Prevalence of Obesity and Overweight among Adults in the Middle East Countries from 2000 to 2020: A Systematic Review and Meta-Analysis

Hassan Okati-Aliabad, Alireza Ansari-Moghaddam, Shiva Kargar, and Neda Jabbari

1. Health Promotion Research Center, Zahedan University of Medical Sciences, Zahedan, Iran
2. MSc of Epidemiology, Gerash University of Medical Sciences, Gerash, Iran
3. Department of Environment Health Engineering, School of Health, Zahedan University of Medical Sciences, Zahedan, Iran

Correspondence should be addressed to Shiva Kargar; shivakargar@yahoo.com

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Background. Obesity has become a significant public health issue worldwide, and it is a major risk factor for many non-communicable diseases. This systematic review aimed to identify the prevalence of obesity and overweight in the Middle East region and different countries in this region. Materials and Methods. PubMed, Google Scholar, and MEDLINE databases were searched from 2000–2020 to identify relevant studies in the Middle East area. The survey was carried out using combinations of Medical Subject Headings (Mesh) keywords like “body mass index”, “obesity”, “overweight”, “prevalence”, “Middle-East”, and “Countries in the Middle East area”. Analysis of the data was done using STATA-14, and a random-effects model was used to estimate the pooled prevalence. Results. A total of 101 studies with 698905 participants have been identified that met inclusion criteria for this meta-analysis. The pooled estimates of the prevalence of obesity and overweight in the Middle East area were 21.17 (95% CI: 17.05–26.29) and 33.14 (95% CI: 26.87–40.87), respectively. The findings showed that obesity prevalence increased with age so that the highest prevalence of obesity and overweight was observed in people >40 years old. Obesity prevalence in the Middle East area remained steady between 2000–2006 and 2014–2020 (23%). During these time intervals, the prevalence of overweight decreased from 34.83 (95% CI: 32.40–37.45) to 32.85 (95% CI: 31.39–34.38). Conclusions. Despite the relative stabilization of the overweight and obesity trend in the Middle East, current interventions to combat the overweight epidemic need to be maintained and strengthened because the prevalence of overweight and obesity in this region is still very high. The prevalence of obesity increases with age so that people over 40 have the highest percentage of obesity and overweight. Therefore, implementing intervention programs to prevent and control obesity and overweight in the Middle East is essential.

1. Introduction

Obesity and overweight are health problems that indicate excessive and abnormal accumulation of body fat and lead to adverse health effects [1]. Epidemiological studies have identified obesity and overweight as risk factors for several diseases, including diabetes, various cancers, cardiovascular disease, and hypertension [2]. The increasing prevalence of high BMI and its resulting mortality threaten people’s health in many countries. In addition, it causes destructive health effects and financial burden on people and society [3, 4]. The leading causes of the increase in obesity and overweight in the Eastern Mediterranean (EMRO) are lifestyle changes, including unhealthy eating habits, physical inactivity, and cultural, social, and economic changes [5, 6]. On the other hand, using a plant-based diet and physical activity in daily life reduces the risk of obesity [7]. Kuwait, Qatar, and Libya, the three EMRO countries, were among the top ten countries with the highest prevalence of obesity in the world in 2013 [8].
The body mass index (BMI) is a simple index to classify overweight and obesity in adults and is defined as weight in kg/height in m². Individuals with a BMI ≥ 30 kg/m² are considered obese, and individuals with a BMI between 25 and 29.9 kg/m² are considered overweight [9]. Studies show that with age, BMI increases, which is more common in women than men [10].

Up-to-date information on the level and trend of overweight and obesity is needed to prioritize measures to prevent and control weight gain and obesity by health policymakers. Therefore, this systematic review aims to estimate the prevalence of obesity and overweight in general and based on countries in the Middle East. The study also evaluated the attributable risk of obesity-related cardiovascular disease populations in the Middle East.

2. Method

2.1. Search Strategy. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) standards were used when conducting this systematic review [11]. A literature search was performed in the online database including Google Scholar, PubMed, and MEDLINE to find the relevant article published between 2000 and 2020. The investigation was done using keyword combinations Medical Subject Headings (Mesh) such as “body mass index”, “obesity”, “overweight”, “prevalence”, “Middle-East”, and “Countries in the Middle East area”. Two authors worked separately on the literature search.

2.2. Inclusion and Exclusion Criteria. The following are the criteria for including articles in the meta-analysis:

1. Studies have defined a BMI of ≥ 30 kg/m² as obesity and a BMI of 25–29.9 kg/m² as overweight
2. The classification of overweight and obese people was clearly defined
3. Cross-sectional population-based studies were performed between 2000 and 2020 that reported the prevalence of obesity and overweight
4. Adults over the age of 15 were eligible to participate in the studies

Studies were excluded from the meta-analysis if they were not published in English and if they focused on children and adolescents and populations with specific conditions, such as hypertension, diabetes, and cancer. In addition, studies that provided the only frequency of obesity and overweight, with no data to calculate the 95% confidence interval and mixed reporting of obesity and overweight were excluded.

3. Study Selection and Data Extraction

3.1. Data Extraction. All articles identified in databases were screened based on keyword, title, and abstract by two researchers independently. Then, relevant articles were assessed, and data extraction was done from the eligible articles and information stored into Microsoft Excel using a checklist created by the researcher.

Data extracted for study characteristics contained the following items: names of authors, year of publication, sample size, gender, age, study setting (country, urban/rural), the prevalence of obesity, overweight, and body mass index mean and its 95% confidence interval. Some studies, however, did not report confidence intervals. As a result, the following equation was used to calculate the relevant confidence intervals for each point estimation:

\[ \hat{p} + \frac{z^{\alpha/2}}{2n} \pm \frac{\sqrt{p(1-p)\hat{z}^2}}{4n} \left( \frac{1}{1 + \frac{z^2}{n}} \right) \]  

3.2. Statistical Analysis. The random-effects models were used to generate pooled estimates. I-square and Q figures were also used to look at potential sources of heterogeneity.

The population attributable risks for cardiovascular diseases such as coronary heart disease (CHD), heart failure (HF), and atrial fibrillation (AF) associated with obesity were calculated by prevalence estimates of the obesity in this meta-analysis and the equation: \( PAR = P \times (RR - 1)/P \times (RR - 1) + 1 \). The RR was obtained from previously published recent meta-analyses that assessed the association between obesity and the disease listed above.

Therefore, the relative risk (RR) and 95% CI for atrial fibrillation (AF) were considered 1.51 (1.35–1.68) [12] and odd ratio (OR) and 95% CI for the association between obesity and coronary heart disease (CHD) and heart failure (HF) were considered 1.20 (1.02–1.41) and 1.62 (1.32–1.99), respectively [13, 14].

4. Result

4.1. Selection of Study and Characteristics. In the primary search, 1037 articles were identified from databases, of which 230 duplicate articles were excluded. In the first phase (assessing title and abstract), 533 articles were removed due to not being a cross-sectional study design, unrelated title, out of the Middle East scope and review article nature. Finally, 274 articles were assessed in full text; of these, 101 articles met the inclusion criteria in this systematic review and meta-analysis. The flowchart of the study selection process and the frequency of factors for exclusion are outlined in Figure 1.

The studies were performed in 17 Middle East countries: Turkey (16 reports), Iran (11), Kuwait (9), Israel (2), Saudi Arabia (11), Oman (4), Palestine (6), Yemen (1), United Arab Emirates (5), Syria (2), Lebanon (6), Iraq (7), Cyprus (2), Bahrain (2), Jordan (8), and Egypt (8).

A total of 698905 participants aged >15 years were included in this systematic review. Studies had a range of sample sizes from 2500 to 257555. The articles were published between 2000 and 2020, including 18 articles during 2000–2006, 40 articles during 2007–2013, and 43 articles during 2014–2020. Moreover, four studies assessed the prevalence of obesity and overweight on only men and thirteen studies on only women. Table 1 summarizes the characteristics of the articles that were used in the study.
4.2. Prevalence of Overweight and Obesity. Overall, the pooled estimates of the prevalence of obesity and overweight in the Middle East countries were 21.17 (95% CI: 17.05–26.29) and 33.14 (95% CI: 26.87–40.87), respectively (Figure 2). However, some heterogeneity was observed between the results of the studies \((p < 0.001)\). The range of prevalence of obesity in the Middle East region was between 40.62 (95% CI: 35.85–46.03) in Syria and 8.80 (95% CI: 7.70–10.00) in Yemen. Also, the range of prevalence of overweight among adults in the Middle East region was between 62.10 (95% CI: 60.30–63.90) in Israel and 23.50 (95% CI: 22.00–25.20) in Yemen.

Based on results of sex-specific subgroup analyses, the prevalence of obesity was significantly higher in women, 25.40 (95% CI: 23.66–27.27), than in men, 19.86 (95% CI: 17.60–22.40) \((p = 0.001)\). In contrast, men were more likely to be overweight than women, with a prevalence of 37.80 (95% CI: 36.20–39.47) compared to 31.24 (95% CI: 29.96–32.57) \((p < 0.001)\).

For residency-specific subgroup analyses, although the rural population had a higher prevalence of obesity and a lower prevalence of overweight than the urban population, it was not statistically significant \((p = 0.59, p = 0.77)\). The findings of age-specific subgroup studies revealed that obesity increased with age, peaking in the 50–59 and 60–69 age ranges. In addition, the 40–49 and 60–69 age groups had the highest prevalence of overweight (Table 2).

4.3. Time Trends in Obesity and Overweight by Country and Gender. Table 3 depicts the prevalence of obesity and overweight in the Middle Eastern countries from 2000 to 2020. From 2000 to 2006, the highest prevalence of obesity was in Saudi Arabia, 39.6 (95% CI: 37.9–41.3), and Syria, 38.2 (95% CI: 36.0–40.3). Moreover, from 2014 to 2020, the highest prevalence of obesity was in Oman, 67.81 (95% CI: 65.22–70.51), and Syria, 43.4 (95% CI: 40.2–46.6). Concerning the prevalence of overweight, from 2000 to 2006, the highest prevalence was observed in Kuwait, 44.85 (95% CI: 38.74–51.93), and Iran, 43.3 (95% CI: 37.6–49.1). Despite this, from 2014 to 2020, the highest prevalence was in Jordan, 39.94 (95% CI: 33.98–46.95), and the United Arab Emirates, 39.81 (95% CI: 33.66–47.08).

Overall, in the Middle East region, obesity prevalence remained stable from 2000 to 2006 and 2014 to 2020, with an average prevalence of 23 percent. However, the prevalence of overweight decreased from 34.83 (95% CI: 32.40–37.45) to 32.85 (95% CI: 31.39–34.38) during these time intervals.

The sex-specific subgroup prevalence showed that in women, the prevalence of obesity and overweight decreased from 26.62 (95% CI: 22.93–30.90) and 32.30 (95% CI: 29.84–34.96) during 2000 to 2006 to 23.15 (95% CI: 20.85–25.70) and 32.85 (95% CI: 31.39–34.38) during 2014 to 2020, respectively.

The prevalence of obesity in men increased from 20.08 (95% CI: 16.24–24.82) from 2000 to 2006 to 23.48 (95% CI: 20.26–27.20) from 2014 to 2020. However, the overweight prevalence was stable at these periods (39%).

4.4. Population Attributable Risk of Cardiovascular Disease for Obesity. Table 4 presents Population Attributable Risk
| Authors/year of publication | Setting | Sampling | Age | N.Men | N. female | N. total | Sex/setting | Obesity | Prevalence | 95% CI | Overweight | Prevalence | 95% CI |
|-----------------------------|---------|----------|-----|--------|-----------|----------|-------------|---------|------------|--------|------------|------------|--------|
| Gunaid et al., 2012 [15]   | Yemen   | R, U     | Random sample | ≥20 | 919 | 1581 | 2500 | FM | 8.8 | 7.7–10 | 23.5 | 22–25.2 |
| Janghorbani et al., 2007 [16] | Iran   | —       | Stratified probability cluster | 15–65 | 45,082 | 44,322 | 89,404 | FM | 17.6 | 17.3–17.8 | 32.2 | 31.9–32.5 |
| Kelishadi et al. 2007 [17] | Iran    | R, U    | — | 15–64 | 45113 | 44344 | 89,532 | FM | 28.6 | 28.3–28.9 | 10.8 | 10.6–11 |
| Djalalinia et al. 2020 [18] | Iran    | R, U    | Systematic random sampling cluster | ≥18 | 20280 | 15,044 | 29,124 | FM | 22.7 | 22.2–23.2 | 36.6 | 36.0–37.1 |
| Ali AL-Nooh et al. 2014 [19] | Bahrain | —       | Census | 39.1 | 641 | 498 | 1139 | FM | 38.7 | 35.7–41.5 | 39.7 | 36.8–42.5 |
| Al-Ansari et al. 2000 [20]  | Bahrain | U       | Volunteered | 17–38 | 238 | 406 | 644 | FM | 9 | 6.9–11.4 | 18.1 | 15.2–21.3 |
| Nitzan Kaluski et al. 2007 [21] | Israeli | —      | Random sample | 25–64 | 1371 | 1410 | 2781 | FM | 22.8 | 21.2–24.4 | 62.1 | 60.3–63.9 |
| Fraser et al., 2008 [22]    | Israeli | R, U    | Convenience, cluster random sample | 35–64 | 363 | 1117 | 1480 | FM | 40.9 | 38.2–43.3 | 33.4 | 30.9–35.8 |
| Shabu, 2019 [23]            | Iraq    | U       | Multistage sampling | ≥18 | 14,425 | 14,682 | 29,107 | FM | 25.8 | 24.3–24.2 | 31.3 | 30.7–31.8 |
| AL-Tawil et al., 2005 [24]  | Iraq    | U       | Convenience sample | ≥18 | 322 | 178 | 500 | FM | 7.8 | 5.6–10.5 | 35.8 | 31.5–40.1 |
| Ali Mansour et al. 2012 [25] | Iraq    | U       | Simple random population-based | ≥18 | 62.5 ± 82.1 | 62.5 ± 82.1 | 62.5 ± 82.1 | FM | 8.1 | 5.3–11.6 | 31.6 | 26.6–37 |
| Wafaa et al., 2013 [26]     | Iraq    | U       | Probably | >19 | 35.2 | 30.7–39.8 | 34.5 | 30.1–39.1 |
| Jasim et al., 2018 [27]     | Iraq    | U       | Randomly | >19 | 55 | 145 | 200 | FM | 81.5 | 75.4–86.6 | — | — |
| Hayyawi et al., 2016 [28]   | Iraq    | U       | Census | >19 | 55 | 145 | 200 | FM | 78.1 | 64.9–88.1 | — | — |
| Al-Yasseri et al., 2019 [29] | Iraq    | U       | Convenience sample | 50.2 ± 8.4 | 82.7 | 75.6–88.5 | — | — |
| Al-Kilani et al., 2011 [30] | Oman    | U       | Voluntary basis | 18–25 | 101 | 101 | 202 | FM | 1.49 | 0.3–4.2 | 26.7 | 20.7–33.4 |
| Authors/year of publication | Setting Country | Rural/urban Method | Sampling | Age | N. Men | N. female | N. total | Sex/setting | Obesity Prevalence | 95% CI | Overweight Prevalence | 95% CI |
|-----------------------------|-----------------|-------------------|----------|-----|--------|-----------|---------|-------------|-------------------|--------|----------------------|--------|
| Louay et al., 2015 [31]     | Oman U          | Census            | 18–24    | 43  | 183    | 226       | FM      | M 7.8       | 4.1–11.2          | 29.2   | 23.3–35.6            |
| Barakat et al., 2009 [32]   | Oman R          | Randomly selected | ≥20      | 236 | 643    | 879       | FM      | M 22.9      | 20.1–25.7         | 32.3   | 29.2–35.5            |
| Tengfei et al., 2020 [33]   | Oman R          | Voluntarily       | 16–80    | 554 | 677    | 1231      | FM      | M 28        | 24.5–31.6         | 33.1   | 29.4–36.9            |
| Abdeen et al., 2011 [34]    | Palestine R, U  | Randomly         | 18–64    | 1725| 1653   | 3378      | FM      | M 24.6      | 20.9–28.2         | —      | —                    |
| Abdul-Rahime et al., 2001 [35] | Palestine U    | —                 | 30–65    | 190 | 295    | 485       | FM      | M 30        | 23.5–37            | —      | —                    |
| El Kishawi et al., 2014 [36] | Palestine R, U | Multistage sampling | 18–50   | 209 | 269    | 478       | FM      | M 29.2      | 25.2–33.5         | 36.4   | 32.0–40.8            |
| Stene et al., 2001 [37]     | Palestine R     | —                 | 30–65    | 352 | 498    | 850       | FM      | M 37.5      | 31.7–43.6         | 33.8   | 28.2–39.8            |
| Damiri et al., 2017 [38]    | Palestine U     | 2 stages stratified random sampling | 18–24 | 352 | 498    | 850       | FM      | M 9.1       | 6.3–12.5          | 27.2   | 22.6–32.2            |
| El Kishawi et al., 2016 [39] | Palestine U     | —                 | 18–50    | 1381| 2208   | 3589      | FM      | M 49.3      | 45.3–49.5         | 58.4   | 53.6–63.8            |
| Weiderpass et al., 2019 [40] | Kuwaiti —       | Random sampling   | 18–69    | 918 | 1362   | 2280      | FM      | M 47.5      | 45.3–49.5         | 80.4   | 78.7–82.2            |
| Al Rashdan and Al Nesef 2010 [41] | Kuwaiti —      | Random sample     | 20–67    | 53  | 50     | 103       | F       | 53          | 50.3–55.6         | —      | —                    |
| AlMajed et al, 2011 [42]    | Kuwaiti U       | Randomly         | 17–24    | 173 | 311    | 484       | FM      | M 19.8      | 16.3–23.6         | 30.6   | 26.5–34.9            |
| Raman et al, 2012 [43]      | Kuwaiti U       | Convenience sample | ≥20     | 432 | 432    | 432       | FM      | M 20.8      | 17.1–24.9         | 39.8   | 35.1–44.6            |
| Al-Asi 2003 [44]            | Kuwaiti —       | —                 | <40      | 3282| 3282   | 3282      | F       | 27.4        | 25.9–28.9         | 47.9   | 46.2–49.7            |
| Badr et al., 2012 [45]      | Kuwaiti U       | A multistage cluster sampling | >50   | 948 | 1395   | 2443      | FM      | M 30.2      | 27.2–33.2         | 45.6   | 42.3–48.8            |
| Alkazemi et al, 2019 [46]   | Kuwaiti U       | Convenience sample | 21.57 ±1.99 | 193 | 422    | 615       | F       | 15.7        | 12.9–18.9         | 22.7   | 19.5–26.2            |
| Authors/year of publication | Setting | Sampling | Obesity | Overweight |
|----------------------------|---------|----------|---------|------------|
| Authors/year of publication | Setting | Sampling | Obesity | Overweight |
| Al-Isa, 2004 [47] | Kuwaiti | — | Systematic random sampling | >20 | 485 | 19.7 | 16.2–23.6 | 41.2 | 36.6–45.8 |
| Zaghoul et al., 2013 [48] | Kuwaiti | — | Using stratified sampling, randomly | ≥19 | 469 | 43.1 | 40.0–46.1 | 33.1 | 30.2–36 |
| Adel Bakir et al., 2017 [49] | Syria | U | Randomly | 18–60 | 919 | 43.4 | 40.2–46.6 | 31.3 | 28.3–34.4 |
| Fouad, 2006 [50] | Syria | — | Stratified, cluster sampling, randomly | 18–65 | 485 | 28.4 | 25.5–31.4 | 37 | 33.8–40.2 |
| Andreou et al., 2017 [49] | Cyprus | U | Stratified random sample | 18–80 | 1393 | 28.8 | 27.0–35.4 | 46.9 | 42.2–51.3 |
| Heraclides et al., 2015 [52] | Cyprus | — | Stratifying sampling | 24–65 | 428 | 21.5 | 19.4–23.7 | — | — |
| Abu-Zaiton and Fawwaz 2013 [53] | Jordan | — | Multistage cluster sampling | >18 | 49 | 8.3 | 4.0–14.7 | 21.67 | 14.6–30.11 |
| Suleyman et al., 2009 [54] | Jordan | U | Multistage cluster sampling | 17–28 | 428 | 10.1 | 8.5–12 | 28.5 | 26.0–31.1 |
| Attoom, 2018 [55] | Jordan | — | Multistage random | 16–46 | 570 | 8.8 | 6.3–11.9 | 23.3 | 19.4–27.6 |
| Khader et al., 2009 [56] | Jordan | U | Systematic random | 18–70 | 168 | 10.8 | 8.7–13.2 | 31.3 | 28.1–34.7 |
| Matalqah et al., 2019 [57] | Jordan | U | Convenience sampling | >18 | 605 | 14.7 | 10.8–20.7 | 36.9 | 33.4–40.4 |
| Ahmad et al., 2006 [58] | Jordan | R | Proportional sampling technique | 20–25 | 233 | 6.8 | 3.9–10.9 | 27 | 21.4–33.2 |
| Khamaisheh et al., 2015 [59] | Jordan | U | Random sampling | 18–24 | 54 | 11.1 | 4.1–22.6 | 57.4 | 43.2–70.7 |
| Abu Ghazaleh and Budair 2013 [60] | Jordan | U | — | 43.2 | 4962 | 4.8 | 4.2–43.3 | 25.7 | 24.8–28.7 |
| Mowafi et al., 2013 [61] | Egypt | U | Stratified random sample | ≥22 | 1823 | 11 | 11.4–20.1 | 47.7 | 41.8–53.6 |
| Abdel Sadek et al., 2016 [62] | Egypt | U | Multistage stratified random sampling | 17–27 | 1823 | 23.8 | 21.9–25.8 | 41.9 | 39.6–44.2 |
| Mohamed Shebl et al., 2015 [63] | Egypt | U | — | ≥60 | 50 | 6.6 | 5.0–8.5 | 28.8 | 25.8–32 |

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| Authors/year of publication          | Country | Setting | Sampling | N. Men | N. female | N. total | Sex/setting | Obesity 95% CI | Overweight 95% CI |
|-------------------------------------|---------|---------|----------|--------|-----------|----------|-------------|----------------|-------------------|
| Abdel Rahman et al., 2012 [65]      | Egypt   | U       | Random sample | ≥60    | 112       | 207      | 319 FM      | 27.1–37.7       | 29.4–24.5–34.8     |
| Genena and Salama, 2017 [66]        | Egypt   | U       | Randomly  | 18–26  | 141       | 257      | 389 FM      | 8.8–15.3        | 28.9–24.4–33.6     |
| Farrag et al., 2015 [67]            | Egypt   | U       | —        | 19.5 ±2.0 | 136      | 214     | 350 FM      | 9.3–12.2      | 27.8–25.8–29.9     |
| Mahfouz et al., 2006 [68]           | Egypt   | R       | Systematically random | ≥60    | 136       | 1182     | 1838 FM     | 23.6–33.3       | 34–29.0–39.2       |
| Yount and Li, 2011 [69]             | Egypt   | —       | —        | 15–49  | 140       | 257      | 400 FM      | 3.2–7.9        | 20–16.1–24.2       |
| Sakr et al., 2016 [70]              | Lebanon | U       | —        | 16–32  | 140       | 260      | 400 FM      | 0.4–6.1        | 7.1–3.4–12.7       |
| Fahs et al., 2017 [71]              | Lebanon | U, R    | Stratified cluster, randomly | ≥45    | 1000      | 1125     | 2048 FM     | 22.8–32.7       | 48.9–43.4–54.4     |
| Naja et al., 2011 [72]              | Lebanon | R, U    | —        | 20–55  | 923       | 1125     | 2048 FM     | 21.7–27.3       | 65.7–62.7–68.9     |
| Yahia et al., 2008 [73]             | Lebanon | U       | Randomly | 20 ±1.9 | 96        | 124      | 220 FM      | 6.6–20.8        | 37.5–27.8–47.9     |
| Haidar et al., 2016 [74]            | Lebanon | U       | Randomly | ≥18    | 149       | 151     | 300 FM      | 22.0–32.4       | 37.6–32.1–43.4     |
| Samhat et al., 2020 [75]            | Lebanon | U       | Randomly | 24–45  | 101       | 206     | 307 FM      | 19.4–24.9       | 31.6–26.4–37.1     |
| Delibasi et al., 2007 [76]          | Turkey  | R, U    | Randomly | ≥18    | 1324      | 1322    | 2646 FM     | 16.0–18.9       | 39.6–34.3–43.6     |
| Erem et al., 2001 [77]              | Turkey  | U       | Random cluster sampling | ≥20   | 5866      | 7000    | 12866 FM    | 26.6–28.1       | 36.2–35.3–37.3     |
| D. Yumuk et al., 2005 [78]          | Turkey  | U       | Invited  | ≥20    | 641       | 855     | 1496 FM     | 19.1–25.7       | 43.2–39.3–47.1     |
| Akbay et al., 2003 [79]             | Turkey  | U       | Stratified random sampling | 20–74 | 6756      | 6998    | 13754 FM    | 28.7–30.2       | 39.5–38.7–40.4     |
| Bagiacik et al., 2009 [80]          | Turkey  | U       | Randomly | ≥20    | 218       | 208     | 426 FM      | 20.8–22.8       | 44.8–43.6–46.6     |
| Authors/year of publication         | Setting Country | Rural/urban | Sampling Method     | Age      | N. Men | N. female | N. total | Sex/setting | Obesity Prevalence | 95% CI | Overweight Prevalence | 95% CI |
|-----------------------------------|-----------------|-------------|---------------------|----------|--------|-----------|----------|-------------|--------------------|--------|----------------------|--------|
| Gültekin et al., 2009 [81]        | Turkey          | R, U        | Multistage          | 18–65    | 1050   | 1050      | 2100     | FM          | 27                 | 25.1–29 | 34.4                 | 32.4–36.5 |
| Ardahan and Konal, 2019 [82]      | Turkey          | U           | Voluntarily         |          | 547    | 476       | 1023     | FM          | 30.5               | 27.6–33.4 | —                   | —      |
| Arıkan et al., 2014 [83]          | Turkey          | R, U        | Multistage stratified | ≥15      | 1015   | 1023      | 2,038    | FM          | 24.2               | 22.4–26.2 | 34.3                 | 32.2–36.4 |
| Delibasi et al., 2007 [76]        | Turkey          | R, U        | Randomly            | ≥18      | 3277   | 1885      | 5162     | FM          | 29.5               | 28.2–30.7 | 30                   | 28.7–31.2 |
| Ustu et al., 2012 [84]            | Turkey          | U           | Random cluster      | ≥18      | 527    | 539       | 1066     | FM          | 33.6               | 31.9–35.2 | 27.6                 | 26.0–29.1 |
| Yabancı et al., 2010 [85]         | Turkey          | U           | Voluntarily         | 18–59    | 1524   | —         | —        | M           | 8.3                | 6.1–11    | 40.9                 | 36.7–45.3 |
| Ahin et al., 2011 [86]            | Turkey          | U           | Randomly            | ≥20      | 2288   | 2728      | 5016     | FM          | 23.5               | 22.3–24.7 | 36.8                 | 35.4–38.1 |
| Erem et al., 2004 [87]            | Turkey          | U           | Random cluster sampling | ≥20      | 204    | 520       | 2724     | FM          | 31.9               | 29.6–34.3 | 32.2                 | 29.9–34.6 |
| Dinc et al., 2006 [88]            | Turkey          | U           | Randomly            | 15–49    | —      | 1602      | —        | F           | 31.9               | 29.6–34.3 | 32.2                 | 29.9–34.6 |
| Yalcin et al., 2004 [89]          | Turkey          | U           | Multistage sampling | 18–65    | 980    | 956       | 1936     | FM          | 27.3               | 25.3–29.3 | 36.1                 | 33.9–38.2 |
| Ucan and Ovaryodu, 2010 [90]      | Turkey          | U           | —                   | ≥18      | 749    | 852       | 1601     | FM          | 41.8               | 39.4–44.3 | 30.5                 | 28.2–32.8 |
| Kerkadi et al., 2003 [91]         | UAE             | U           | —                   | 18–25    | 452    | 92        | 544      | FM          | 31.4               | 27.5–35.5 | 36.2                 | 31.8–40.3 |
| Kalavathy et al., 2019 [92]       | UAE             | U           | Convenience sampling | 18–77    | 5018   | 5018      | 10036    | FM          | 35.4               | 34.6–35.4 | 31.9                 | 31.5–32.3 |
| Hajat et al., 2012 [93]           | UAE             | U           | —                   | 18–75    | —      | —         | —        | F           | 38.3               | 37.8–38.9 | 28.8                 | 28.2–30.4 |
| Sulaiman et al., 2017 [94]        | UAE             | —           | Systematic random sampling | ≥18    | 2204   | 520       | 2724     | FM          | 32.3               | 30.5–34.1 | 43                   | 41.1–44.9 |
| Sheikh-Ismailet al., 2009 [95]    | UAE             | U           | Random sample       | 20–90    | —      | 724       | —        | F           | 36.1               | 32–40.5  | 35.1                 | 31.0–39.4 |
| Alhakbany et al., 2018 [96]       | Saudi Arabia    | U           | Multistage stratified cluster sampling | 14–25 | 454 | 81 | 535 | F | 8.1 | 5.8–11 | 21.4 | 17.6–25.4 |
| Al-Rethaiaa et al., 2010 [97]     | Saudi Arabia    | U           | Randomly            | 14–24    | 357    | —         | —        | M           | 15.7               | 12.0–19.8 | 21.8                 | 17.6–26.5 |
| Al-Baghi et al., 2008 [98]        | Saudi Arabia    | —           | Invited             | ≥30      | 99946  | 95905     | 195874   | FM          | 43.8               | 43.5–44   | 35.1                 | 34.9–35.3 |
| Al-Qahtani, 2019 [99]             | Saudi Arabia    | U           | Voluntary           | —        | 949    | 732       | 1681     | F           | 29.1               | 24.7–31.4 | 35.4                 | 30.5–37.5 |
| Authors/year of publication | Setting | Sampling | Obesity Prevalence | Sex/age setting | Overweight Prevalence |
|-----------------------------|---------|----------|-------------------|----------------|----------------------|
| Alsaif et al., 2002 [100]   | Saudi Arabia | R, U | A multistage stratified cluster sampling | 30–70 | 1613 | 1648 | 3261 | FM | 39.6 | 37.9–41.3 | 36.6 | 35.0–38.3 |
| Horaib et al., 2013 [101]   | Saudi Arabia | — | Multistage stratified random | 34.12 ± 7.25 | — | — | 10,229 | FM | 29 | 28.1–29.9 | 40.8 | 39.9–41.8 |
| Baig et al., 2015 [102]     | Saudi Arabia | U | — | 22.40 ± 3.90 | 610 | — | — | M | 18.5 | 15.5–21.8 | 29.8 | 26.2–33.6 |
| Al-Ghamdi et al., 2018 [103]| Saudi Arabia | R, U | Multistage sampling | ≥18 | 381 | 638 | 1019 | FM | 27.5 | 24.8–30.4 | 26.6 | 24.0–29.5 |
| Alharthi et al., 2017 [104] | Saudi Arabia | U | Convenience sampling | 20–40 | 387 | 120 | 507 | FM | 29.5 | 25.6–33.7 | 36.2 | 32.4–41 |
| Balgoon et al., 2019 [105]  | Saudi Arabia | U | — | 18–25 | — | 164 | — | F | 14 | 9.1–20.3 | 17.6 | 12.1–24.4 |
| Al-Raddadi et al., 2019 [106]| Saudi Arabia | U | Stratified cluster sampling | ≥18 | 667 | 752 | 1419 | FM | 35.2 | 32.7–37.7 | 32.4 | 29.9–34.9 |
| Tabrizi et al., 2017 [107]  | Iran | U | Multistage stratified cluster sampling | 15–65 | 1368 | 1450 | 2818 | FM | 24 | 22.4–25.6 | 39.6 | 37.7–41.4 |
| GHaderian et al., 2018 [108]| Iran | U | Random cluster sampling | ≥20 | 1187 | 1388 | 2575 | FM | 26.5 | 25.1–28.5 | 39.3 | 37.4–41.3 |
| Rezaeian and Salem 2007 [109]| Iran | U | Random sample | >30 | 316 | 440 | 756 | FM | 11.5 | 9.3–13 | 38.2 | 34.7–41.8 |
| Ayatollahi and Ghoreshizadeh 2010 [110]| Iran | U | Random multistage sample | 25–55 | 1141 | 1141 | 2282 | FM | 16.5 | 15.8–18.1 | 40.2 | 38.2–42.3 |
| Nikooyeh et al., 2016 [111]| Iran | U | Randomly | 20–60 | 114 | 135 | 249 | FM | 25.4 | 17.7–34.4 | 38.6 | 29.6–48.1 |
| Dastgiri et al., 2006 [112]| Iran | U | Simple random | ≥18 | 132 | 168 | 300 | FM | 22.4 | 17.0–27.6 | 43.3 | 37.6–49.1 |
| Najafi et al, 2020 [113]    | Iran | U | — | ≥35 | 57,614 | 71,643 | 129,257 | FM | 30.43 | 30.1–30.6 | 40.76 | 40.4–41 |
| Marzban et al., 2020 [114] | Iran | U | Multistage systematic sampling | 20–70 | 395 | 395 | 790 | FM | 21.51 | 18.7–24.5 | 35.44 | 32.1–38.8 |
| Marzban et al., 2020 [114] | Iran | U | Multistage systematic sampling | 20–70 | 395 | 395 | 790 | FM | 21.51 | 18.7–24.5 | 35.44 | 32.1–38.8 |
(PAR) for cardiovascular disease, including coronary heart disease (CHD), heart failure (HF), and atrial fibrillation (AF). Population Attributable Risk (PAR) for cardiovascular disease was ranged from 0.3 to 19.8% by countries and about 11% of HF, 4% of CHD, and 9% of AF were related to obesity in more countries. The highest PAR was observed for heart failure (HF), of which nearly 11.5% of HF was attributed to obesity. Also, the cardiovascular disease burden related to obesity in Syria, Kuwait, and Iraq was higher than that in other countries due to the high prevalence of obesity in these countries. The fraction of cardiovascular disease attributable to obesity ranged from 3.6 to 10.5% in males and 4.7 to 13.4% in females.

### 5. Discussion

The results of this systematic review showed that the prevalence of overweight and obesity in the Middle East is 23.5–62.1 and 14.5–40.6, respectively. The difference in socioeconomic status and lifestyle between countries can explain this difference. In this study, the highest prevalence of obesity and overweight was in Kuwait, Syria, and Israel. Lifestyle changes over the past few years, including the use of Arabic diets (high-calorie and fatty foods such as fast foods), alcohol consumption, and reduced physical activity, may explain the high prevalence of noncommunicable diseases, including obesity [115].

Moreover, some studies have shown that the high prevalence of overweight and obesity in deprived sparsely populated groups is partly due to the low quality of their diet [116]. In this study, the lowest prevalence of obesity and overweight was in Yemen, which could be due to the low number of reports of obesity and the lack of new studies.

In this study, the prevalence of obesity was higher in women than men. This result is similar to the study in Spain [10] and contrasts with the study in Turkey [84]. This difference can be partly due to multiple births in women, hormonal differences between men and women, and sedentary lifestyle in women because most women are housewives or have jobs with less physical activity [117]. Studies have also shown that the prevalence of obesity in married people is increasing, which obviously puts women at even greater risk of obesity [118, 119].

Previous studies have shown that aging is strongly associated with the prevalence of obesity, and in general, the prevalence of obesity increases until age 70 and then begins to decrease [18, 120]. The present study results also show the natural pattern of obesity increase with age, at least up to

### Figure 2: Overall prevalence of overweight and obesity in Middle East countries.

| Country     | N.of reports | Prevalence (CI 95%) |
|-------------|--------------|---------------------|
| Yemen       | 1            | 23.50 (22.00–25.20) |
| Bahrain     | 2            | 26.91 (24.66–28.31) |
| Iraq        | 6            | 30.46 (26.44–35.10) |
| Oman        | 3            | 30.65 (27.63–34.00) |
| Egypt       | 7            | 30.73 (28.94–32.63) |
| UAE         | 5            | 31.01 (25.79–37.28) |
| Palestine   | 4            | 31.45 (24.49–40.38) |
| Syria       | 2            | 31.64 (29.99–33.39) |
| Saudi Arabia| 11           | 31.80 (29.56–34.21) |
| Turkey      | 15           | 32.60 (28.87–36.93) |
| Jordan      | 7            | 33.10 (27.91–39.26) |
| Iran        | 11           | 33.92 (26.47–43.48) |
| Lebanon     | 6            | 34.31 (26.47–44.46) |
| Cyprus      | 13           | 36.00 (33.00–39.10) |
| Kuwait      | 9            | 38.70 (28.72–52.16) |
| Israel      | 1            | 62.10 (60.30–63.90) |
| Overall     | 92           | 33.14 (26.87–40.87) |

| Country     | N.of reports | Prevalence (CI 95%) |
|-------------|--------------|---------------------|
| Yemen       | 1            | 8.80 (7.70–10.00)   |
| Oman        | 4            | 14.57 (9.55–35.67)  |
| Jordan      | 8            | 16.80 (10.52–26.83) |
| Lebanon     | 6            | 18.30 (12.49–26.84) |
| Bahrain     | 2            | 18.75 (4.49–78.33)  |
| Egypt       | 8            | 21.35 (15.09–30.20) |
| Iran        | 11           | 22.41 (19.32–25.99) |
| Israel      | 2            | 22.45 (21.12–23.86) |
| Palestine   | 6            | 22.55 (15.78–32.22) |
| UAE         | 5            | 23.29 (18.84–28.78) |
| Cyprus      | 2            | 23.32 (15.35–35.66) |
| Turkey      | 16           | 23.56 (20.56–27.00) |
| Saudi Arabia| 11           | 24.95 (21.02–29.61) |
| Iraq        | 7            | 29.07 (18.85–44.84) |
| Kuwait      | 9            | 29.25 (24.32–35.17) |
| Syria       | 2            | 40.62 (35.85–46.03) |
| Overall     | 101          | 21.17 (17.05–26.29) |

| Country     | N.of reports | Prevalence (CI 95%) |
|-------------|--------------|---------------------|
| Yemen       | 1            | 12.4619             |
| Oman        | 4            | 63.9269             |
| Jordan      | 8            | 4.48911             |
| Lebanon     | 6            | 78.3145             |
| Bahrain     | 2            | 21.17 (17.05–26.29) |
69–60 years, and the highest prevalence of obesity and overweight was seen in people over 40 years. It is thought that the decline in the prevalence of obesity in people over the age of 70 is partly due to a lower survival rate in obese people and a decrease in physical activity with increasing age in men and women. In addition, menopausal women are more prone to weight gain from 45 years [76, 121].

The present study showed that the prevalence of obesity and overweight in the Middle East in the last two decades had been almost a steady trend. However, the prevalence of obesity and overweight is at a high level. Evidence shows that the trend in mean BMI in northwestern European countries and high-income English-speaking regions and Asia-Pacific is flat for both sexes [122].

Furthermore, the results obtained from the Middle East region countries indicate a fundamental difference between the current level and trend of overweight and obesity between countries. In many countries, the prevalence of obesity and overweight has significantly decreased (Table 4). Another study showed that in many European countries, the prevalence of obesity and overweight in children has also stabilized [116]. While the prevalence of overweight and obesity seems to stabilize and even decline at different levels in different countries, it is still an important public health

### Table 2: The prevalence of obesity and overweight in the Middle East countries.

| Variables     | N. of studies (population) | Obesity Prevalence (95% CI) | Test for heterogeneity (p-value) | N. of studies (population) | Overweight Prevalence (95% CI) | Test for heterogeneity (p-value) |
|---------------|----------------------------|-----------------------------|---------------------------------|----------------------------|--------------------------------|---------------------------------|
| Country       |                            |                             |                                 |                            |                                |                                 |
| Kuwait        | 9 (14174)                  | 29.25 (24.32–35.17)         |                                 | 9                          | 38.70 (28.72–52.16)            |                                 |
| Israel        | 2 (3743)                   | 22.45 (21.12–23.86)         |                                 | 1                          | 62.10 (60.30–63.90)            |                                 |
| Saudi Arabia  | 11 (215575)                | 24.95 (21.02–29.61)         |                                 | 11                         | 31.80 (29.56–34.21)            |                                 |
| Oman          | 4 (2538)                   | 14.57 (5.95–35.67)          |                                 | 3                          | 30.65 (27.63–34.00)            |                                 |
| Palestine     | 6 (5905)                   | 22.55 (15.78–32.22)         |                                 | 4                          | 31.45 (24.49–40.38)            |                                 |
| Yemen         | 1 (2500)                   | 8.80 (7.70–10.00)           |                                 | 1                          | 23.50 (22.00–25.20)            |                                 |
| United Arab Emirates | 5 (54516) | 23.29 (18.84–28.78) |                                 | 5                          | 31.01 (25.79–37.28)            |                                 |
| Turkey        | 16 (71268)                 | 23.56 (20.56–27.00)         | p < 0.001                       | 15                         | 32.66 (28.87–36.93)            | p < 0.001                       |
| Syria         | 2 (2961)                   | 19.40 (35.85–46.03)         |                                 | 2                          | 31.64 (29.99–33.39)            |                                 |
| Lebanon       | 6 (4275)                   | 18.30 (12.48–26.84)         |                                 | 6                          | 34.31 (26.47–44.46)            |                                 |
| Iraq          | 7 (32550)                  | 29.07 (18.85–44.84)         |                                 | 6                          | 30.46 (26.44–35.10)            |                                 |
| Cyprus        | 2 (4022)                   | 23.32 (15.25–35.66)         |                                 | 1                          | 36.00 (33.00–39.10)            |                                 |
| Bahrain       | 2 (1783)                   | 18.75 (4.49–78.33)          |                                 | 1                          | 26.91 (12.46–58.10)            |                                 |
| Jordan        | 8 (12668)                  | 16.80 (10.52–26.83)         |                                 | 7                          | 33.10 (27.91–39.26)            |                                 |
| Egypt         | 8 (12872)                  | 21.35 (15.09–30.20)         |                                 | 7                          | 30.73 (28.94–32.63)            |                                 |
| Iran          | 11 (257555)                | 22.41 (19.32–25.99)         |                                 | 11                         | 33.92 (26.47–43.48)            |                                 |
| Total (Middle East) | 101 (698905) | 21.17 (17.05–26.29) |                                 | 92                         | 33.14 (26.87–40.87)            |                                 |
| Sex           |                            |                             |                                 |                            |                                |                                 |
| Female        | 70 (361960)                | 25.40 (23.66–27.27)         | p = 0.001                       | 63                         | 31.24 (29.96–32.57)            | p < 0.001                       |
| Male          | 62 (340723)                | 19.86 (17.60–22.40)         |                                 | 56                         | 37.80 (36.20–39.47)            | p < 0.001                       |
| Residency     |                            |                             |                                 |                            |                                |                                 |
| Urban         | 4 (21684)                  | 19.89 (13.59–29.11)         | p = 0.59                        | 4                           | 38.89 (33.53–45.11)            | p = 0.77                        |
| Rural         | 4 (9337)                   | 22.81 (16.27–31.96)         |                                 | 4                           | 37.19 (28.41–48.69)            |                                 |
| Age group     |                            |                             |                                 |                            |                                |                                 |
| 18–29         | 8 (17825)                  | 10.46 (7.56–14.47)          |                                 | 8                           | 27.51 (21.51–35.18)            |                                 |
| 30–39         | 9 (213681)                 | 21.76 (17.10–27.70)         |                                 | 9                           | 18.32 (18.37–23.35)            |                                 |
| 40–49         | 9 (213681)                 | 29.19 (23.43–36.37)         |                                 | 9                           | 44.19 (37.80–51.67)            |                                 |
| 50–59         | 9 (213681)                 | 37.05 (31.76–43.22)         | p < 0.001                       | 9                           | 37.71 (32.79–43.36)            | p < 0.001                       |
| 60–69         | 8 (238548)                 | 36.10 (32.01–40.72)         |                                 | 8                           | 40.45 (35.90–45.57)            |                                 |
| ≥70           | 5 (206524)                 | 24.05 (18.65–31.02)         |                                 | 5                           | 36.10 (33.34–39.09)            |                                 |

*NR: number report.
| Country             | Obesity Prevalence (95% CI) | Overweight Prevalence (95% CI) | Obesity Prevalence (95% CI) | Overweight Prevalence (95% CI) | Obesity Prevalence (95% CI) | Overweight Prevalence (95% CI) |
|---------------------|-----------------------------|-------------------------------|-----------------------------|-------------------------------|-----------------------------|-------------------------------|
| Kuwait              | 23.53 (17.04–32.48)         | 44.85 (38.74–51.93)          | 33.95 (28.02–41.14)         | 41.01 (24.89–67.58)           | 25.27 (10.03–63.66)         | 29.13 (18.05–47.02)           |
| Israel              | NA                          | NA                            | NA                          | NA                            | NA                          | NA                            |
| Saudi Arabia        | 39.6 (37.9–41.3)            | 36.6 (35.0–38.3)             | 35.65 (23.80–53.40)         | 37.82 (32.64–43.83)           | 20.98 (16.88–26.08)         | 28.10 (24.18–32.64)           |
| Oman                | NA                          | NA                            | 13.79 (4.79–39.45)          | 31.73 (29.04–34.67)           | 67.81 (65.22–70.51)         | 29.2 (23.3–35.6)              |
| Palestine           | 34.71 (24.89–48.40)         | 36.4 (32–40.8)               | 24.4 (22.9–25.9)            | 38.0 (36.3–39.6)              | 16.12 (4.15–62.62)          | 26.39 (16.67–41.78)           |
| Yemen               | NA                          | NA                            | 8.8 (7.7–10)                | 23.5 (22–25.2)                | NA                          | NA                            |
| United Arab Emirates| 6.7 (4.4–9.7)               | 19.4 (15.6–23.7)             | 23.91 (10.98–52.07)         | 29.68 (25.25–34.90)           | 32.15 (30.55–33.84)         | 39.81 (33.66–47.08)           |
| Turkey              | 25.68 (22.53–29.28)         | 36.86 (34.93–38.90)          | 21.21 (16.39–27.45)         | 29.70 (23.50–37.54)           | 27.12 (21.62–34.02)         | 34.3 (32.2–36.4)              |
| Qatar               | NA                          | NA                            | NA                          | NA                            | NA                          | NA                            |
| Syria               | 38.2 (36.0–40.3)            | 31.8 (29.8–33.9)             | NA                          | NA                            | 43.4 (40.2–46.6)            | 31.3 (28.3–34.4)              |
| Lebanon             | NA                          | NA                            | 17.77 (3.13–100.76)         | 37.08 (16.08–85.50)           | 17.72 (11.25–27.91)         | 32.64 (23.46–45.40)           |
| Iraq                | 25.0 (19.1–31.6)            | 39.0 (32.2–46.1)             | 13.78 (4.62–11.1)           | 33.01 (29.02–37.55)           | 43.17 (27.26–68.39)         | 25.69 (16.92–39.01)           |
| Cyprus              | NA                          | NA                            | 29.0 (26.2–31.9)            | 36.0 (33.0–39.1)              | 18.8 (17.4–20.2)            | NA                            |
| Bahrain             | 9.0 (6.9–11.4)              | 18.1 (15.2–21.3)             | NA                          | NA                            | 38.7 (35.7–41.5)            | 39.7 (36.8–42.5)              |
| Jordan              | NA                          | NA                            | 23.60 (10.45–53.30)         | 28.63 (25.02–32.78)           | 15.96 (11.18–22.77)         | 39.94 (33.98–46.95)           |
| Egypt               | 28.3 (23.6–33.3)            | 34.0 (29.0–39.2)             | 37.06 (26.83–51.21)         | 32.54 (31.58–33.52)           | 12.89 (7.17–23.16)          | 28.21 (26.65–29.86)           |
| Iran                | 22.4 (17–27.6)              | 43.3 (37.6–49.1)             | 17.74 (12.61–24.97)         | 27.02 (13.28–54.94)           | 25.98 (22.15–30.47)         | 38.29 (36.0–40.72)            |
| Sex                 |                             |                               |                             |                               |                             |                               |
| Female              | 26.62 (22.93–30.90)         | 32.30 (29.84–34.96)          | 27.20 (23.70–31.22)         | 33.07 (31.17–35.09)           | 23.68 (21.16–26.51)         | 28.87 (26.97–30.91)           |
| Male                | 20.08 (16.24–24.82)         | 39.14 (36.0–42.57)           | 17.09 (14.0–20.87)          | 36.79 (34.08–39.72)           | 23.48 (20.26–27.20)         | 39.03 (37.05–41.10)           |
| Total (Middle East) | 23.98 (21.24–27.08)         | 34.83 (32.40–37.45)          | 22.62 (20.18–25.35)         | 32.02 (28.56–35.89)           | 23.15 (20.85–25.70)         | 32.85 (31.39–34.38)           |
issue. Increasing public awareness of the effects of obesity and interventions related to daily physical activity and healthy diets have helped stabilize obesity [116, 123].

The present study showed that 4% of CAD, 11% of HF, and 9% of AF in the Middle East could be attributed to obesity. In general, approximately 8% of cardiovascular diseases in the region is related to obesity. Due to the high prevalence of obesity in people over 40 years of age, the risk of developing the disease in this age group increases. Previous studies have shown a link between obesity and cardiovascular disease [124–126]. Therefore, having a healthy lifestyle that includes healthy nutrition and adequate physical activity can significantly prevent obesity and its complications such as cardiovascular disease [59].

6. Conclusion

This meta-analysis showed that although the prevalence of obesity and overweight has been almost constant in the Middle East over the past two decades, the prevalence of obesity is significantly higher. In addition, the high prevalence of obesity and overweight in people over 40 years of age and the increasing trend of obesity with increasing age is a concern that should be considered by providers of intervention programs in the region. The results also showed that approximately 8% of cardiovascular diseases in the Middle East could be attributed to obesity. Therefore, obesity is a risk factor for CVD, and the necessary interventions to prevent obesity and its complications are essential.

7. Limitations

This study had limitations such as an unequal number of studies in countries, the use of different sampling methods, and differences in the age distribution of participants, which could be the source of differences in the prevalence of obesity and overweight in countries. Another limitation of this study is the lack of reports on obesity and overweight in urban and rural areas. Also, in this study, the unadjusted relative risk was used to calculate the attributable risk, while possible confounders such as blood pressure, smoking, family history of obesity, and socioeconomic status can confound RR as an indicator of the relationship between obesity and cardiovascular disease.

Data Availability

Data are available upon request.

Conflicts of Interest

The authors declare that there are no conflicts of interest.

Authors’ Contributions

Shiva Kargar and Alireza Ansari-Moghadam contributed to the conceptualization and methodology. Neda Jabbari and Shiva Kargar conducted the investigation and screening of articles. Shiva Kargar performed data extraction. Shiva Kargar and Hassan Okati-Aliabad wrote the original draft. Shiva Kargar, Hassan Okati-Aliabad, and Alireza Ansari-Moghadam reviewed and edited the article.

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