104106 (68399, 152467)**	**284 (188.1, 414.4)**	**−0.5 (-2.8, 1.9)**
Oman	**110295 (84180, 148640)**	**2675.9 (2111.4, 3394.5)**	**−1.5 (-2, -1.1)**	**26384 (19791, 35701)**	**567.8 (446.1, 724.1)**	**−0.9 (-1.2, -0.6)**	**11150 (7102, 16784)**	**265 (178.8, 383.8)**	**−1.4 (-4.1, 1.1)**
Palestine	**101782 (79243, 131699)**	**2868 (2248.4, 3630.2)**	**−1.8 (-2.5, -1.3)**	**23148 (17783, 30172)**	**601.2 (472.7, 773)**	**−1.1 (-1.7, -0.7)**	**10109 (6549, 14844)**	**281.7 (185.6, 412.1)**	**−2.1 (-4.7, 0.7)**
Qatar	**74938 (56461, 101342)**	**2513.1 (1977.8, 3177.9)**	**−2.8 (-3.8, -1.9)**	**18095 (13388, 24750)**	**547 (429.6, 697.7)**	**−1.4 (-2, -1)**	**7560 (4852, 11433)**	**247.6 (165.9, 357.4)**	**−3.1 (-5.9, -0.4)**
Saudi Arabia	**1000012 (761517, 1326633)**	**2727.8 (2143.3, 3464.9)**	**0.1 (-0.2, 0.4)**	**231329 (172639, 310834)**	**580.2 (455.9, 741.8)**	**0.3 (-0.1, 0.5)**	**100132 (64563, 148662)**	**268.6 (178.9, 389.4)**	**−0.2 (-2.7, 2.4)**
Sudan	**804491 (626528, 1044812)**	**2852.1 (2234.1, 3611.6)**	**−0.3 (-0.5, -0.1)**	**185517 (142954, 243360)**	**602.3 (474, 778.8)**	**−0.1 (-0.2, 0.2)**	**80487 (52631, 117694)**	**282.3 (186.1, 410.8)**	**−0.3 (-2.9, 2.3)**
Syrian Arab Republic	**414330 (315819, 538815)**	**2889.6 (2265.1, 3663.2)**	**1.3 (1, 1.8)**	**87384 (67302, 112608)**	**608.3 (478.9, 787.1)**	**1.4 (1, 1.8)**	**41034 (26714, 60137)**	**285.2 (189.5, 415.7)**	**0.8 (-1.7, 3.3)**
Tunisia	**381408 (293932, 486931)**	**2883.1 (2258.7, 3648.4)**	**0.6 (0.4, 0.9)**	**79383 (62002, 102497)**	**604.3 (474.9, 777.4)**	**0.3 (0.2, 0.5)**	**37856 (24817, 55427)**	**286 (188, 415.1)**	**0.3 (-2.1, 3.1)**
Turkey	**2696086 (2091024, 3434491)**	**2875 (2252.6, 3640.8)**	**0 (-0.1, 0)**	**564532 (440732, 733058)**	**601.5 (472.6, 771.7)**	**−0.1 (-0.1, 0)**	**267435 (174137, 390416)**	**284.8 (188.6, 414.8)**	**0 (-2.4, 2.5)**
United Arab Emirates	**301533 (221561, 413691)**	**2536.2 (2000.6, 3197.9)**	**−2.2 (-3.2, -1.4)**	**70712 (50498, 101159)**	**551 (432.8, 700.4)**	**−0.9 (-1.7, -0.4)**	**30440 (19270, 47076)**	**250.7 (166.5, 364.1)**	**−2.3 (-5.3, 0.4)**

(*continued on next page*)

Table 1 (*continued*)

	Prevalence (95 % UI)			Incidence (95 % UI)			YLDs (95 % UI)		
	Counts (2019)	**ASRs (2019)**	**Pcs in ASRs 1990–2019**	**Counts (2019)**	**ASRs (2019)**	**Pcs in ASRs 1990–2019**	**Counts (2019)**	**ASRs (2019)**	**Pcs in ASRs 1990–2019**
Yemen	**597238 (464125, 777153)**	**2874.2 (2251.5, 3638.2)**	**0.1 (-0.4, 0.5)**	**138483 (107024, 181749)**	**602.6 (473.7, 774.3)**	**0.1 (-0.3, 0.4)**	**59350 (38888, 86824)**	**282.6 (186.5, 408.3)**	**0.2 (-2.3, 2.5)**

ASR: Age-standardised rate; Pcs: Percent changes; UI: Uncertainty interval; YLD: Years lived with disability.

utilised to produced separate age-specific estimates for both sexes. However, if no within-study sex ratio was reported, the prevalence data were divided utilising a sex ratio derived from a meta-analysis of sex-specific data via meta-regression (Bayesian, Regularized and Trimmed - MR-BRT). The sex ratio (female to male) in this study was 1.31 (1.30–1.32). Lastly, following bias correction, when studies presented estimates encompassed age groups broader than 25 years, DisMod-MR 2.1 was applied to disaggregate these into the required five-year age groups. Potential bias caused by using alternative definitions of neck pain was adjusted for using MR-BRT. A complete description of the data processing has previously been reported [9]. The modeling strategy was the same as in GBD 2017,

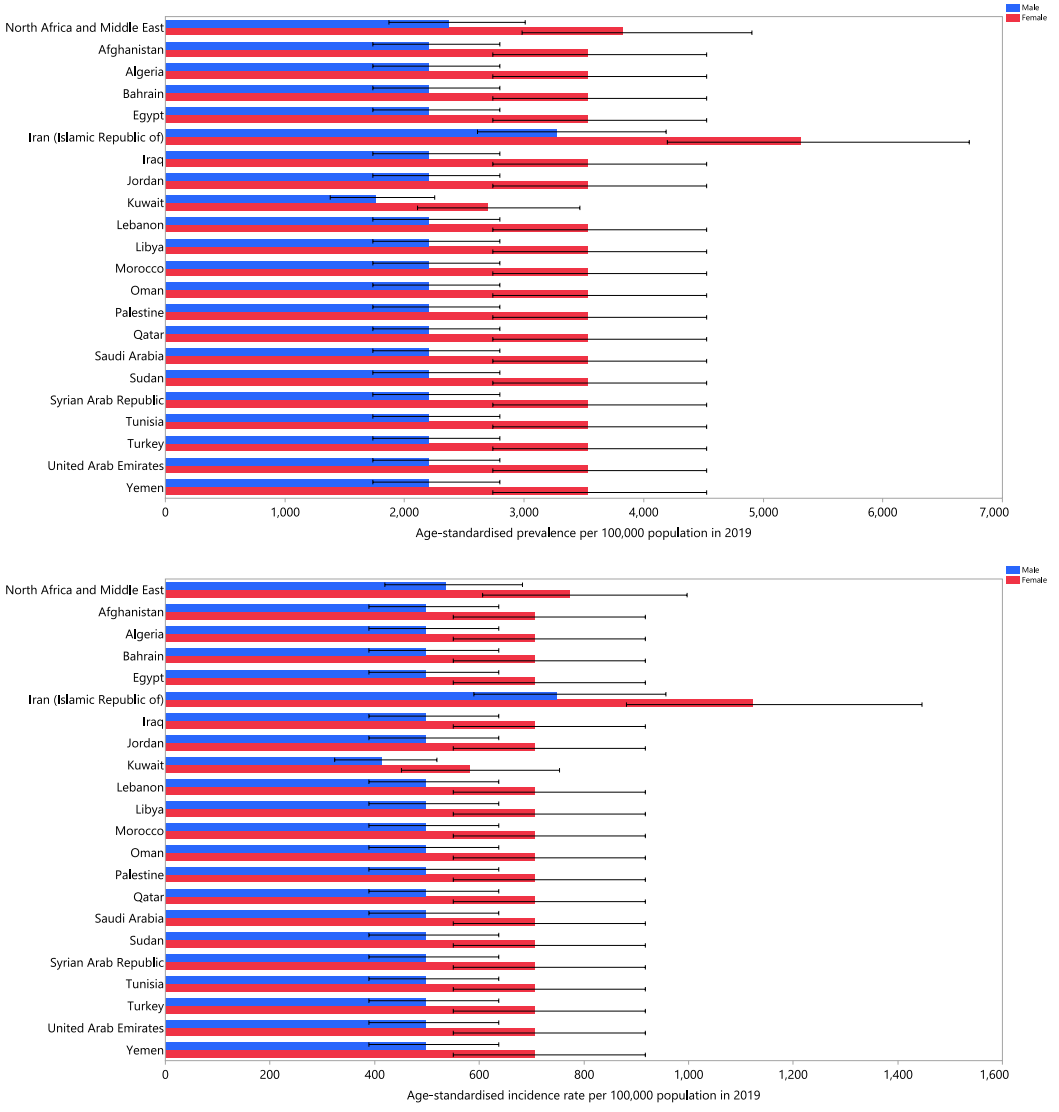

Fig. 1. Age-standardised point prevalence **(A)**, incidence rate **(B)**, and YLD rate **(C)** of neck pain (per 100,000 population) in the Middle East and North Africa region in 2019, by sex and country. YLD = years lived with disability. (Generated from data available from http://ghdx.healthdata.org/gbd-results-tool).

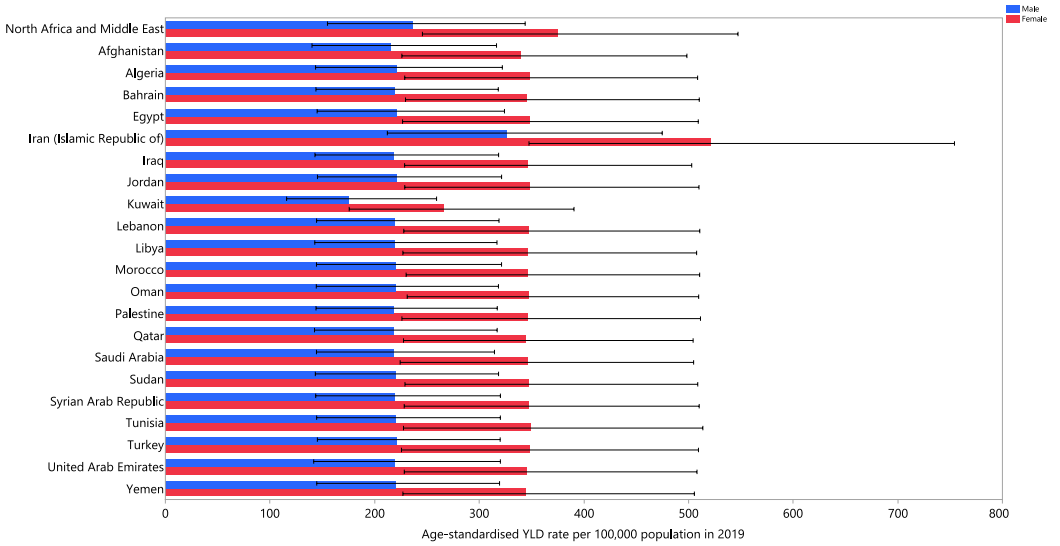

Fig. 1. (*continued*).

including the assumption that no incidence of neck pain occurred before the age of five and that there was no mortality caused by neck pain [9]. Further details can be found in the GBD capstone paper [9].

2.4. Severity and YLD

There were four severity levels of neck pain and their matching disability weights (DWs) are shown in Table S1. YLD was produced by multiplying the prevalence estimates for each sequelae with their corresponding DWs. The YLD is a measure of disease burden, where one YLD corresponds to one complete 12 month period of healthy life lost due to the disability or ill-health. The disability-adjusted life year (DALY), which is another commonly used measure to demonstrate the disease burden, is calculated by adding together the YLDs and years of life lost. As neck pain caused no mortality, the YLDs and DALYs were identical. All estimates were standardised using the GBD standard population and all were accompanied by 95 % uncertainty intervals (UIs). The UIs were estimated by making 1000 iterations at every step in the modelling process. The 1000 estimates were then arranged in numerical order, with the 95 % UIs being from the 25th to the 975th values.

The study employed Smoothing Splines to examine the association between neck pain and SDI [12]. The SDI produces a score which ranges from 0 (indicating the lowest level of development) to 1 (indicating the highest level of development). The index serves as a comprehensive measure of socio-economic advancement, which incorporates the income per capita distributed over time, educational achievement among individuals over 15 years of age, and the overall fertility rate among individuals under 25 years old [9]. The estimated incidence, point prevalence, and YLDs due to neck pain in the MENA region were sourced from http://ghdx.healthdata.org/gbd-results-tool. Additionally, all figures were generated using R software (Version 3.5.2).

3. Results

3.1. The Middle East and North Africa region

In 2019, the number of prevalent cases of neck pain in MENA was 17.4 million (95 % UI: 13.5 to 22.3). The age-standardised point prevalence was 3066.7 (2407.8–3894.3) per 100,000 individuals, which has decreased by 0.1 % since 1990 (−0.3 to 0.1 %) (Table 1 and Table S1). There were 3.8 million (3.0–5.1) incident cases of neck pain in MENA and an age-standardised incidence rate of 649.2 (509.2–829.2) per 100,000, which has decreased by 0.2 % since 1990 (−0.5 to 0.0 %) (Table 1 and Table S2). There were 1.7 million (1.1–2.5) regional YLDs in 2019, with an age-standardised rate of 303.0 (201.5–438.8) per 100,000, which was 0.2 % lower than in 1990 (−0.9 to 0.5 %) (Table 1 and Table S3).

3.2. National level

In 2019, within the MENA region, the national age-standardised point prevalence of neck pain was between 2167.5 and 4288.7 cases (per 100,000). The three highest age-standardised point prevalence rates in 2019 were reported in Iran [4288.7 (3391.7–5448.4)], Lebanon [2919.5 (2279.7–3701.0)] and the Syrian Arab Republic [2889.6 (2265.1–3663.2)], while the lowest were found in Kuwait [2167.5 (1705.4–2779.4)], Qatar [2513.1 (1977.8–3177.9)] and the United Arab Emirates [2536.2 (2000.6–3197.9)] (Fig. 1A and Table S1). The age-standardised incidence rates of neck pain in 2019, for the 21 MENA countries, ranged from 488.7 to

934.1 cases per 100,000. Iran [934.1 (732.9–1189.9)], Lebanon [608.4 (477.5–782.1)] and the Syrian Arab Republic [608.3 (478.9–787.1)] had the highest rates. In contrast, the lowest rates were in Kuwait [488.7 (379.9–623.2)], Qatar [547.0 (429.6–697.7)] and the United Arab Emirates [551.0 (432.8–700.4)] (Fig. 1B and Table S2). In terms of the national age-standardised YLD rates of neck pain in 2019, the range spanned from 215.0 to 423.5 cases per 100,000. Iran [423.5 (280.3–609.8)], Lebanon [287.8 (189.0–422.2)] and Tunisia [286.0 (188.0–415.1)] recorded the highest rates, while Kuwait [215.0 (141.0–314.1)], Qatar [247.6 (165.9–357.4)] and the United Arab Emirates [250.7 (166.5–364.1)] had the lowest (Fig. 1C and Table S3).

From 1990 to 2019, there were increases in the age-standardised point prevalence in several countries in the MENA region, with the largest percentage changes being seen in Kuwait [3.2 % (2.3–4.1 %)], Libya [1.8 % (1.4–2.3 %)] and the Syrian Arab Republic [1.3 % (1.0–1.8 %)], while Qatar [−2.8 % (−3.8 to −1.9 %)], the United Arab Emirates [−2.2 % (−3.2 to −1.4 %)] and Bahrain [−2.0 % (−2.8 to −1.3 %)] had the largest decreases (Table S1). The biggest increases in the estimated age-standardised incidence rates were found in Kuwait [2.8 % (2.1–3.5 %)], Libya [1.4 % (1.1–1.8 %)] and the Syrian Arab Republic [1.4 % (1.0–1.8 %), while the largest decreases were seen in Afghanistan [−1.4 % (−2.2 to −0.7 %)], Qatar [−1.4 % (−2.0 to −1.0 %)] and Palestine [−1.1 % (−1.7 to −0.7 %)] (Table S2). The largest increase in the age-standardised YLD rate was seen in Iran [1.1 % (0.4–1.8 %)], while the largest decrease was found in Qatar [−3.1 % (−5.9 to −0.4 %)] (Table S3 and Fig. S1).

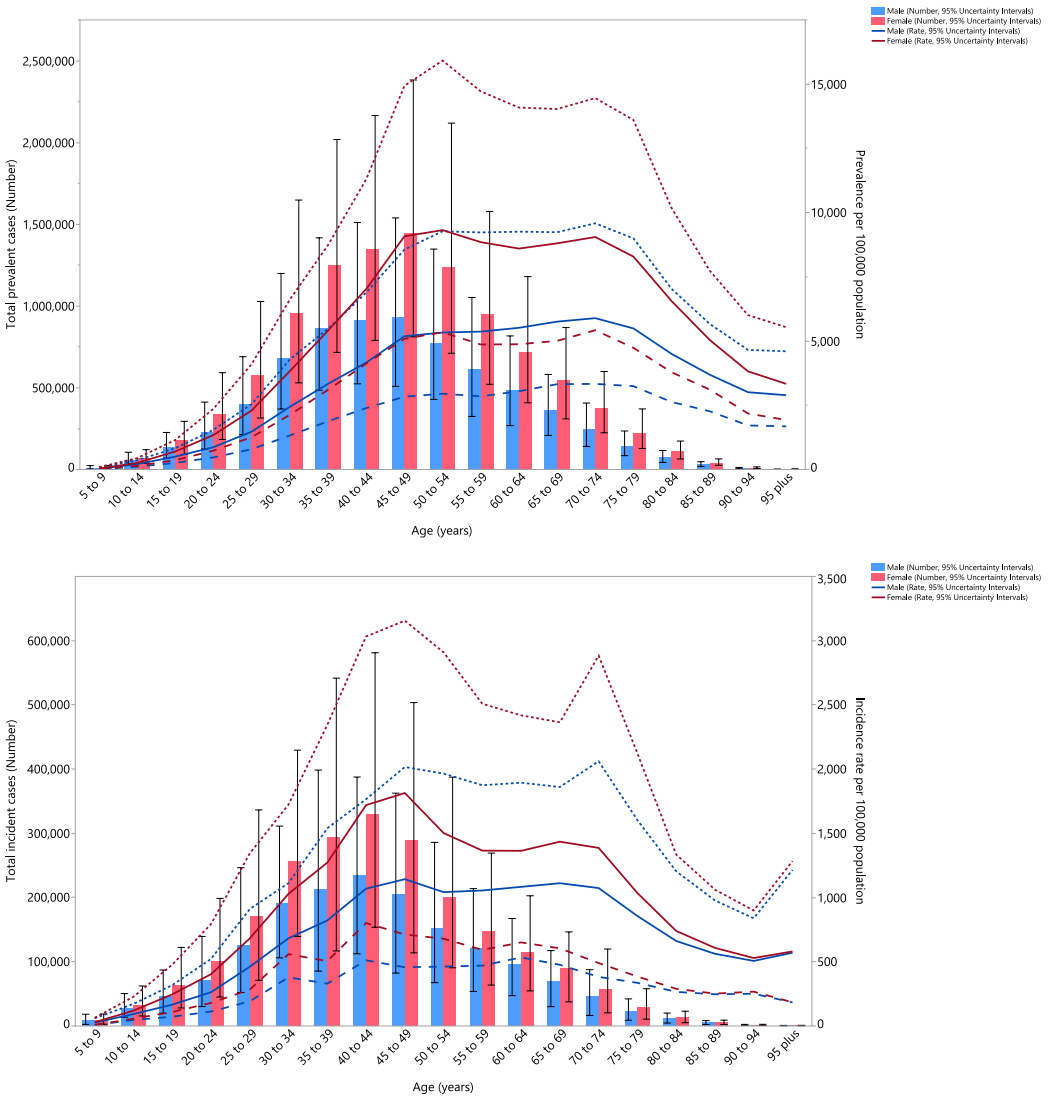

Fig. 2. Numbers of prevalent cases and prevalence (**A**), number of incident cases and incidence (**B**) and the number of YLDs and YLD rate (**C**) for neck pain per 100,000 population in the Middle East and North Africa region, by age and sex in 2019; Dotted and dashed lines indicate 95 % upper and lower uncertainty intervals, respectively. YLD = years lived with disability. (Generated from data available from http://ghdx.healthdata.org/gbd-results-tool).

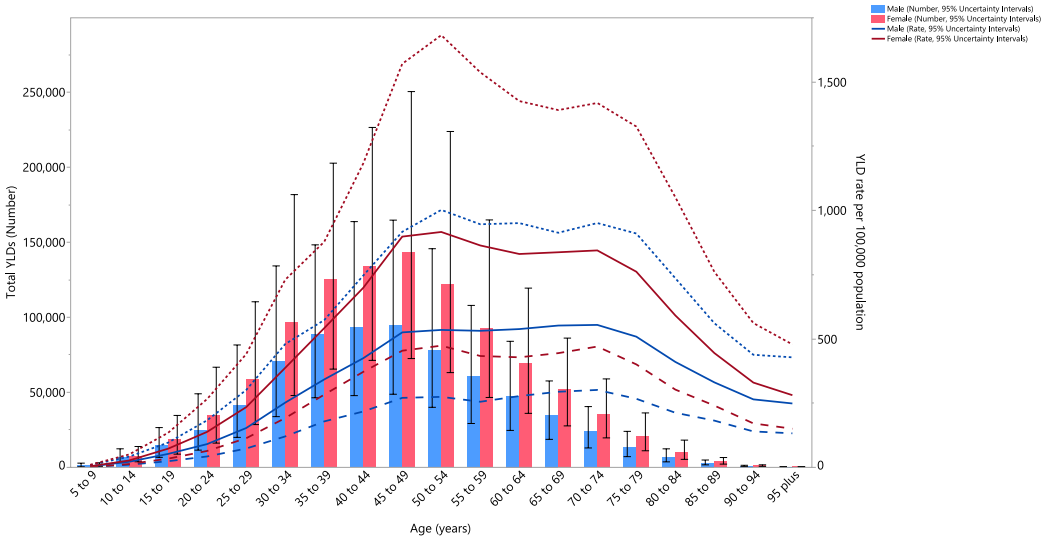

Fig. 2. (*continued*).

3.3. Age and sex patterns

In 2019, the point prevalence of neck pain in the region reached its peak among females in the 50–54 age range and among males in the 70–74 age range. The point prevalence showed an almost constant increase with a plateau from 45 to 79 years of age. In addition, females had a higher point prevalence in all age ranges. In terms of the number of prevalent cases, these peaked in the 45–49 age range in both sexes, and were again higher in females in all age ranges (Fig. 2A).

In the year 2019, the incidence rates of neck pain in the MENA region peaked in the 45–49 age-group, while the overall number of incident cases peaked in the 40–44 age-group for both sexes. Furthermore, the incident rate and the number of incident cases were higher in females of all age-groups (Fig. 2B). The YLD rate of neck pain in the MENA region escalated with age for both men and women, reaching its peak in the 45–49 age group. Moreover, the number of YLDs peaked in the 45–49 age range for both sexes. The YLD rates and YLDs were higher for females across the entire age range (Fig. 2C).

The age-standardised YLD rates in MENA were compared to the global rates by sex, age-groups, and for both 1990 and 2019. The ratios were similar for 1990 and 2019 across all age-groups (Fig. 3).

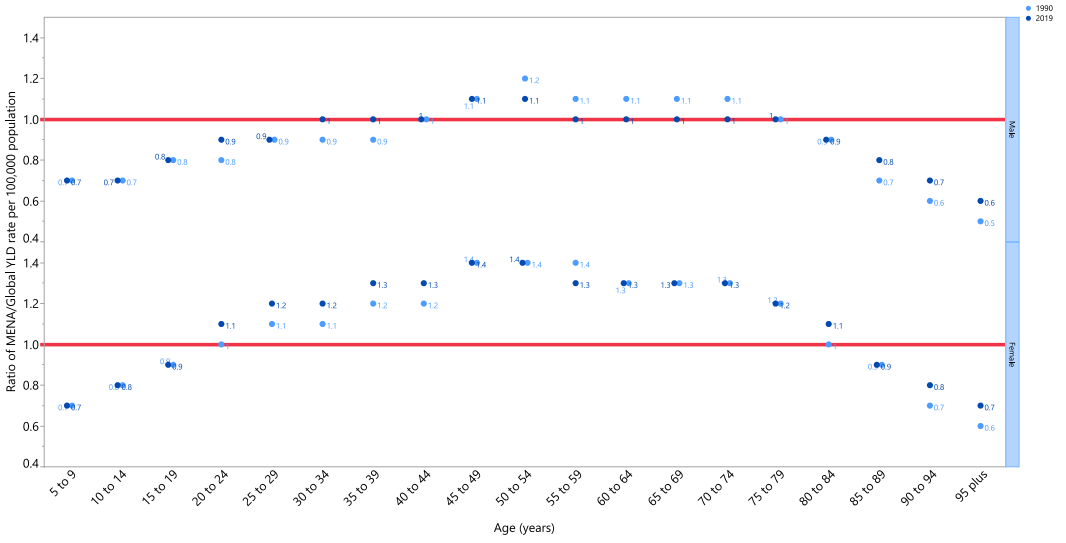

Fig. 3. Ratio of the Middle East and North Africa region to the global neck pain YLD rate by age and sex, 1990 and 2019. YLD = years lived with disability. (Generated from data available from http://ghdx.healthdata.org/gbd-results-tool).

3.4. Relationship with SDI

The relationship between the SDI and the burden of neck pain (i.e., age-standardised YLD rate) was not significant up to an SDI level of 0.62. After this, the YLD rate decreased until it reached an SDI level of 0.82, and then increased with increasing SDI values. Furthermore, the burden in Kuwait was substantially lower than the expected, while the burden in Iran was noticeably higher than the expected burden over the entire measurement period (Fig. 4).

4. Discussion

The current research utilised GBD 2019 data to present information on the prevalence, incidence and YLDs due to the neck pain in the MENA region from 1990 to 2019. In 2019, neck pain was responsible for 17.2 million prevalent cases, 3.8 million incident cases and 17.2 million YLDs. We found that the age-standardised point prevalence, incidence rate and YLD rate of neck pain had hardly changed during the last thirty years. In addition, neck pain was more common among females in their fifth decade of life. Furthermore, the burden of neck pain had no clear and consistent relationship with the SDI over the measurement period.

The proportion of neck pain within the overall incidence of musculoskeletal disorders in MENA increased from 17.3 % in 1990 to 18.4 % in 2017 [13]. In addition, there were global declines in the age-standardised point prevalence (0.9 %), incidence (0.7 %) and YLD rates (0.7 %) of neck pain between 1990 and 2017 [5]. However, from 1990 to 2019 a much lower decrease was found in the MENA region. Moreover, our research found that the age-standardised point prevalence of neck pain in MENA was 3066.7 per 100,000 population, while in 2017 the corresponding figure was 4458.4 [5]. Furthermore, the age-standardised annual incidence rate of neck pain in MENA was 975.6 (per 100,000 population) in 2017, but in 2019 this had decreased to 649.2 (per 100,000). This pattern was also seen in the YLD rate, with our findings being much lower than those from 2017 [5]. There were no significant changes in the burden of neck pain over the period 1990–2019 in MENA. Similarly, at the global level there were no noteworthy alterations in the age-standardised prevalence (−0.48 % [−2.58, 1.67 %]), incidence (−0.46 [−2.13, 1.52]), and YLD rates (−0.34 [−2.47, 1.85]) of neck pain between 1990 and 2019 [8]. The differences in the burden of neck pain could be as a result of low-quality data and the inconsistent recording of neck pain in this region, or were simply due to the different measurement period between the two studies [5]. Moreover, variations in the data sources used by GBD 2017 and 2019 may be another potential contributor to the observed differences. The findings strongly imply that the development and implementation of focused rehabilitation and preventative programs have the potential to reduce the prevalence and burden of neck pain globally, especially within the MENA region. Such programs could help to maintain a steady and manageable level of neck pain, both globally and within MENA, by concentrating on methods that improve neck health.

In 2019, Iran registered the highest burden of neck pain, in terms of the age-standardised point prevalence, while the lowest rates were found in the high-income Arab countries of western Asia, such as Kuwait. According to the GBD 2017 study, musculoskeletal disorders were the third largest contributor to all-cause DALYs in Iran and neck pain accounted for 21.7 % of the DALYs attributable musculoskeletal disorders in 2017 [14]. The disparities in the neck pain burden among MENA countries may stem from inter-country variations in contact with important risk factors, particularly psychosocial and work-related factors [1]. The substantially higher rate

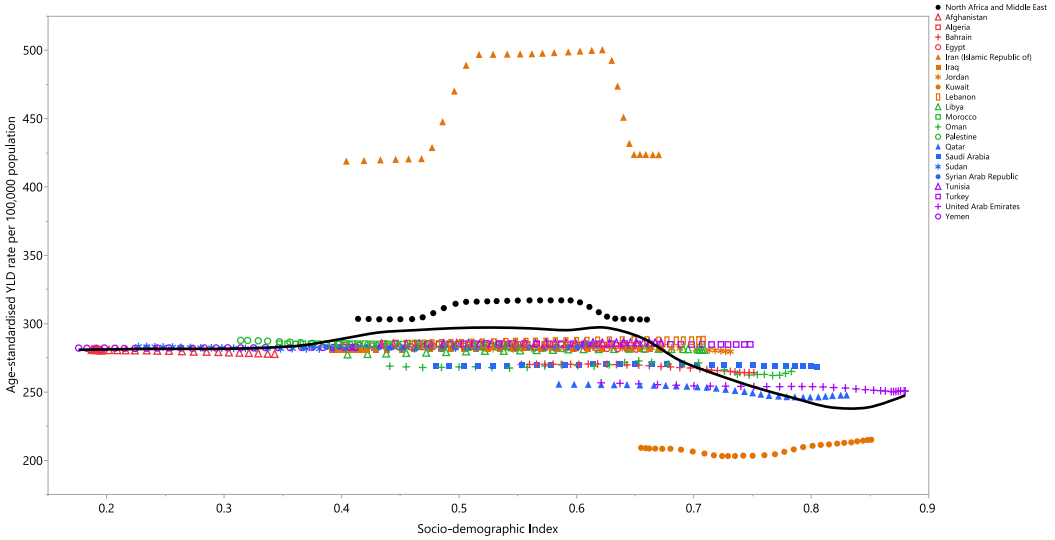

Fig. 4. Age-standardised YLD rates of neck pain for the 21 countries and territories, by SDI from 1990 to 2019; Expected values based on the Socio-demographic Index and disease rates in all locations are shown as the black line. Each point shows the observed age-standardised YLD rate for each country during 1990–2019. YLD = years lived with disability. SDI= Socio-demographic Index (Generated from data available from http://ghdx.healthdata.org/gbd-results-tool).

of neck pain in Iran might be as a result of the higher rate of mental disorders observed in the country. Several studies have found a strong correlation between mental health problems and the incidence of neck and back pain [15–18]. Furthermore, in 2019 Iran had the highest prevalence of schizophrenia, major depressive disorder, anxiety disorder, bipolar disorder, and attention-deficit/hyperactivity disorder in MENA [19]. Therefore, targeting psychological problems in this country may be accompanied by a future decrease in the burden of neck pain. Additional research is required to identify the reasons for the higher burden of neck pain in Iran and to plan programs to lower the burden.

The present study found that Iran was the only country to register an increase in the YLD rate attributable to neck pain over the period 1990 to 2019. This finding might be due to population growth and aging as a result of increased life expectancy in Iran, which has been driven by widespread improvements in access to healthcare services [20]. In addition, exposure to risk factors in the workplaces, such as ergonomic risks, play a key role in the occurrence of neck pain. Although disabilities due to occupational risk factors in Iran have decreased for males over the period 1990 to 2019, they have increased slightly for females [20]. Considering the higher YLD rate in females, it may be that work-related factors are the main contributors to the increased YLD rate over the last few decades. Furthermore, a national survey of Iranian employees found that repetitive work and maintaining a constant sitting position were the main physical causes of neck pain among females [21]. In a recent trial, an ergonomic training intervention (e.g., proper sitting positions and effective exercises while working) were provided to a number of Iranian workers, with the aim of evaluating the subsequent risk of neck pain. This research demonstrated that the frequency of neck pain was substantially reduced for those workers who attended the ergonomic workshops [22]. There are many other recommendations for the management of neck pain, including reassurance, guidance, and education, as well as medication, injections, acupuncture, thermotherapy, manual manipulation, exercise regimens, postural adjustments, traction, electrotherapy, orthotic aids, ergonomic interventions, taping or strapping, psychological approaches, comprehensive multidisciplinary treatments, imaging referrals, specialist opinions, and an assortment of other interventions that can be categorised as “miscellaneous” [23]. In addition, the use of mobile systems for the avoidance, diagnosis and treatment of neck pain are also being developed [24]. The development of more specific preventive measures requires information about the burden of neck pain associated with its specific risk factors, but unfortunately these could not be reported in the current study. Nevertheless, developing interventions that improve workplace ergonomics and providing educational courses for workers might be effective in reducing the burden of neck pain at the country and regional levels.

The present research found that the most substantial increases in the age-standardised point prevalence and incidence rate were found in Kuwait. Similarly, the GBD 2017 study also noted that Kuwait was among the top three countries globally and was estimated to have the most substantial increases in the point prevalence, incidence and YLD rates since 1990 [5]. Generally, neck pain is a common complication of several rheumatological disorders, including osteoarthritis [25], rheumatoid arthritis [26], polymyalgia rheumatica [27], and fibromyalgia [28]. Kuwait also had a substantial rise in the point prevalence of musculoskeletal disorders over the period 1990 to 2017 [6]. Therefore, in Kuwait it appears that the frequency of neck pain has increased in parallel with increases in other musculoskeletal disorders.

The point prevalence in MENA was higher among females of all age ranges in 2019, which is consistent with global observations [5]. Furthermore, the regional number of prevalent cases were highest in the 45–49 age range among both sexes in our study, whereas globally in 2017 it was highest in the 45–49 age range for males and the 50–54 age range for females [5]. The higher rate of neck pain among females is in line with the findings of previous studies [29–31]. Furthermore, a study involving 22,000 participants from the general population of Spain found that the risk of chronic neck pain was twice as high among females as it was among males [32]. Likewise, an analysis of the health status of nearly 9 million US adults noted there was a higher prevalence of neck pain among females (4.8 %) than in males (3.9 %) [33]. The evidence seems to mirror the predicted gender disparities reported globally for pain itself, irrespective of the site and origin of the pain [34,35]. A higher sensitivity to pain, having a lower pain tolerance and threshold, and reporting higher job stress are likely explanations for why females are more susceptible to suffering more intense and unpleasant pain. Furthermore, studies have revealed that sex hormones potentially influence pain sensitivity and that endogenous opioid functioning and baseline genetics have a causal role in these gender differences [36–38]. Therefore, middle aged females should be prioritised in any clinical practice and policy actions taken for tackling the regional neck pain problem.

We observed that SDI had a slight negative correlation with the age-standardised YLD rate of neck pain between the SDI levels of 0.62 and 0.82, indicating within this range there was a generally higher burden of neck pain in countries with lower socioeconomic levels over the period 1990 to 2019. However, at the global level a positive relationship was reported between developmental status and the age-standardised YLD rate of neck pain [5]. The relatively monotonic burden of neck pain up to an SDI of 0.62 suggests that the same interventions could be applied in most MENA countries within this range. The higher YLD rate in the low and middle SDI counties of MENA might imply that there is still room for equipping workplaces with more standard tools, encouraging individuals to avoid inactivity, and training workers in ergonomically appropriate work habits. In addition, applying strategies for controlling psychological risk factors, particularly stress and anxiety, might also be effective interventions in these countries.

4.1. Strengths and limitations

In contrast to back pain, very little attention has been given to neck pain, and its attributable burden seems to have been underestimated over the last few decades. The present research is the first to investigate the prevalence, incidence and YLDs associated with neck pain in the MENA region using the most up-to-date data from the GBD project. However, our research has several shortcomings that must be considered when interpreting our findings. The GBD project did not model the burden of neck pain attributed to its specific risk factors. In general, identifying and controlling the specific risk factors of a particular disease or disorder is necessary to enable the implementation of preventive measures. The provision of country specific details about risk factors would

definitely benefit health policy-makers and must therefore be included in all following iterations of the GBD project. In addition, the study includes data from all 21 countries in the MENA region, but it may not represent the entire population of the region. The exclusion of certain populations may limit the generalisability of the findings and could result in an incomplete understanding of the burden of neck pain in MENA.

The current research used a number of methods for data processing, including adjusting for bias and estimating uncertainty intervals. While these methods are commonly used, they also provide the potential for bias and variability to be introduced into the results. Furthermore, the accuracy of the estimates may be influenced by the assumptions and models used in the data processing. Moreover, the study focused on the burden of neck pain but does not provide information on the treatment and management strategies employed in the MENA region. Understanding the availability and effectiveness of existing treatments and the rehabilitation programs available is crucial for developing targeted interventions to alleviate the burden of neck pain. Furthermore, the primary data included in the GBD studies might not all be high quality and data was only available for a limited number of countries. Thus, the results reported here were mainly derived from estimations and modeling.

Considering the extensive scope of the GBD 2019 study, which included 204 countries over a span of 30 years, both sexes, and 20 age groups, GBD 2019 had the task of generating approximately 250,000 estimates. It is important to highlight that GBD consistently utilizes uniform severity distributions across various time periods and geographical regions. Additionally, the GBD approach frequently involves estimating proportions or counts for certain countries by leveraging data from other nations. This strategy is particularly evident in the MENA region, where adequate primary data might be lacking. Therefore, encouraging healthcare providers to include questions about neck pain in national health surveys should be strongly encouraged. In addition, incorporating primary data from national health surveys would substantially improve our understanding of the situation in each of the MENA countries. In order to improve the precision of the findings, future studies could focus on documenting temporal trends over this time period. An investigation into the evolving burden of neck pain would provide valuable insights into the effectiveness of interventions and shed light on how socioeconomic changes impact the burden of neck pain.

5. Conclusions

The prevalence of neck pain varied widely between countries. Although the age-standardised point prevalence, incidence and YLD rate from neck pain barely changed from 1990 to 2019, the burden in this region continues to be high. Those who are middle-aged are particularly at risk, regardless of whether they are males or females. It is necessary to raise public awareness of neck pain, its risk factors, and the importance of obtaining an early diagnosis and treatment in reducing long-term complications. Furthermore, creating ergonomically appropriate working environments and providing training would also be useful in reducing the incidence of work-related neck pain. Lastly, tracking the national trends associated with neck pain is crucial in order to update the interventions used in accordance with the need and resources available. Future studies are needed to research the burden of neck pain that is attributable to each risk factor, as well as to facilitate the recommendation of specific interventions for controlling and reducing neck pain in the region.

Contributors

SS, AAK, MA and AK designed the study. RSA and SS analysed the data and performed the statistical analyses. RSA, SAN, MN, AK, MJMS, AAK, GSC and SS drafted the initial manuscript. All authors reviewed the drafted the manuscript for critical content. All authors approved the final version of the manuscript.

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Ethics approval

The present study was approved by the ethics committee of the Tabriz University of Medical Sciences (IR.TBZMED.REC.1400.1166). All methods were performed in accordance with national guidelines and regulations.

Patient consent for publication

Not required.

Data sharing statement

The data used for these analyses are all publicly available at http://ghdx.healthdata.org/gbd-results-tool.

Author note

This study is based on publicly available data and solely reflects the opinion of its authors and not that of the Institute for Health Metrics and Evaluation.

CRediT authorship contribution statement

Ramin Ahangar-Sirous: Writing – original draft, Writing – review & editing. **Mahasti Alizadeh:** Conceptualization, Writing - review & editing. **Seyed Aria Nejadghaderi:** Writing – original draft, Writing – review & editing. **Maryam Noori:** Writing – original draft, Writing – review & editing. **Alireza Khabbazi:** Conceptualization, Writing – original draft, Writing – review & editing. **Mark J. M. Sullman:** Writing – original draft, Writing – review & editing. **Ali-Asghar Kolahi:** Conceptualization, Writing – original draft, Writing – review & editing. **Gary S. Collins:** Writing – original draft, Writing – review & editing. **Saeid Safiri:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Software, Visualization, Writing – original draft, Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.heliyon.2023.e21296.

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