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Systematic Review

The Association between Marital Status and Obesity: A Systematic Review and Meta-Analysis

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Abstract: Background: Obesity was included in the International Classification of Diseases in 1990 as a chronic disease characterized by the excessive accumulation of body fat and a body mass index (BMI) greater than 30 kg/m^2. Aim: This systematic review was aimed to examine the role of marital status in determining body mass index and the risk of obesity. Methods: We performed a systematic literature search using three databases (PubMed (Medline), Embase, and Google Scholar) with the search query. Results: Of the 105 studies included in the systematic review, 76 studies (72%) reported a greater risk of obesity in married individuals compared to unmarried individuals. A meta-analysis of 24 studies included a total population of 369,499 participants: 257,257 married individuals (40,896 of whom had obesity) and 112,242 comparison subjects (single, divorced, or widowed individuals, 15,084 of whom had obesity). Odds ratios for obesity found a significant pooled odds ratio for obesity in married individuals compared with controls (OR 1.70; 95% CI 1.38–2.10). The socioeconomic environment was not the same throughout the period of studies analyzed. The odds of obesity in married individuals during economic crises was greater than during the period between crises: OR 2.56 (95% CI 2.09–3.13) during crises vs. OR 1.55 (95% CI 1.24–1.95) between crises. Conclusion: The results of this review confirm the importance of considering marital status in determining the risk of obesity.

Keywords: marital status; obesity; risk; body mass index; meta-analysis

Citation: Nikolic Turnic, T.; Jakovljevic, V.; Strizhkova, Z.; Polukhin, N.; Ryaboy, D.; Kartashova, M.; Korenkova, M.; Kolchina, V.; Reshetnikov, V. The Association between Marital Status and Obesity: A Systematic Review and Meta-Analysis. *Diseases* **2024**, *12*, 146. https://doi.org/10.3390/diseases12070146

Academic Editor: Marwan El Ghoch

Received: 8 May 2024
Revised: 7 June 2024
Accepted: 9 June 2024
Published: 5 July 2024

1. Introduction

Over the past years, both in developed and developing countries, there has been a sudden increase in the number of people suffering from obesity and related chronic conditions. Obesity constitutes a risk factor for diseases such as hypertension, type 2 diabetes, and cancer [1,2]. Obesity was included in the International Classification of Diseases (ICD-10) in 1990 as a chronic disease characterized by the excessive accumulation of body fat and a body mass index (BMI) greater than 30 kg/m^2. The World Health Organization (WHO) reported that the worldwide prevalence of the obesity has tripled since 1975 [3].

It is now well established from a variety of studies that obesity is a complex disease with several known risk factors, including low physical activity, unbalanced diet, endocrine diseases, genetic predisposition, household wealth, and occupation. Marital status has

been demonstrated to be an important social factor. Much of the literature emphasizes that being married is associated with a lower risk of non-communicable morbidity and mortality. This indicates a need to understand the various perceptions of marriage as a protective or risk factor that exist among literature.

Aizer, A. et al. (2013) revealed a substantially greater risk of metastatic cancer and mortality from 10 major cancer sites in unmarried compared to married individuals [4]. The results of the meta-analysis conducted by Krajc, K. et al. (2022) were in line with Aizer's findings, reporting better overall and cancer-specific survival in married compared to unmarried patients [5].

Wong, C. et al. (2018) performed a systematic review and meta-analysis that included 34 studies from different nations and found that marriage was related to decreased cardiovascular morbidity and mortality. Unmarried participants were 1.4 times more likely to develop cardiovascular disease and die of cardiovascular diseases and stroke than married people [6].

Sommerlad, A. et al. (2018) discovered in their meta-analysis that lifelong single individuals had a 42% greater risk of having dementia and widowed individuals had a 20% greater risk of having dementia compared to married individuals [7].

The meta-analysis of Wang, Y. et al. (2020), which comprised 21 prospective cohort studies with a total of 7,881,040 individuals and 1,888,752 deaths, concluded that being unmarried conferred a higher risk of all-cause, cancer, cardiovascular disease, and coronary heart disease mortalities for both sexes [8].

However, studies in recent decades have found that marriage is associated with changes in BMI and behaviors that contribute to obesity. The relationship between marital status and obesity can be attributed to a number of factors, including changes in lifestyle, eating habits, and social support. When individuals enter into marriage, they often experience a shift in their daily routines, which can impact their health behaviors.

Dinour, L. et al. (2011) conducted a systematic review consisting of 20 studies on BMI results before and after marriage. The data for these articles were gathered over a 40-year period, from 1966 to 2004. According to Dinour's results, marriages were associated with an increase in body weight, whereas divorces were associated with a decrease in body weight, both in males and females [9]. However, the relatively small sample size of the available research limited the scope of this review. Sixteen of the 20 studies included in the review were carried out in the United States. Furthermore, the review did not include a quantitative analysis.

The studies presented thus far provide evidence that marital status is associated with both better health outcomes for many non-communicable diseases, but a negative impact on BMI and the risk of obesity which is considered to be a risk factors for such diseases. These contradictory data require in-depth study and prompted the first meta-analysis of the association between marital status and the risk of obesity. The aim of the study was to investigate the association between marital status and the risk of obesity based on the meta-analysis.

2. Materials and Methods

The study protocol was registered in the international prospective register of systematic reviews (PROSPERO) under number CRD42021292440. The preferred reporting items for systematic reviews and meta-analyses (PRISMA) statement was used as a guide to write this review.

2.1. Search Methods

We performed a systematic literature search using three databases (PubMed (Medline), Embase, and Google Scholar) with the search query: ('marital status' OR 'marri*' OR 'family status') AND ('obesity' OR 'adiposity') AND ('body mass' OR 'body mass index' OR 'bmi' OR 'anthropometry') AND ('risk' OR 'prevalence') AND ([adult]/lim OR [aged]/lim OR [very elderly]/lim) AND 'article'/it.

A comprehensive literature search was conducted during the time period from 5 December 2021 to 4 February 2022. No language or publication date restrictions were applied. This ensured the inclusion of relevant research and allowed for an effective and integrated approach to addressing the research question. The authors of the relevant articles were contacted to obtain the full texts and additional information of the articles if they were not available.

2.2. Selection Criteria

We included observational studies evaluating the association between marital status and obesity. We applied no restrictions on the region of the study population. Abstracts and studies not reporting numerical data were excluded. We also excluded studies reporting overweight BMI thresholds of 25–29 kg/m^2 or lower for Asian populations. All of the studies that analyzed the BMI as a numerical outcome, using averages, were also excluded. The eligibility of the full texts of articles was assessed by two investigators independently. Disagreements were discussed and, if needed, resolved by a third reviewer not involved in the initial selection.

The PICO (population, intervention, comparison, outcome) format was applied to formulate a focus question and to develop a systematic search strategy for the study, accordingly. Population: Adults worldwide. We excluded studies investigating obesity in pregnant women and adolescents younger than 15 years old. Intervention: No intervention considered. Comparison: Comparison subjects were married and unmarried (single, divorced, widowed) individuals. Outcome: Obesity based on the BMI. The BMI threshold for obesity varies with ethnicity. Researchers attribute this to ethnic characteristics, including average height, muscle mass, and fat mass. Asians have been found to express signs of obesity with lower BMI values on average compared to Europeans. The WHO recommends the use of lower BMI levels for obesity in Asia-Pacific countries (BMI $\geq$ 28 kg/m^2 or BMI $\geq$ 25 kg/m^2) [10]; thus, the outcome was considered eligible for the studies on respective populations.

2.3. Data Extraction and Quality Assessment

From each of the selected articles, we obtained the following data: first author; year of publication; country; study design and duration; sample size; participants characteristics, including their sex; age; marital status; group sizes; odds ratio (OR) and 95% confidence interval (95% CI).

The data extraction and the risk of bias were first assessed within the selected studies independently by two investigators, disagreements were discussed and, if needed, resolved by a third reviewer. We used the Newcastle–Ottawa scale adapted for cross-sectional studies to assess the risk of systematic error in the included studies.

2.4. Data Synthesis and Analysis

The analysis was performed in the software program Review Manager 5.4.1. Data synthesis was based on the recommendations of the Cochrane collaboration. Pooled odds ratios and 95% confidence intervals were calculated for primary binary data obtained from included studies.

We used Cochrane's Q test and the I2 index to estimate the heterogeneity of effect sizes. Since heterogeneity was high and significant in conducted meta- and submeta-analyses, DerSimonian and Laird's random random effects model was chosen to synthesize the results from selected studies.

3. Results

As a result of database screening, 2950 publications were received, which were checked for compliance with the inclusion criteria. After the removal of duplicates and exclusion of non-eligible articles, 128 articles were included for further eligibility assessment. One hun-

dred and five articles provided the data eligible for analysis and were therefore evaluated in this systematic review (Figure 1).

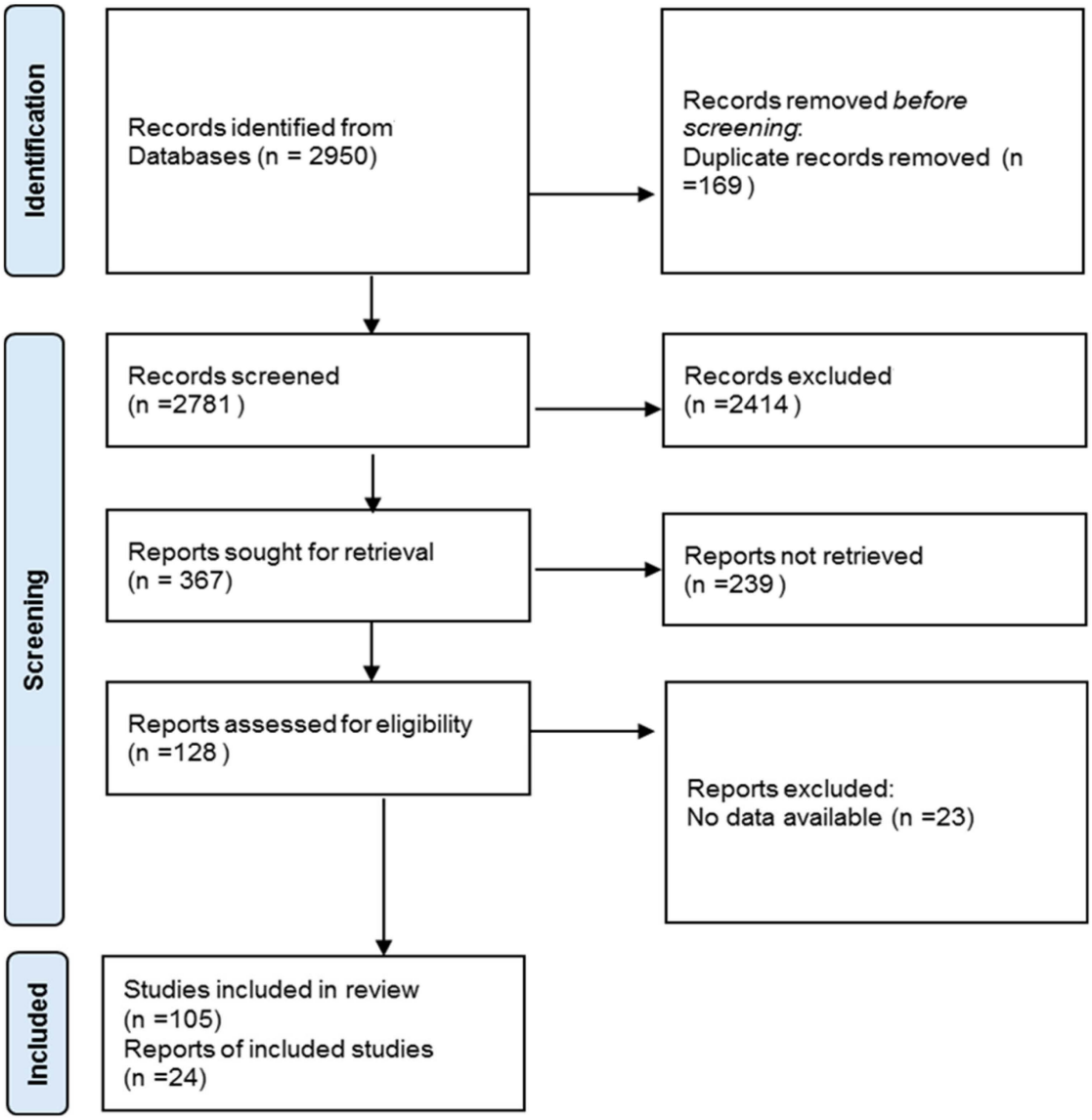

Figure 1. The flow chart for screening and selection of articles according to PRISMA statement.

The selected studies were published between 1991 and 2021. The age of participants in the eligible studies lied within a range between 15 and 87 years. All 105 selected studies adopted multivariate logistic regression to investigate the association between obesity and multiple social factors, including marital status as one of the independent variables [11–117]. Out of 105 eligible studies, 29 used nationwide data, including Asian and African regions. Table 1 presents the most extensive national studies that included an assessment of the relationship between BMI and various social factors.

Of the 105 studies included in the systematic review, 76 studies (72%) reported a greater risk of obesity in married individuals compared to unmarried individuals. We retrieved and examined covariate-adjusted odds ratios for the evaluation of the association between marital status and obesity. We identified significant results, provided as odds ratio and 95% confidence intervals, in 20 papers.

The selected studies provided controversial findings for obesity in sex groups. Some studies showed that women have a greater risk of obesity, while others stated the opposite. It should be noted that 7 of the 105 studies were performed solely on female populations.

Separate odds ratio results for men were reported in 20 articles. Ten of them reported a significantly higher risk of obesity in married men, while in the other 10, the association between marital status and the risk of obesity in men was not significant. Regarding women, separate odds ratios for this group were published in 22 studies. Thirteen showed a significantly greater risk of obesity for married women, eight studies reported no significant differences between married and unmarried women, and one study reported a significant result indicating that the risk of obesity was higher in unmarried women.

Table 1. Summary of findings of articles based on nationally representative observational studies.

First Author, Year of Publication	Country	Period of Observation	Number of Participants	Evaluated Factors of Obesity	Results for Marital Status and Obesity
Zhang, 2020 [116]	China	2012–2015	441,306	Sex, age, education level, smoking, alcohol consumption, marital status, family history of cardiovascular disease	A significantly higher prevalence of overweight and obesity was found among married and cohabiting individuals compared to those who are unmarried, OR 1.16 (95% CI 1.07–1.25).
Gouda, 2014 [45]	India	2005–2006	124,385 women	Age, religion, caste, education level, marital status, parity, work status, region, mass media exposure	Married women were 1.86 and 2.14 times more likely to be overweight or to have obesity, respectively, than unmarried women, RR 2.14 (95% CI 1.680–2.729).
Janghorbani, 2008 [53]	Iran	2004–2005	89,404	Sex, age, marital status, education level, physical activity, smoking, area of residence	Ever-married status was associated with a significantly higher risk of overweight and obesity in both men and women. The multivariate OR of obesity was three times higher in married compared to unmarried.
Seubsman, 2010 [91]	Thailand	2005–2005	87,134	Sex, age, marital status, educational attainment, monthly personal income, household assets classified by replacement value, housing type.	Obesity was substantially less prevalent among single men and women than in those with relationships.
Gong, 2021 [44]	USA, California	2013–2014	47,970 asian-americans	Sex, age, ethnicity, household income, smoking, marital status, education level, physical activity, fast food consumption	Obesity was highly prevalent among married people.
Baik, 2018 [25]	Republic of Korea	1998–2011	42,584	Sex, age, marital status, employment status, income, smoking, alcohol consumption, sleep duration, psychological factors, diet	Being married was associated with the prevalence of obesity.

Table 1. *Cont.*

First Author, Year of Publication	Country	Period of Observation	Number of Participants	Evaluated Factors of Obesity	Results for Marital Status and Obesity
Sartorius, 2015 [89]	South Africa	2008–2012	28,247	Sex, age, living in formal urban areas, white ethnicity, being married, not exercising and/or in higher socio-economic category and/or living in households with proportionate higher spending on food (and unhealthy food options)	Marriage was identified as an important determinant of obesity, with male obesity being more strongly associated with marital status. Leaving a marriage (divorce or widowhood) was associated with a considerable reduction of risk of obesity.
Hosseini, 2020 [48]	Canada	2012–2015	28,238	Age, marital status, smoking, education, social network size (sum of all social contacts), social participation (regular social activities)	Being single, widowed, or divorced/separated was associated with worse anthropometric outcomes in women.
Tzotzas, 2010 [105]	Greece	2010–2010	17,341	Gender, age, marital status, education level	A significant association between marital status and obesity was found in both sex groups.

Of particular interest for this systematic review's focus was the study conducted in China in 2011–2012 on a sample of 10,448 pairs of same-sex twins aged 18–79 years. The findings indicated that marital status and BMI were associated regardless of genetic and common environmental factors in both sexes. Married twins had a higher BMI and a higher risk of overweight and obesity in both sex groups compared to unmarried twins [66].

A total of 24 studies were selected for meta-analysis based on the availability of primary data on the number of participants with obesity and normal weight in groups of married and unmarried (single, divorced, widowed) individuals that were compared. The geographical locations of the selected studies covered 18 countries (Figure 2).

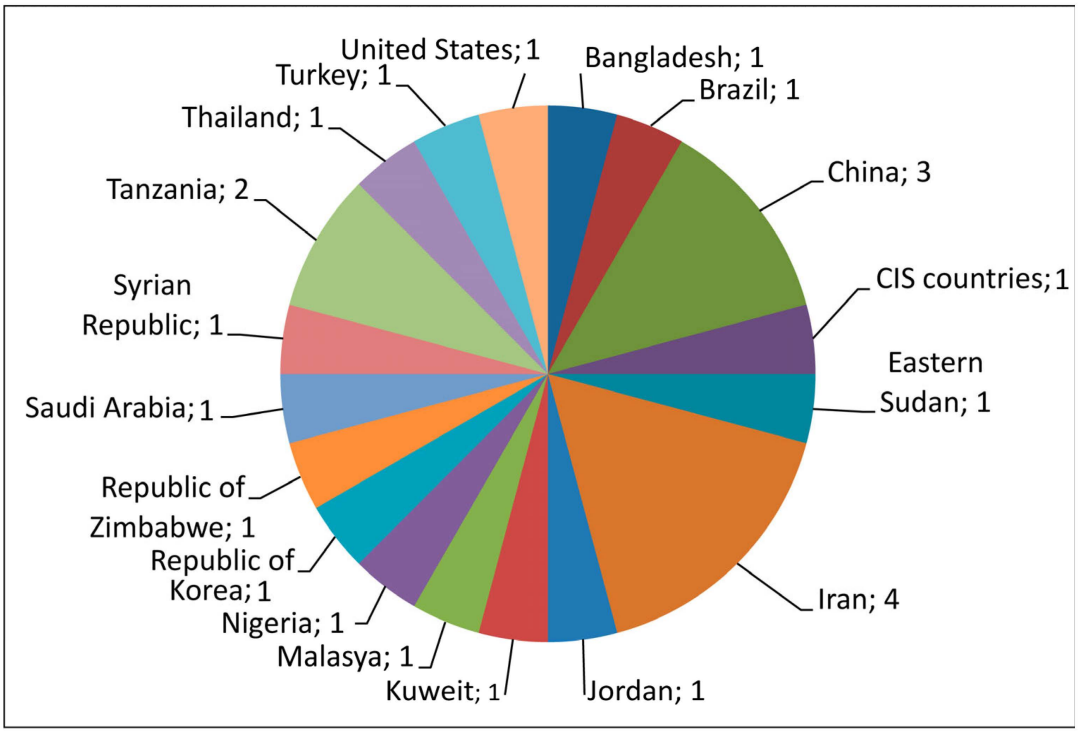

Figure 2. Geographical locations of the 24 studies included in the meta-analysis.

The 24 studies with data that could be pooled for meta-analysis included 55,980 cases (15.15%) of obesity among 369,499 individuals. The proportions of individuals with obesity and individuals with normal weight in married and unmarried participants are shown in Figure 3.

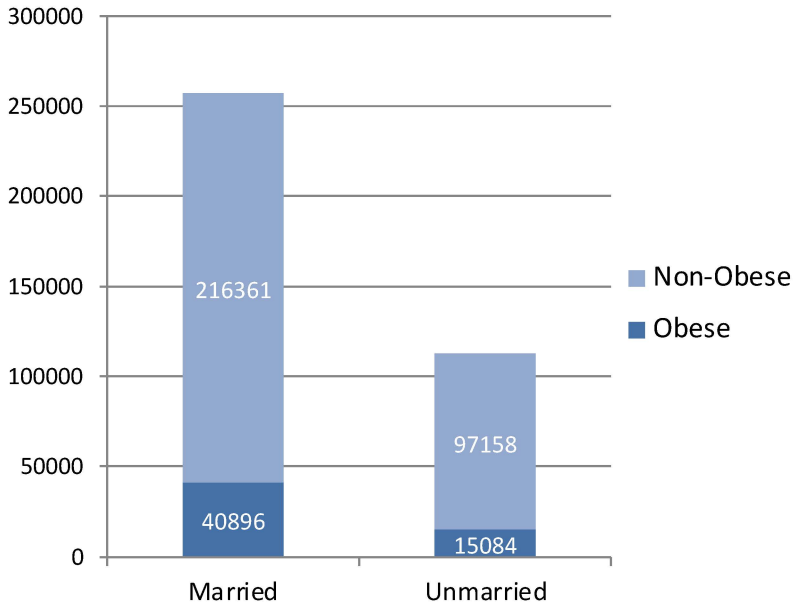

Figure 3. The proportions of participants having obesity in groups of married and unmarried (single, divorced, widowed) individuals.

Table 2 shows the summary of the characteristics and key findings of the studies included in the meta-analysis. Twenty-two of them were cross-sectional studies, and two were cohort studies that included a survey, implying that they also adopted a cross-sectional design to gather data. Similarly designed studies selected for meta-analysis produced results that were comparable.

Table 2. Characteristics of studies included in the meta-analysis.

№	Reference, Year of Publication	Country	Study Design	Obesity BMI Threshold	Age	Sample Size	The Results Given in the Article
1	Bakhshi et al., 2010 [26]	Iran	Cross-sectional study	≥30 kg/m^2	20–69	26,551	Male OR 1.09 (0.9–1.32) Female OR 1.16 (1.03–1.31)
2	Erem et al., 2004 [39]	Turkey	Cross-sectional study	≥30 kg/m^2	20 or older	5016	Obesity prevalence: in women—29.4%, in men—16.5%
3	Klos et al., 2013 [61]	United States	Cross-sectional study	≥30 kg/m^2	20 or older	8078	Married OR 1.73 (1.20–2.52)
4	Fouad et al., 2006 [42]	Syrian Republic	Cross-sectional study	≥30 kg/m^2	18–65	2038	Married OR 2.62 (1.13–6.10)
5	Khader et al., 2008 [60]	Jordan	Cross-sectional study	≥30 kg/m^2	25 or older	1121	Married OR 2.7 (1.4–5.2)

Table 2. *Cont.*

№	Reference, Year of Publication	Country	Study Design	Obesity BMI Threshold	Age	Sample Size	The Results Given in the Article
6	Sidik et al., 2009 [94]	Malasya	Cross-sectional study	≥30 kg/m^2	20–59	891	Married OR 2.70 (1.50–5.01)
7	Janghorbani et al., 2008 [53]	Iran	Cross-sectional study	≥30 kg/m^2	15–65	87,597	Married OR 2.53 (2.25–2.85)
8	Seubsman et al., 2010 [91]	Thailand	A survey in cohort study	≥25 kg/m^2	15–87	85,886	Obesity prevalence: Partnered males 29.4%–36.7% Partnered females 12.2%–13.2% Single males 14.8%–15.9% Single females 8.0%–8.6%
9	Badr et al., 2013 [24]	Kuweit	Cross-sectional study	≥30 kg/m^2	50 or older	2443	Married OR 2.29 (1.69–3.08)
10	Veghari et al., 2010 [107]	Iran	Cross-sectional study	≥30 kg/m^2	15–65	2495	Married OR 5.95 (3.54–10.0)
11	Amer et al., 2011 [18]	Brazil	Cross-sectional study	≥30 kg/m^2	18 or older	369	Married OR 1.6 (0.63–4.11)
12	Shayo et al., 2011 [93]	Tanzania	Cross-sectional study	≥30 kg/m^2	18–65	1249	Married OR 1.6 (1.0–2.4)
13	Watson et al., 2013 [109]	CIS countries	Cross-sectional study	≥30 kg/m^2	18 or older	16,944	Single OR 0.62 (0.50–0.75)
14	Kamal et al., 2015 [56]	Bangladesh	Cross-sectional study	≥30 kg/m^2	15–49	16,273	Married OR 1.01 (0.82–1.25)
15	Wang et al., 2016 [84]	China	Cross-sectional study	≥28 kg/m^2	18–79	20,839	Married OR 1.44 (1.19–1.74)
16	Memish et al., 2013 [68]	Saudi Arabia	Cross-sectional study	≥30 kg/m^2	15 or older	10,702	Single OR 0.53 (0.46–0.63)
17	Eum et al., 2021 [40]	Republic of Korea	Cross-sectional study	≥25 kg/m^2	19–60	2592	Married RR 1.78 (1.25–2.54)
18	Mangemba et al., 2020 [67]	Republic of Zimbabwe	Cross-sectional study	≥30 kg/m^2	15–49	8904	Married OR 1.54 (1.27–1.87)
19	Ahmed et al., 2020 [63]	Tanzania	Cross-sectional study	≥30 kg/m^2	15–49	11,741	Married RR 1.78(1.25–2.54
20	Najafi et al., 2018 [75]	Iran	A survey in cohort study	≥30 kg/m^2	35–65	10,086	Overall prevalence of obesity 26.72%
21	Aladeniyi et al., 2017 [14]	Nigeria	Cross-sectional study	≥30 kg/m^2	24 or older	4828	Married OR 2.1 (1.7–2.8)

Table 2. *Cont.*

№	Reference, Year of Publication	Country	Study Design	Obesity BMI Threshold	Age	Sample Size	The Results Given in the Article
22	Liu et al., 2018 [112]	China	A survey in cohort study	≥30 kg/m^2	18–79	39,034	Single OR 0.86 (0.77–0.96)
23	Omar et al., 2020 [79]	Eastern Sudan	Cross-sectional study	≥30 kg/m^2	20 or older	594	Married OR 4.37(2.60–7.35)
24	Song et al., 2019 [98]	China	Cross-sectional study	≥28 kg/m^2	35–80	14,618	Married OR 1.8 (1.4–2.5)

On assessing study quality using the Newcastle–Ottawa scale modified for cross-sectional studies, we found that all 24 studies selected for the meta-analysis were deemed to be of high quality (7–9 score), thus providing a low risk of bias (Figure 4).

Figure 4. Details of the Newcastle–Ottawa scale score for studies included in meta-analysis.

Of the 24 studies, 19 showed a significant association between marital status and obesity. Eighteen studies reported that married individuals had a greater risk of obesity than unmarried individuals. A meta-analysis of 24 studies included a total population of 369,499 participants: 257,257 married individuals (40,896 of whom had obesity) and 112,242 comparison subjects (single, divorced, or widowed individuals, 15,084 of whom had obesity).

Our first analysis of all available studies reporting odds ratios for obesity found a significant pooled odds ratio for obesity in married individuals compared with controls (OR 1.70; 95% CI 1.38–2.10) (Figure 5). Heterogeneity was high and significant. This may be attributed to the differing sample sizes employed in the included studies, as well as the ethnic characteristics that may have influenced the predisposition to obesity. The observed heterogeneity in the selected studies may also be attributed to the varying age compositions of the study populations, as age-related patterns in BMI have been identified.

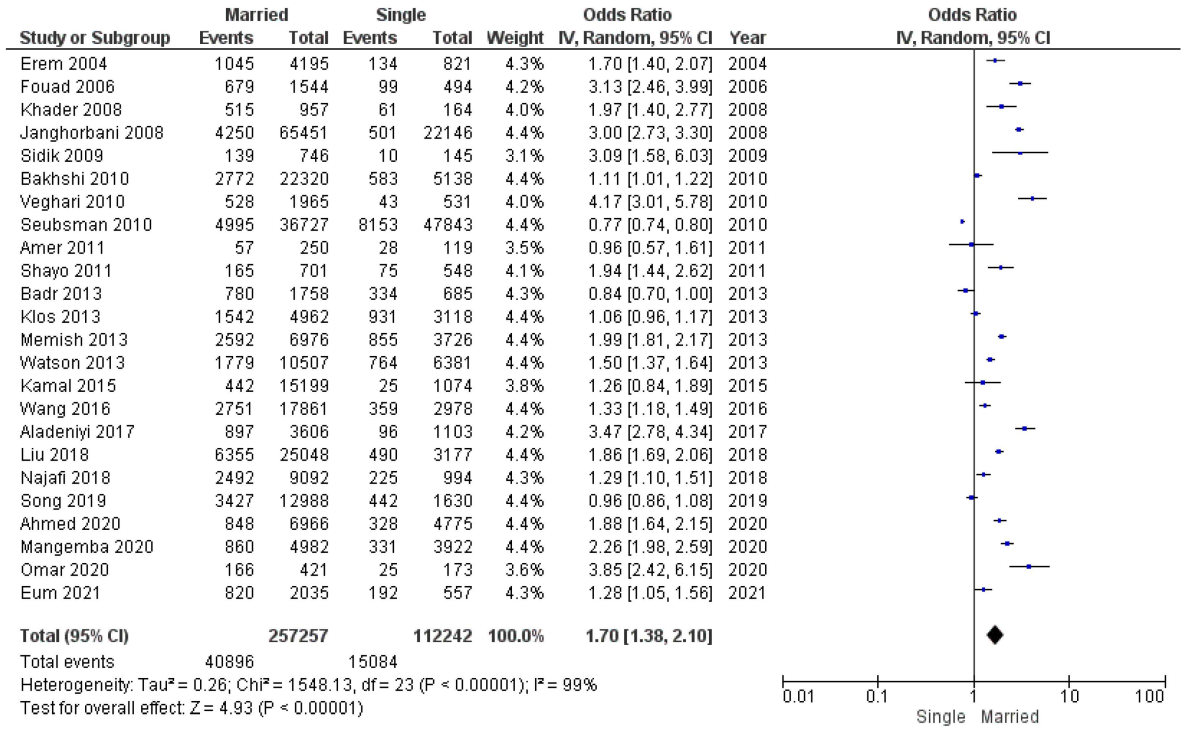

Figure 5. Meta-analysis of odds ratios and 95% confidence intervals for marital status and obesity.

Considering differences in obesity BMI thresholds, we conducted submeta-analyses of the respective subgroup of studies: BMI $\geq$ 30 kg/m^2, BMI $\geq$ 28 kg/m^2, and BMI $\geq$ 25 kg/m^2.

A submeta-analysis of two studies with an obesity threshold of BMI $\geq$ 25 kg/m^2 included a total population of 87,162 participants (14,160 of whom had obesity): 38,762 married individuals (5815 of whom had obesity) and 48,400 unmarried individuals (8345 of whom had obesity). As shown in Figure 6, the pooled odds ratio in this group of studies was not significant (OR 0.98, 95% CI 0.59–1.63). Heterogeneity was high and significant.

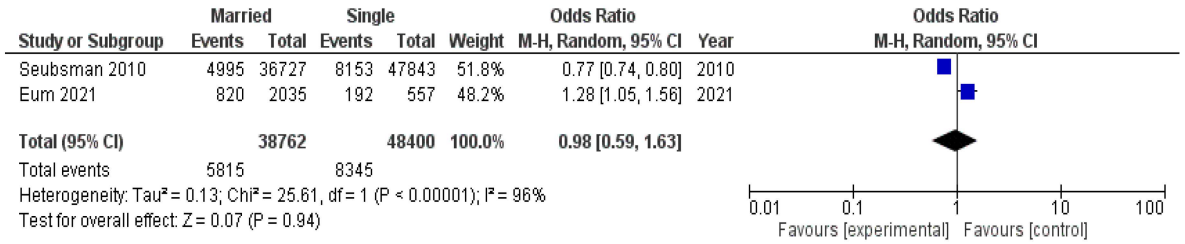

Figure 6. Submeta-analysis of odds ratios and 95% confidence intervals for marital status and obesity in a group of studies with an obesity threshold of BMI $\geq$ 25 kg/m^2.

A submeta-analysis of three studies with an obesity threshold of BMI $\geq$ 28 kg/m^2 included a total population of 63,682 participants (13,824 of whom had obesity): 55,897 married individuals (12,533 of whom had obesity) and 7785 unmarried individuals (1291 of

whom had obesity). From this data (Figure 7), we can see that the group resulted in a greater but still not significant pooled odds ratio (OR 1.34, 95% CI 0.91–1.97). Heterogeneity was high and significant.

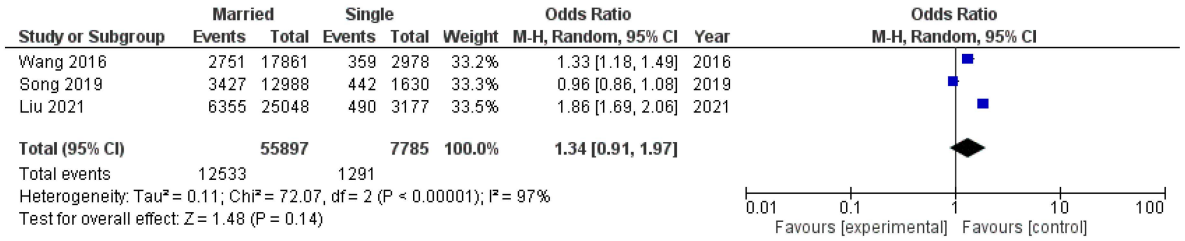

Figure 7. Submeta-analysis of odds ratios and 95% confidence intervals for marital status and obesity in a group of studies with an obesity threshold of BMI $\geq$ 28 kg/m^2.

The last subgroup of studies that had an obesity threshold of BMI $\geq$ 30 kg/m^2 included a total population of 218,655 participants (27,996 of whom had obesity): 162,598 married individuals (22,548 of whom had obesity) and 56,057 unmarried individuals (5448 of whom had obesity). The submeta-analysis of this group showed that the exclusion of studies with a lower obesity BMI threshold resulted in a greater odds ratio (OR 1.88, 95% CI 1.54–2.29) compared to the meta-analysis of all 24 studies (Figure 8). Heterogeneity was high and significant.

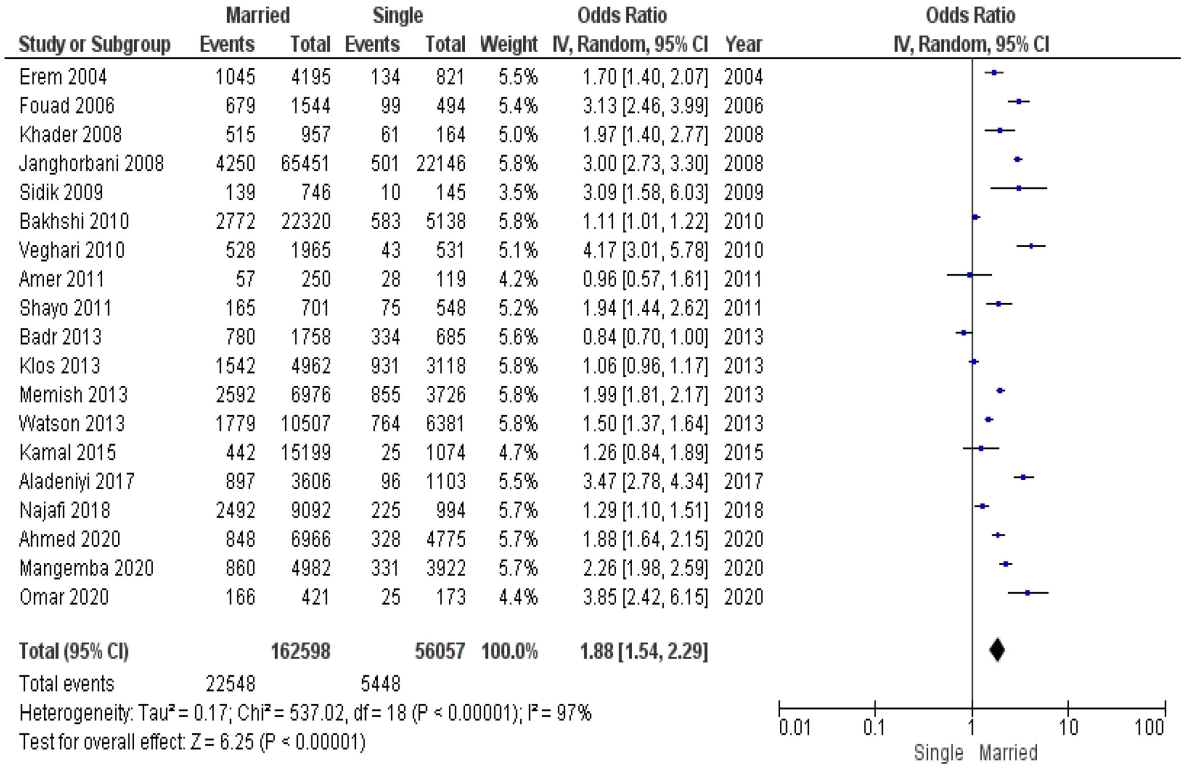

Figure 8. Submeta-analysis of odds ratios and 95% confidence intervals for marital status and obesity in a group of studies with an obesity threshold of BMI $\geq$ 30 kg/m^2.

Odds ratios for meta-analysis of all included studies and submeta-analyses are presented in Table 3. The most interesting conclusion drawn from the figures provided in a table is that there is a considerable influence of marital status on the odds of obesity among married Europeans, because both the criteria for obesity are higher for them and the pooled odds ratio in the respective meta-analysis was greater than in the meta-analysis that included studies from all populations.

Table 3. Odds ratios and 95% confidence intervals for meta- and submeta-analyses based on obesity threshold of BMI.

Studies	Sample Size (N)	Odds Ratio	95% Confidence Interval for OR
All studies (n = 24)	369,499	1.70	1.38–2.10 *
Obesity threshold of BMI $\geq$ 30 kg/m^2 (n = 19)	218,655	1.88	1.54–2.29 *
Obesity threshold of BMI $\geq$ 28 kg/m^2 (n = 3)	63,682	1.34	0.91–1.97
Obesity threshold of BMI $\geq$ 25 kg/m^2 (n = 2)	87,162	0.98	0.59–1.63

*—significant results.

In addition to BMI threshold division, it was considered to conduct submeta-analyses to investigate the association of marital status and obesity in sex subgroups. The results of submeta-analyses in sex subgroups are presented in Figures 9 and 10.

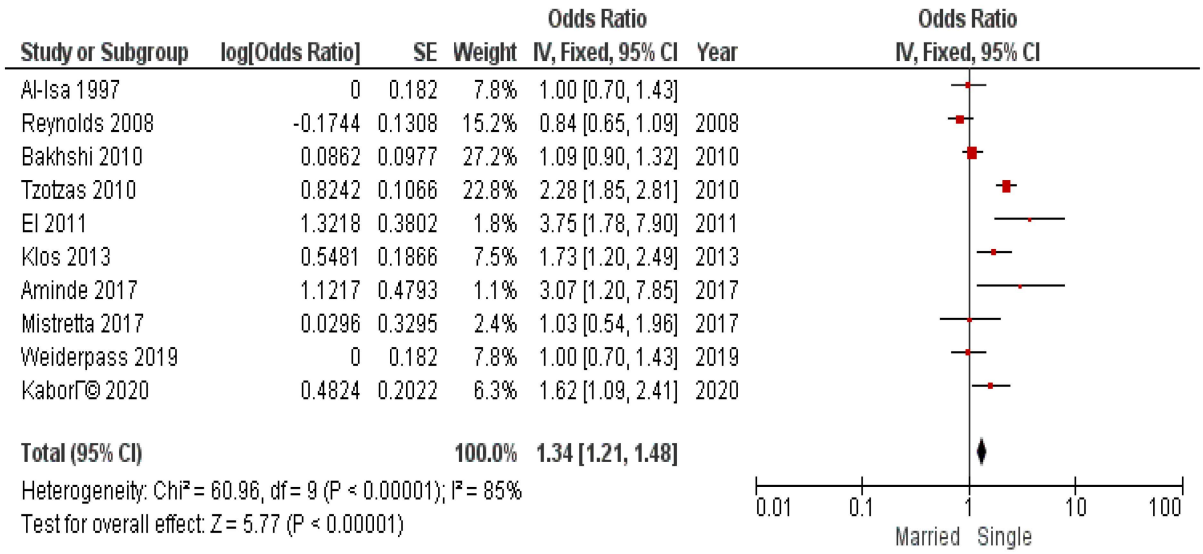

Figure 9. Submeta-analysis of odds ratios and 95% confidence intervals for marital status and obesity in a subgroup of women.

We obtained significant pooled odds ratio for both subgroups: OR 1.34 (95% CI 1.21–1.48) for men and OR 1.27 (95% CI 1.20–1.34) for women. Heterogeneity was high and significant.

The socioeconomic environment was not the same throughout the period of studies analyzed. We made the assumption that, during a crisis and decreased socioeconomic conditions, fewer people have the ability to maintain healthy lifestyle and purchase quality food. Considering this fact, we conducted a submeta-analysis of subgroups: (1) studies conducted during the global economic crises of 2008–2009 and 2020–2021 (Figure 11), (2) studies conducted between 2010 and 2019 (Figure 12).

The group of studies conducted during the economic disturbances of 2008–2009 and 2020–2021 consisted of 112,886 participants (8812 of whom had obesity): 81,067 married individuals (7457 of whom had obesity) and 31,819 unmarried individuals (1355 of whom had obesity).

The group of studies conducted between economic crises consisted of 100,753 participants (18,005 of whom had obesity): 77,336 married individuals (14,046 of whom had obesity) and 23,417 unmarried individuals (3959 of whom had obesity).

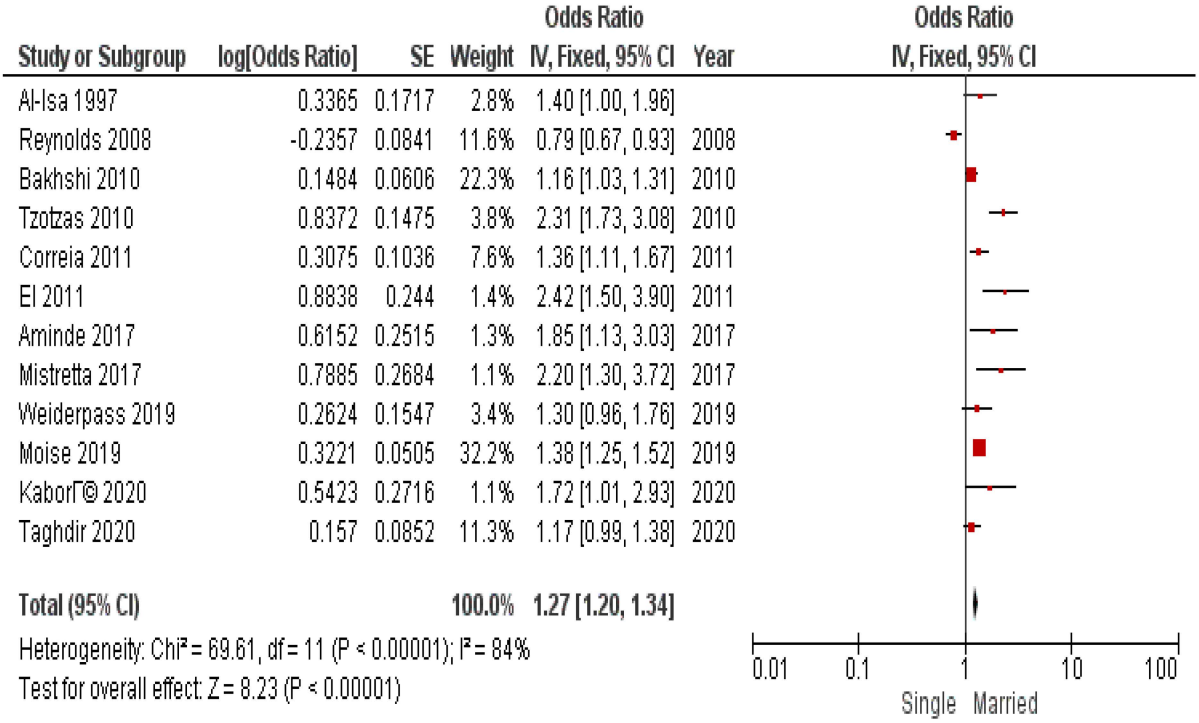

Figure 10. Submeta-analysis of odds ratios and 95% confidence intervals for marital status and obesity in a subgroup of men.

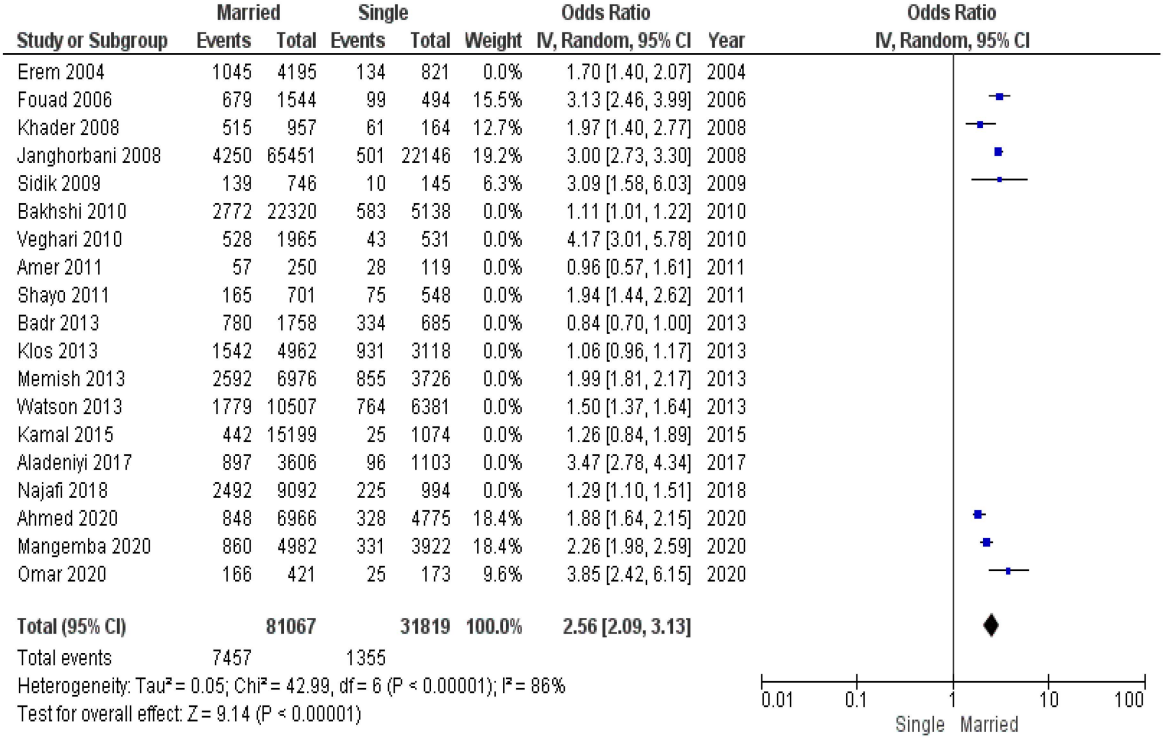

Figure 11. Submeta-analysis of odds ratios and 95% confidence intervals for marital status and obesity in a studies conducted during economic crises of 2008–2009 and 2020–2021.

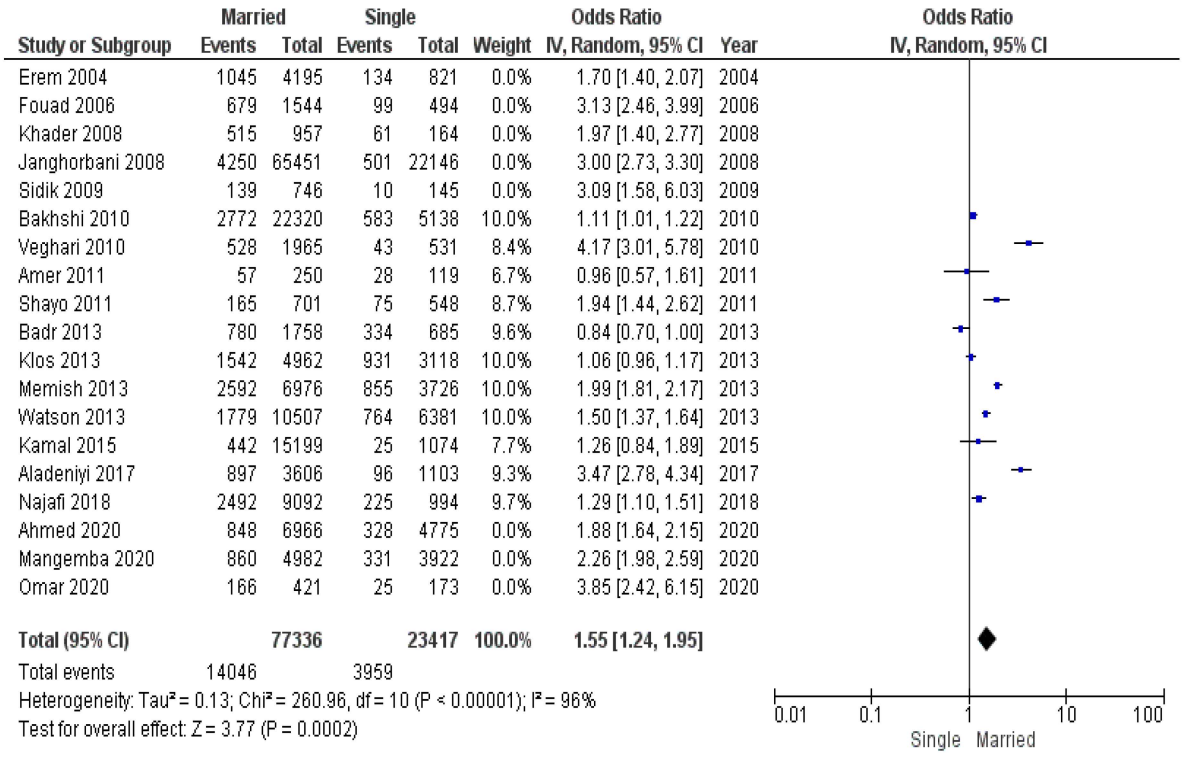

Figure 12. Submeta-analysis of odds ratios and 95% confidence intervals for marital status and obesity in a studies conducted between economic crises from 2010 to 2019.

According to pooled odds ratio for these subgroups, the odds of obesity in married individuals during economic crises was greater than during the period between crises: OR 2.56 (95% CI 2.09–3.13) during crises vs. OR 1.55 (95% CI 1.24–1.95) between crises.

4. Discussion

Despite a multiplicity of obesity prevention strategies in both developed and developing countries, the prevalence of obesity continues to rise. The rapid expansion in the prevalence of obesity-related diseases is imposing a substantial burden on healthcare systems worldwide. Genetic predisposition cannot account for the accelerated increase in obesity observed in recent decades within specific ethnic groups and across the globe.

Over the past several decades, a substantial body of research has been conducted on obesity among the population. A significant proportion of these studies have focused on identifying risk factors for obesity. Among those risk factors, social factors have received considerable attention. Our study summarized all available published data and showed that married individuals have higher odds of developing obesity compared to unmarried (single, divorced, widowed) individuals. There are several hypotheses that may potentially explain our findings.

The first hypothesis may be expressed as follows: over time, couples who share a household establish shared routines, eating habits, and preferred activities. In such circumstances, the probability of developing shared unhealthy habits increases. If one partner gains weight, the other partner is more likely to gain weight as well. Furthermore, the sense of security and peace of mind that accompany marriage may have a direct effect on metabolic rate. Adipose tissue accumulates when metabolic activities are slowed [118].

There is also the contrary hypothesis that excessive weight in one or both partners may be an indicator of issues in a couple's relationship. The disappointment and depression may cause a so-called "stress eating" behavior [119].

One of possible factors associated with marriage is the commitment that is inherent in the formation of a family. The sharing of a household and the desire to spend time with a

partner occupy a significant portion of leisure time, and if not sufficiently motivated, can overshadow health issues. In order to maintain sufficient physical activity, a person must apply additional efforts and be engaged in it regularly. This necessitates the allocation of time, financial resources, and, most crucially, willpower. The presence of children also entails an additional responsibility for the couple, with their leisure time often devoted to the care of the child.

Another hypothesis explains the association between early marriage and obesity risk. This concept is particularly applicable in developing nations, where the rate of early marriage is higher due to religious, economic, and social factors. A lower socioeconomic level in comparison to developed nations may be another factor impeding individuals from maintaining a healthy lifestyle [120,121].

These hypotheses require further investigation. However, preventive measures should be focused on improving relationships within the couple and efforts to build shared healthy habits. Partners should discover leisure activities that are both in their best interests and allow them to sustain healthy behaviors.

Taken together, the findings of the actual study empower the idea that the development of family weight loss programs can be very effective in preventing obesity. Family programs will increase the likelihood of forming new healthy habits within couples and provide support and motivation for healthy behaviors. It may be beneficial to find such activities that are mutually agreeable by both partners. It can be reasonably asserted that the prevention of disease and the maintenance of optimal health are contingent on the establishment and sustenance of a harmonious and trusting relationship between the couple. Individuals who are married or cohabiting should pay more attention to their body weight.

The findings of this study can be utilized to mitigate the adverse effects of social and environmental factors, particularly those associated with marriage and cohabitation. From a public health perspective, it is crucial to highlight the risk and preventive factors of diseases. However, the fact that obesity increases the risk of the development of hypertension, type 2 diabetes, and cancer is contrary to data showing a lower prevalence of these diseases among married people. In this regard, the hypothesis that cohabitation with a partner is a protective factor that exceeds the risks associated with obesity requires further investigation.

Limitations

The actual study is not without limitations. A major limitation of this review is the design of the included studies. Even when undertaken as part of longitudinal investigations, the studies included in the meta-analysis were cross-sectional. However, the significant effect sizes found in several of the studies indicate a high level of quality in these research data. Another limitation is that the studies lacked information on the length of marriage, cohabitation, or singleness. This prevented the effects of duration of cohabitation or single living on obesity from being investigated. As an additional source of limitation, it is worth mentioning the possible variation in the measurements used in the studies carried out in the different countries. Future studies should explore this further.

5. Conclusions

The results of this review confirm the importance of considering marital status in determining the risk of obesity. The odds of obesity were 88% higher among married individuals compared with single, divorced, and widowed individuals (considering the WHO recommended obesity threshold of BMI $\geq$ 30 kg/m^2). No significant differences in odds were found in Asia-Pacific countries with lower obesity BMI thresholds (BMI $\geq$ 25 kg/m^2 or $\geq$ 28 kg/m^2). The odds of obesity in married men did not differ from that of women.

During the 2008–2009 and 2020–2021 global economic crises, the odds of obesity in married individuals increased compared to the period between crises.

Individuals who are married or cohabiting should be advised to control their weight more strictly and take regular measurements, maintain a healthy diet, and engage in physical activity.

Author Contributions: Conceptualization, methodology, N.P. and Z.S.; software, validation, V.J. and D.R.; formal analysis, investigation, resources, M.K. (Mariia Kartashova) and N.P.; data curation, writing—original draft preparation, M.K. (Margarita Korenkova); writing—review and editing, visualization, T.N.T.; supervision, project administration, V.K., V.R.; supervision, project administration. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Ethics approval was not required for this study. The study protocol was registered on the International prospective register of systematic reviews (PROSPERO) under number CRD42021292440.

Conflicts of Interest: The authors declare no conflicts of interest.

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