

RESEARCH

Open Access



The association between violence against women and chronic pain: a systematic review and meta-analysis

Allison Uvelli^{1*}, Carola Ribaudò², Giacomo Gualtieri^{1,3}, Anna Coluccia¹ and Fabio Ferretti¹

Abstract

Violence against women is a phenomenon that involves at least 35% of women worldwide. Violence can be sexual, physical, and/or psychological, perpetrated by the partner, another family member, or a stranger. Violence is a public health problem because its consequences include higher morbidity, higher mortality, and short and long-term physical and psychological health diseases. Most studies prove an association between any type of violence and some chronic pain diagnoses but no one has done a complete collection of this evidence. This systematic review and meta-analysis aimed to evaluate whether this association is statistically significant, including the largest number of studies. Through the inclusion of 37 articles, the association has been demonstrated. Compared with no history of violence, women who did experience violence showed 2 times greater odds of developing chronic pain. The impact of violence was significant also on fibromyalgia separately, but not on pelvic pain.

PROSPERO registration

PROSPERO CRD42023425477.

Keywords Violence against women, Chronic pain, Systematic review

Background

The phenomenon of gender violence

Violence against women is a violation of their human rights and a public health issue [1]. This violence can take many forms, such as interpersonal violence, domestic abuse, or intimate partner violence, including sexual, physical, and psychological violence. The ultimate goal is to exert control over women's lives, which can destroy

their independence, self-determination, personal growth, and psychological well-being.

The United Nations [2] defines violence against women as “any act of gender-based violence that results in or is likely to result in, physical, sexual or mental harm or suffering to women, including threats to such acts, coercion or arbitrary deprivation of liberty, whether occurring in public or private life”. In recent years, policies aimed at addressing and preventing violence have been on the rise. However, despite these efforts, the incidence of violence remains high. According to a recent observational study, approximately 51.7% of women in the European Union have experienced violence at some point in their lives [3]. Additionally, at least 35% of women worldwide have reported experiencing violence [4].

Intimate partner violence (IPV) is the most prevalent type of violence against women, and it is more difficult to detect and study than violence perpetrated by strangers

*Correspondence:

Allison Uvelli
allison.uvelli@unisi.it

¹ Department of Medical Science, Surgery and Neurosciences, University of Siena, Viale Bracci, Siena 53100, Italy

² AOUC Azienda Ospedaliero-Universitaria Careggi, Largo Brambilla, Florence 50134, Italy

³ AOUS Azienda Ospedaliero-Universitaria Senese, Viale Bracci, Siena 53100, Italy



© The Author(s) 2024. **Open Access** This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>. The Creative Commons Public Domain Dedication waiver (<http://creativecommons.org/publicdomain/zero/1.0/>) applies to the data made available in this article, unless otherwise stated in a credit line to the data.

[5]. IPV is defined by the Centers for Disease Control and Prevention (CDC) as violence perpetrated by a current or former intimate partner, including physical violence, sexual violence, stalking, and psychological aggression [6]. In the last decade, there has been a significant amount of literature on this topic, but there are still many aspects that require further exploration.

Consequences of abuse

Abuse survivors suffer various consequences that range from higher morbidity and mortality and short and long-term physical and psychological health problems [7]. Victimized women have higher rates of depression, post-traumatic stress disorder (PTSD), anxiety, alcoholism, and suicidal tendencies [8–10].

Apart from psychological consequences, violence can cause chronic health problems and pain [11–14]. The prevalence of chronic pain is 8.78% in Europe [15], 6% in Canada [16], and 8% in the United States of America [17]. Most studies focus on pelvic/vaginal pain [18], fibromyalgia [19], irritable bowel syndrome/bowel symptoms [20], abdominal pain [21], temporomandibular pain [22], breast pain [23], migraine/headache [24], back pain [25], and neck pain [26], which tend to become chronic as well as the pain derived from them.

Previously, researchers studied health conditions and violence types separately, such as the association between sexual trauma and pelvic pain [27, 28], or psychological trauma and fibromyalgia [29, 30]. It is crucial to approach chronic pain as a broad concept because irrespective of the affected body area, individuals can seek assistance from pain therapy departments or clinics. Therefore, it would be beneficial to conduct a general screening.

Several studies and systematic reviews have examined the link between adverse childhood experiences (ACE) and chronic pain [31, 32]. Additionally, some studies have investigated the relationship between post-traumatic stress disorder (PTSD) and physical health consequences [33, 34]. There are also longitudinal studies that track the health of abused women over time [35–37]. Most of these studies show a positive association between any kind of violence and all chronic conditions, with a significant difference between the group of abused women and the group of not-abused women [38–44]. Despite this, the exact cause of these conditions is still not clear.

Given the complexity of the situation at hand, the biopsychosocial model [45] could provide us with a better understanding of the underlying causes. This model asserts that diseases arise from a combination of biological, psychological, and social factors that vary from person to person. Accordingly, if we adopt this approach, we could infer that chronic pain in victims of violence is not exclusively caused by a single factor, be it psychological,

sociological, or biological, but rather by a combination of all three.

What is the current stage of gender research?

Studies on gender violence have been conducted for many years, and they continue to be relevant in recent times. These studies have created a large database that experts and researchers can use to orient their study or clinical practices. It is essential to categorize available data into various evidence collections to have more precise estimates. In particular, data on the health of abused women can guide health policies and guidelines. It can also help healthcare professionals in their clinical work and better direct women toward proper treatment. However, there are no reviews that consider chronic pain as a general concept in this regard. This is the first meta-analysis that investigates the association between violence against women in adulthood and chronic pain.

Objectives

This systematic review and meta-analysis aim to contribute to the clarification of the literature on the association between violence against women and chronic pain, considering all types of abuse verified only in adulthood (abuse suffered after 18 years old), and the major chronic pain diagnoses found in the literature.

The final objective is to increase the knowledge about this condition because no one has done this complete collection before considering it as a wide-ranging phenomenon.

Materials and methods

This search protocol was based on the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines [46], according to the PECOS (Population, Exposure, Comparison, Outcome, Study Design) guidelines.

Search strategy

The research was conducted on the online electronic databases of PubMed, Scopus, and Web of Science from October 2022 to May 2023, and carried out a manual review of references. The databases are selected to contain the most high-quality empirical studies. The protocol has been registered at the International Prospective Register of Systematic Reviews (PROSPERO; registration number CRD42023425477).

The search strategy relating to the association between violence against women and chronic pain was: (“intimate partner violence” OR “interpersonal violence” OR “partner abuse” OR “domestic violence”) AND ((pain)). The keywords have been chosen after a preliminary search of the literature thanks to which it was possible to identify

the most used and relevant terms. The term “violence against women” is not included due to its generalizable meaning, risking losing the focus of the research because it resulted in too many irrelevant articles.

There were no period restrictions on the search to increase the yield of studies, though the language was restricted to studies published in English or Italian.

Authors were also contacted via email where there was insufficient data, and references from included studies were manually scanned for further sources as per published recommendations [47–49].

Criteria for selection of studies

Studies were included if they met the following criteria: human females of at least 18 years old with (“cases”) and without (“controls”) a history of adulthood abuse identified through published observational study designs (cohort, case–control, and cross-sectional studies). For the definition of abuse, we did not limit inclusion criteria based on specific types of violence. Definitions of chronic pain varied between studies and it also adopted an inclusive approach. In general, the pain or discomfort that persists in the affected area for at least 3 out of the past 6 months. Pain signs and symptoms considered were pelvic pain, fibromyalgia, bowel pain, abdominal pain, temporomandibular pain, breast pain, migraine/headache, back pain, and neck pain. Exclusion criteria included male subjects, minor subjects, childhood abuse (abuse suffered before 18 years old), studies without a control group, and studies not published in English or Italian languages. Only the relevant sample was extrapolated from articles with mixed samples.

Lastly, systematic reviews, meta-analyses, commentaries, dissertations, thesis, editorials, and conference deeds were excluded but their references were examined to find other studies not retrieved between the search strategy.

Study selection and data extraction

Studies were selected in a three-stage process. All citations identified from initial searching (articles extracted in October 2022) were imported into Zotero Software, where duplicate citations were removed, after which two reviewers (AU & CR) independently scrutinized all article titles remaining from the original search. After this, the same two reviewers independently analyzed all article abstracts remaining from the second removal. In case of disagreement, the references were discussed until an agreement was reached, and an independent third reviewer (FF) was consulted. In case of unclear abstract, the reference was included in the next stage (full-text screening) to confirm the information given in the full text. For studies assessed for eligibility full manuscripts were obtained, and two reviewers (AU & CR) carried

out an independent full-text review of all English/Italian language articles. Disagreements regarding inclusion or exclusion criteria were resolved by consensus, or through consultation of an independent third reviewer (FF). Two reviewers (AU & CR) carried out independent data extraction, where extractable data was missing, authors were contacted by email. It used outcome data and exposure to abuse to construct a table for the appropriate analyses.

Assessment of study quality

Quality assessment was conducted through existing checklists [50]. Quality was defined as the confidence that bias in the estimation of the effect of abuse on pain symptom outcomes was minimized through appropriate study design methods and analysis. Two independent authors (AU & CR) assessed the quality of the retrieved articles to identify any potential source of bias using predetermined and validated criteria from The Joanna Briggs Institute appraisal checklists for cross-sectional, case–control, and cohort studies [50]. Appraisal criteria are made of comparability and appropriateness of cases and controls, description of subjects and setting, reliable and valid measurement of exposure, appropriateness of inclusion criteria, identification of confounding factors and whether strategies were implemented to deal with these factors, valid and reliable assessment of outcomes, exposure time, appropriateness of follow-up and whether strategies were implemented to deal with incomplete follow-up, and appropriateness of statistical analyses used. To ensure the quality of a study, certain criteria must be met. For cross-sectional studies, at least 5 out of 8 criteria should be met, while cohort studies should meet at least 6 out of 11 criteria. Case–control studies should meet at least 6 out of 10 criteria. Any study that fails to meet these standards will be considered low-quality and excluded from the results. In this particular study, 10 cross-sectional studies satisfied 6 out of 8 criteria, 14 satisfied 5 out of 8 criteria, and 1 satisfied all 8 criteria. Of the cohort studies, 7 out of 11 criteria were met. For the case–control studies, 2 satisfied 6 out of 10 criteria, 2 satisfied 8 out of 10 criteria, 2 satisfied 7 out of 10 criteria, and 1 satisfied all 10 criteria. All articles were found to meet the high-quality criteria, therefore, no articles were excluded based on the quality standard.

Statistical analysis

Statistical analyses were performed using Comprehensive Meta-Analysis Software (CMA) v4. Since the prevalence of chronic pain could be affected by the characteristics of the populations included, and considering the heterogeneity of the symptoms defining this health problem, random-effect models were used in this

study [51]. The effect size was assessed in the odds ratio of having chronic pain and being a victim of violence. The results of three meta-analyses were evaluated: chronic pain in general, pelvic pain, and fibromyalgia. The two sub-categories of pelvic pain and fibromyalgia were also evaluated individually because they had a sufficient number of studies to be able to do it. The effect sizes were estimated by the odds ratios' 95% confidence interval. Forest plots were generated, and heterogeneity analysis of the effect sizes was performed by calculating Higgins's I^2 statistic [52] and Cochrane's Q index [53]. Cochrane's Q p value < 0.1 and an $I^2 > 40\%$ were considered markers of heterogeneity.

Publication bias was explored through the inspection of the funnel plot and the Egger test [54]. The funnel plot appears asymmetrical if publication bias is detected, while a non-statistically significant result of the t-value of Egger's regression intercept allows us to discard publication bias. The level of significance was set at $p < 0.05$.

Results

Literature identification, study characteristics, and quality

The search protocol identified 1392 publications from online databases. 578 were removed as they were duplicate publications. The remaining 814 studies were screened against title and abstract criteria, after which a further 725 were excluded. Of the 89 studies selected for full-text review, 52 were excluded, 4 were written in unknown languages, 19 were due to lack of a control group, 10 focused on childhood abuse, 3 were review, and 16 were due to lack of some important data (the specific number of women with chronic pain in both groups, victimized and not victimized). After the quality assessment was carried out 37 studies were included [12, 23, 25, 55–88]. See the flow diagram in Fig. 1.

The years of the study range from 1994 to 2021, 26 studies are cross-sectional, 7 are case-control, and 4 are cohort studies. Studies from the USA are 56.7%, 10.8% are from the UK, 5.4% are from Spain and Australia respectively, and 21.5% are from other countries.

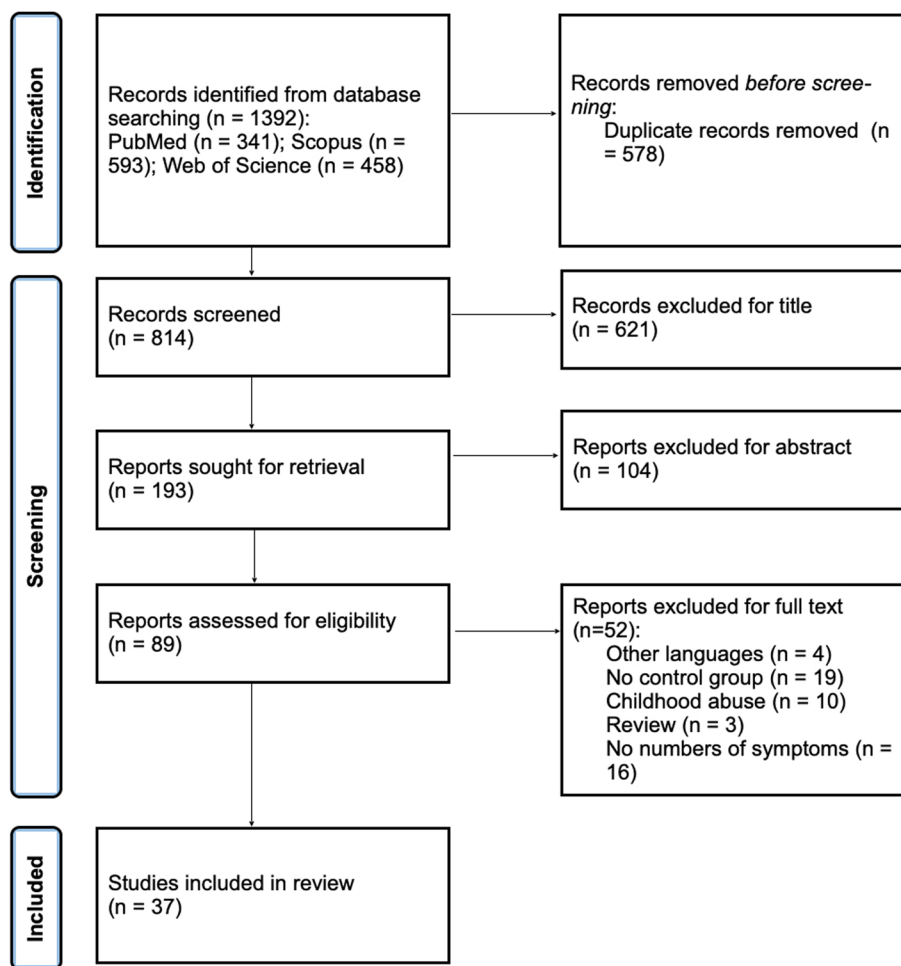


Fig. 1 Prisma flowchart [46]

The sample size ranges from 50 to 92,735, its age ranges from 18 to 65, and all the adult abuse types are represented. Studies evaluated general chronic pain are 56.7%, 18.9% evaluated fibromyalgia, and 24.3% evaluated pelvic pain. Studies evaluated intra-family violence (perpetrated by partners or other family members) are 78.3%, and 21.6% evaluated extra-family violence. Only physical, sexual, and psychological violence were examined in the included studies. Table 1 summarizes the characteristics of the included studies.

Meta-analysis results

Figure 2 shows the results of the random effects meta-analysis about the association between violence and chronic pain. Compared with no history of violence, women who did experience violence showed an increased odds of developing chronic pain (OR 2.08; 95% CI, 1.80–2.41; $p < 0.001$). Significant heterogeneity was found [$I^2 = 85.86$, $Q_{(36)} = 254.56$, $p < 0.001$], and the existence of publication bias was proved by the Funnel plot (7 out of 37 studies were located on the right side out of the plot) (Fig. 3) and by the significance of the Egger test on regression intercept [$\beta = 1.676$, $SE = 0.589$, $t_{(35)} = 2.844$, $p < 0.007$].

The subcategory of studies that investigated only pelvic pain showed a non-significant effect size. (OR 0.57; 95% CI, 0.25–1.29; $p = 0.178$). The forest plot with mean effect sizes is provided in Fig. 4. Significant heterogeneity was found [$I^2 = 96.040$, $Q_{(8)} = 2020.011$, $p < 0.001$], but no publication bias was detected according to the Funnel plot and the Egger test of intercept (Fig. 5) [$\beta = -3.657$, $SE = 3.284$, $t_{(7)} = 1.114$, $p < 0.302$].

The impact of violence on fibromyalgia was significant (Fig. 6): the overall odds ratio effect size was 1.68 (95% CI: 1.44–1.98) with a $p < 0.000$. The forest plot highlighted a high level of homogeneity among the studies' results [$I^2 = 0.000$, $Q_{(86)} = 3.070$, $p < 0.800$], together with the lack of publication bias: all the studies were located inside the Funnel (Fig. 7) and the Egger test of the intercept was not significant [$\beta = 0.913$, $SE = 0.522$, $t_{(5)} = 1.748$, $p < 0.141$].

Discussion

An healthcare point of view

In this review, we evaluated 37 studies on women both with and without a history of sexual, physical, and emotional abuse perpetrated by a partner, a family member, or a stranger. Results found strong and consistent associations between violence and the presence of chronic pain conditions. The results show that women who have experienced violence during adulthood have 2 times greater odds of developing chronic pain. Our findings are consistent with reports that women experiencing violence have adverse health outcomes [18–21], and with other

systematic reviews that associate some pain symptoms/syndromes with some type of adult or childhood abuse [30–34]. Healthcare workers who treat women dealing with chronic pain should be aware that their patients may have experienced violence. Similarly, anti-violence workers should know that women who have suffered violence may develop chronic pain symptoms. Without collaboration and integration between these professionals, the treatment of such women may not be effective. Healthcare workers and anti-violence workers need to work together to provide holistic care and support to these women. Screening women with chronic pain may help identify hidden violence for health workers. Health policies, guidelines, and prevention practices also should consider this association to direct victims to a bio-psycho-social individualized cure. The path to ending violence must address both short and long-term health consequences, not just eliminate the problem. Unfortunately, the etiology of these conditions isn't clear [89], despite longitudinal studies showing how pain persists even four years after separation from the abusive partner [90]. Furthermore, future research is needed to examine also associations between chronic pain and other forms of violence against women, such as financial abuse, stalking, cyber abuse, and coercion.

The problem of an unclear etiology

According to the bio-psycho-social model [45], we may suppose many different factors that contribute to the onset of pain symptoms in violence victims, in fact, this condition is often associated with mental health problems, such as anxiety or depression [8–10], and social problems, such as lack of social support, but for each woman, the three types of factors have different importance. Mood disorders are often present in chronic pain patients with a bidirectional relationship, in fact, people affected by chronic pain were 2.0 to 2.5 more likely to experience an episode of depression than individuals without chronic pain [91, 92], and pain-free individuals with depressive disorder were 4 times more likely to develop chronic pain than not depressed individuals [93, 94]. The same relationship was obtained for all anxiety disorders [95–97], alcohol, drugs, and smoking use/abuse [98–100], and suicidal thoughts [101, 102]. Previous studies found a relationship between chronic pain and specific psychological aspects [103], and neuroimaging studies showed that the activated brain areas by nociceptive stimuli are the same ones involved in emotional and behavioral states [104]. Chronic pain is different from acute pain because it is not necessarily caused by injuries, though it still involves biological processes. Various sensory, autonomic, endocrine, and immune responses interact to contribute to the nociceptive stimuli that are

Table 1 Characteristics of the included studies

Authors	Controls	Cases	Study design	Type of violence	Meta-analysis inclusion group
Talley et al. (1994) Australia [55]	111 30–49 y/o 35 with pain	89 30–49 y/o 45 with pain	Cross-sectional study	Spousal violence	Gastrointestinal chronic pain
Boisset-Piolo et al. (1995) Canada [56]	132 51.2 y/o 39 with pain and fibromyalgia	112 49.3 y/o 44 with pain and fibromyalgia	Case–control study	Sexual and physical abuse	Fibromyalgia and any chronic pain
Taylor et al. (1995) USA [57]	47 49.5 y/o 11 with pain 20 with fibromyalgia	35 44.58 y/o 17 with pain 20 with fibromyalgia	Case–control study	Sexual and physical abuse	Fibromyalgia and any chronic pain
Letourneau et al. (1999) USA [58]	151 33 y/o 37 with pain	40 33 y/o 17 with pain	Cross-sectional study	Sexual, physical and emotional abuse	Any chronic pain
Coker et al. (2000) USA [59]	532 18–65 y/o 118 with pain 50 with pelvic pain	620 18–65 y/o 235 with pain 107 with pelvic pain	Cross-sectional study	Intimate Partner Violence	Pelvic pain and any chronic pain
Dienemann et al. (2000) USA [60]	30 25–45 y/o 8 with pain	47 25–45 y/o 21 with pain	Cross-sectional study	Domestic violence	Chronic headache
Lown & Vega (2001) USA [61]	1057 32 y/o 6 with pain	126 32 y/o 13 with pain	Cross-sectional study	Intimate Partner Violence	Back chronic pain
Weinbaum et al. (2001) USA [62]	2776 18–65 y/o 571 with pain	207 18–65 y/o 73 with pain	Cross-sectional study	Intimate Partner Violence	Any chronic pain
Campbell et al. (2002) USA [63]	1000 21–56 y/o 252 with pain 86 with pelvic pain	980 21–56 y/o 389 with pain 169 with pelvic pain	Case–control study	Intimate Partner Violence	Pelvic pain and Any chronic pain
Kramer et al. (2004) USA [64]	718 18–65 y/o 167 with pain	550 18–65 y/o 291 with pain	Cross-sectional study	Intimate Partner Violence	Any chronic pain
John et al. (2004) UK [65]	649 20–60 y/o 86 with pain	171 20–60 y/o 36 with pain	Cross-sectional study	Physical domestic violence	Lower abdominal chronic pain
Castro et al. (2005) USA—Guatemala [66]	257 44.5 y/o 67 with pain 30 with fibromyalgia	117 44.5 y/o 62 with pain 28 with fibromyalgia	Case–control study	Physical, verbal and sexual abuse	Fibromyalgia and any chronic pain
Coker et al. (2005) USA [67]	530 18–65 y/o 21 with pain	624 18–65 y/o 60 with pain	Cross-sectional study	Intimate Partner Violence	Back chronic pain
Johnson et al. (2006) USA [23]	786 47 y/o 269 with pain	433 47 y/o 164 with pain	Cross-sectional study	Domestic violence	Breast chronic pain
Salam et al. (2006) Bangladesh—Japan [68]	132 25.4 y/o 48 with pain 31 with pelvic pain	364 25.4 y/o 189 with pain 128 with pelvic pain	Cross-sectional study	Spousal violence	Pelvic pain and any chronic pain
Pikarinen et al. (2007) Finland [12]	402 42.5 y/o 79 with pain	289 42.5 y/o 92 with pain	Cross-sectional study	Physical and sexual abuse	Lower abdominal chronic pain
Plante & Kamm (2008) France—UK [69]	56 40 y/o 10 with pain and pelvic pain	110 34 y/o 68 with pain and pelvic pain	Cohort study	Sexual and physical assault, intra-family violence	Pelvic pain and any chronic pain

Table 1 (continued)

Authors	Controls	Cases	Study design	Type of violence	Meta-analysis inclusion group
Ellsberg et al. (2008) Switzerland—USA—UK [70]	10,299 18–50 y/o 2165 with pain	9218 18–50 y/o 2856 with pain	Cross-sectional study	Intimate Partner Violence	Any chronic pain
Kendall-Tackett et al. (2008) USA [71]	53 47 y/o 21 with pain	57 47 y/o 30 with pain	Cross-sectional study	Domestic abuse	Chronic headache
Bonomi et al. (2009) USA [72]	1686 18–64 y/o 340 with pain 128 with pelvic pain	242 18–64 y/o 76 with pain 29 with pelvic pain	Cross-sectional study	Physical and sexual abuse	Pelvic pain and any chronic pain
Ruiz-Perez et al. (2009) Spain [73]	306 40.7 y/o 139 with pain and fibromyalgia	268 47.76 y/o 148 with pain and fibromyalgia	Case–control study	Physical, sexual and emotional abuse	Fibromyalgia and any chronic pain
Vung et al. (2009) Vietnam—Sweden [74]	802 18–60 y/o 81 with pain	81 18–60 y/o 24 with pain	Cross-sectional study	Intimate Partner Violence	Any chronic pain
Becker-Dreps et al. (2010) USA—Nicaragua [75]	776 37 y/o 104 with pain	186 37 y/o 47 with pain	Cross-sectional study	Intimate Partner Violence	Gastrointestinal chronic pain
Vives-Cases et al. (2011) Spain [25]	12,707 18–50 y/o 3069 with pain	278 18–50 y/o 109 with pain	Cross-sectional study	Intimate Partner Violence	Back chronic pain
Prosman et al. (2012) Netherlands [76]	50 19–60 y/o 19 with pain 15 with pelvic pain	50 19–60 y/o 22 with pain 28 with pelvic pain	Case–control study	Intimate Partner Violence	Pelvic pain and any chronic pain
Eldoseri et al. (2014) UK [77]	111 18–65 y/o 35 with pain	89 18–65 y/o 45 with pain	Cross-sectional study	Spousal violence	Any chronic pain
Al-Modallal (2016) Jordan [78]	87 32.7 y/o 57 with pain 42 with fibromyalgia	151 32.7 y/o 120 with pain 99 with fibromyalgia	Cross-sectional study	Intimate Partner Violence	Fibromyalgia and any chronic pain
Halpern et al. (2016) USA [79]	30 18–64 y/o 18 with pain 0 with pelvic pain	34 18–64 y/o 26 with pain 3 with pelvic pain	Cross-sectional study	Intimate Partner Violence	Pelvic pain and orofacial chronic pain
Lacey & Mouzon (2016) USA [80]	836 18–65 y/o 129 with pain	113 18–65 y/o 30 with pain	Cross-sectional study	Intimate Partner Violence	Rheumatic chronic pain
Ford et al. (2017) USA [81]	16 24.9 y/o 4 with pain	34 34.9 y/o 24 with pain	Cross-sectional study	Intimate Partner Violence	Any chronic pain
Iverson et al. (2017) USA [82]	47 39.8 y/o 12 with pain	80 36 y/o 36 with pain	Cross-sectional study	Intimate Partner Violence	Back chronic pain
Campbell et al. (2018) USA [83]	356 27 y/o 311 with pain	534 27 y/o 476 with pain	Case–control study	Intimate Partner Violence	Any chronic pain
Chandan et al. (2019) UK [84]	74,188 36.9 y/o 1507 with pain	18,547 36.9 y/o 343 with pain	Cohort study	Intimate Partner Violence	Temporomandibular joint chronic pain
Craner et al. (2020) USA [85]	48 46.87 y/o 1 with pain 6 with fibromyalgia 4 with pelvic pain	60 45 y/o 11 with pain 15 with fibromyalgia 0 with pelvic pain	Cross-sectional study	Intimate Partner Violence	Fibromyalgia, pelvic pain and any chronic pain

Table 1 (continued)

Authors	Controls	Cases	Study design	Type of violence	Meta-analysis inclusion group
FitzPatrick et al. (2020) Australia [86]	1112 31 y/o 563 with pain 284 with pelvic pain	234 31 y/o 139 with pain 79 with pelvic pain	Cohort study	Intimate Partner Violence	Pelvic pain and any chronic pain
Chandan et al. (2021) UK [87]	74,188 36.9 y/o 53 with pain 239 with fibromyalgia	18,547 36.9 y/o 19 with pain 97 with fibromyalgia	Cohort study	Intimate Partner Violence	Fibromyalgia and any chronic pain
Trivedi et al. (2021) USA [88]	366 47.7 y/o 64 with pain	222 45.9 y/o 67 with pain	Cross-sectional study	Physical, sexual and emotional abuse	Chronic headache

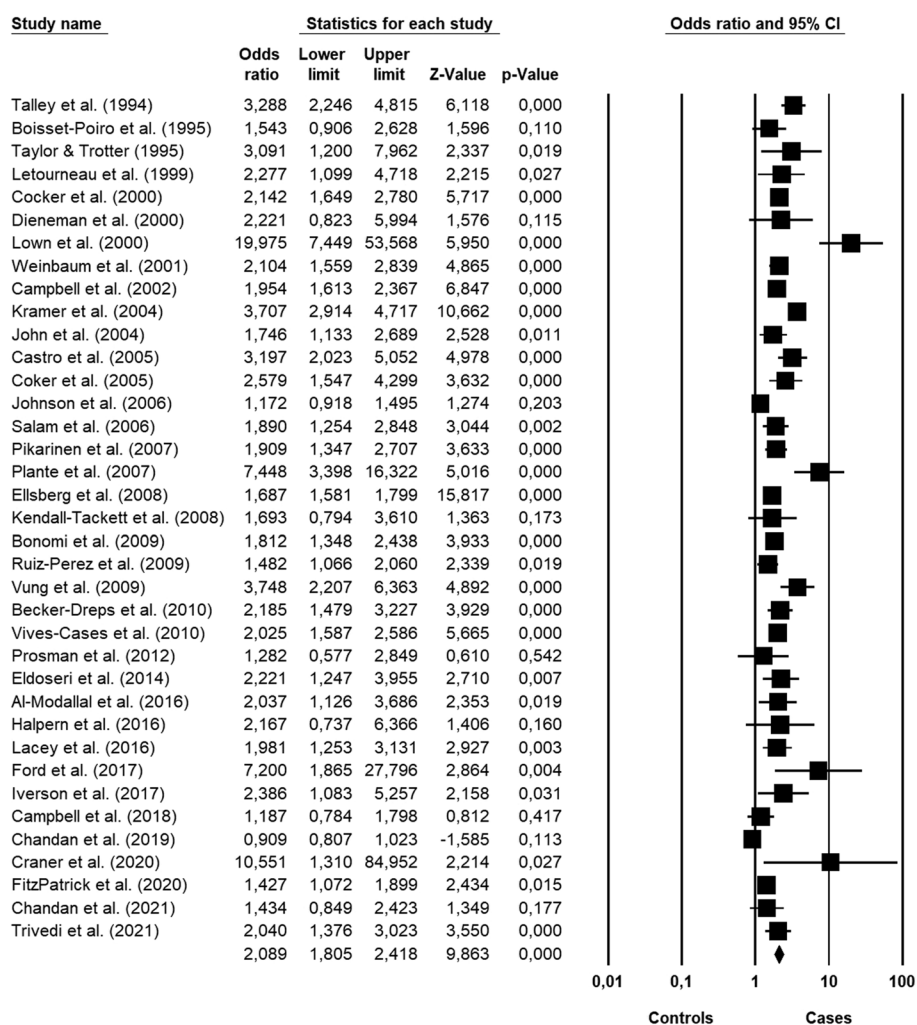


Fig. 2 Forest plot showing the meta-analysis results about chronic pain in general

perceived [105]. The nervous system is responsible for detecting potential threats, signaling danger to the body, and initiating a response to them. Similarly, the endocrine

system helps in increasing the survival chances by causing an arousal response through the stress response. Lastly, the immune system detects microbial invasion

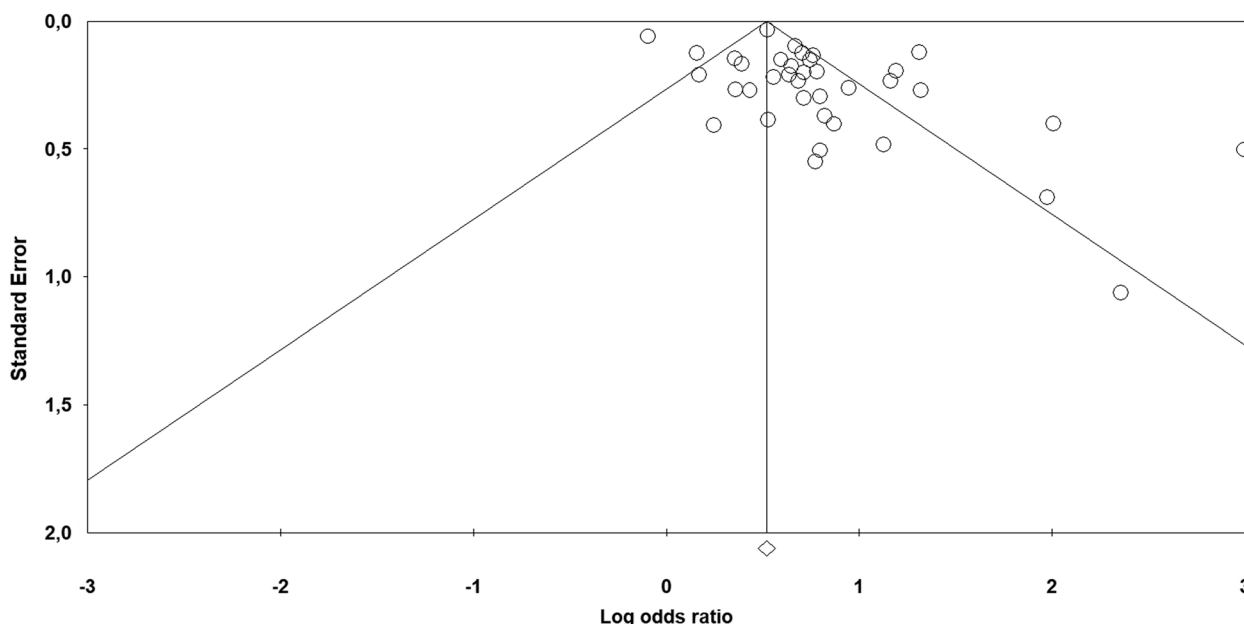


Fig. 3 Funnel plot of chronic pain in general

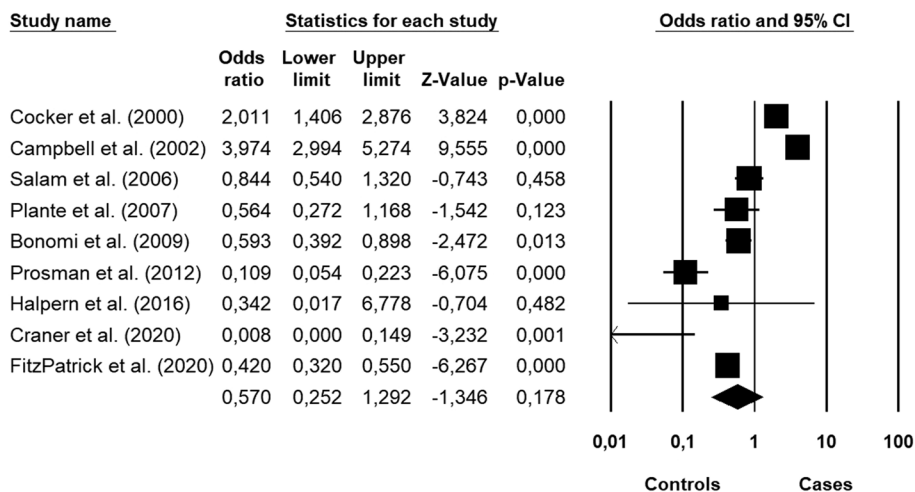


Fig. 4 Forest plot of the meta-analysis results about pelvic pain

and toxins and triggers complex inflammatory responses to fight them [106]. These processes could collectively weaken the body's natural defense mechanism against pain. Persistent pain can result from locally inflamed processes that respond maladaptively to systemic changes at the nervous, endocrine, and immune levels. Chronic pain can persist even after the affected tissues have healed, due to abnormal sensory processes [105]. Trauma, such as violence and abuse, can trigger the autonomic nervous system and the immune system, leading to an inflammatory response to nociceptive stimuli [107]. In addition,

inflammation can increase the risk of mental health problems by affecting the metabolism of neurotransmitters, and conversely, mental health issues can increase the risk of chronic pain [108].

The relationship between pain and violence could be complex; violence could be either a risk factor or a consequence, with a bidirectional relationship. It is difficult to determine which of the two causes the other because there are no longitudinal studies that track women before and after experiencing violence. At the moment it is only possible to show that the association between violence

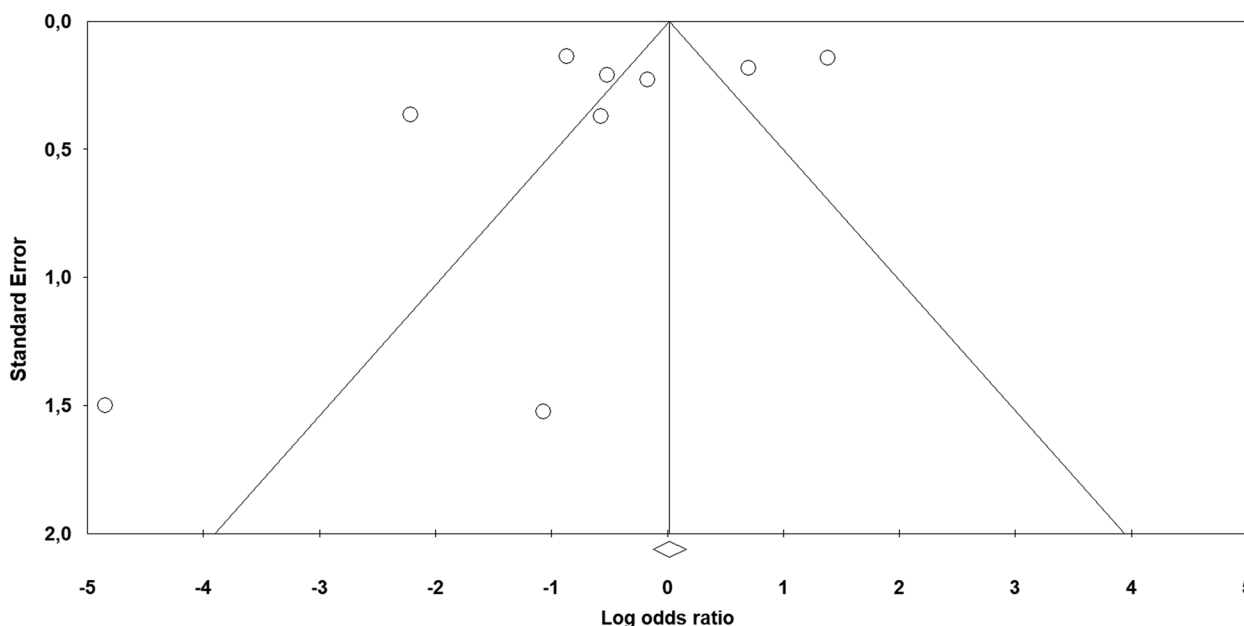


Fig. 5 Pelvic pain Funnel plot

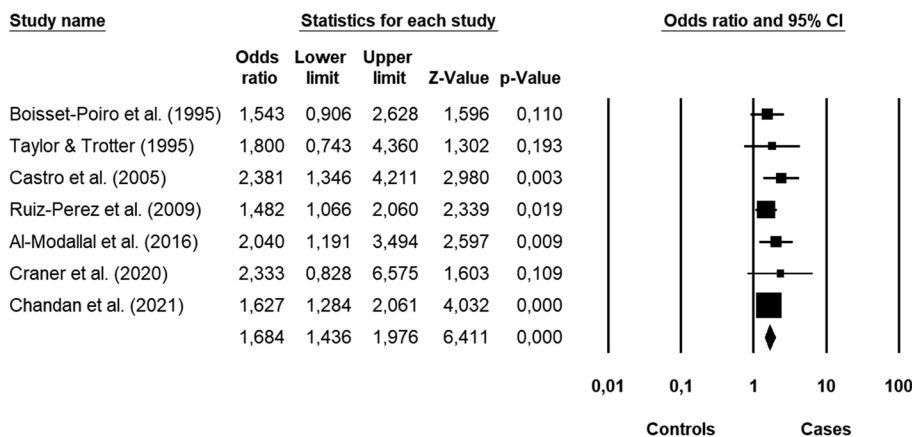


Fig. 6 Forest plot of the meta-analysis results about fibromyalgia

exposure and chronic pain exists and that it's statistically significant.

This review represents the most systematized evidence collection between violence and chronic pain, including some diagnoses not yet considered by previous reviews, and can also evaluate the two subcategories of pelvic pain and fibromyalgia. Unfortunately, the results of the subcategories are less consistent than the general results. This may be due to the few included studies for each category. When the diagnostic categories are combined the achieved results are significant; to obtain the same effects from subcategories it could be necessary to increase the number of studies that have evaluated them. However,

the fibromyalgia results show a positive and significant association, in line with the original hypothesis and previous studies [19, 29, 30].

The specific case of pelvic pain is controversial with some articles reporting an association with violence [27, 28] and others not [18, 109]. The first studies about gender violence and chronic pain initially considered only this subcategory but maybe we need to conduct further research on this aspect. Not only the small number of articles but also the study design may have influenced the results. A recent scoping review of Uvelli et al. [89] shows that for the genitourinary consequences of violence, it is possible to hypothesize a concomitance of biological and

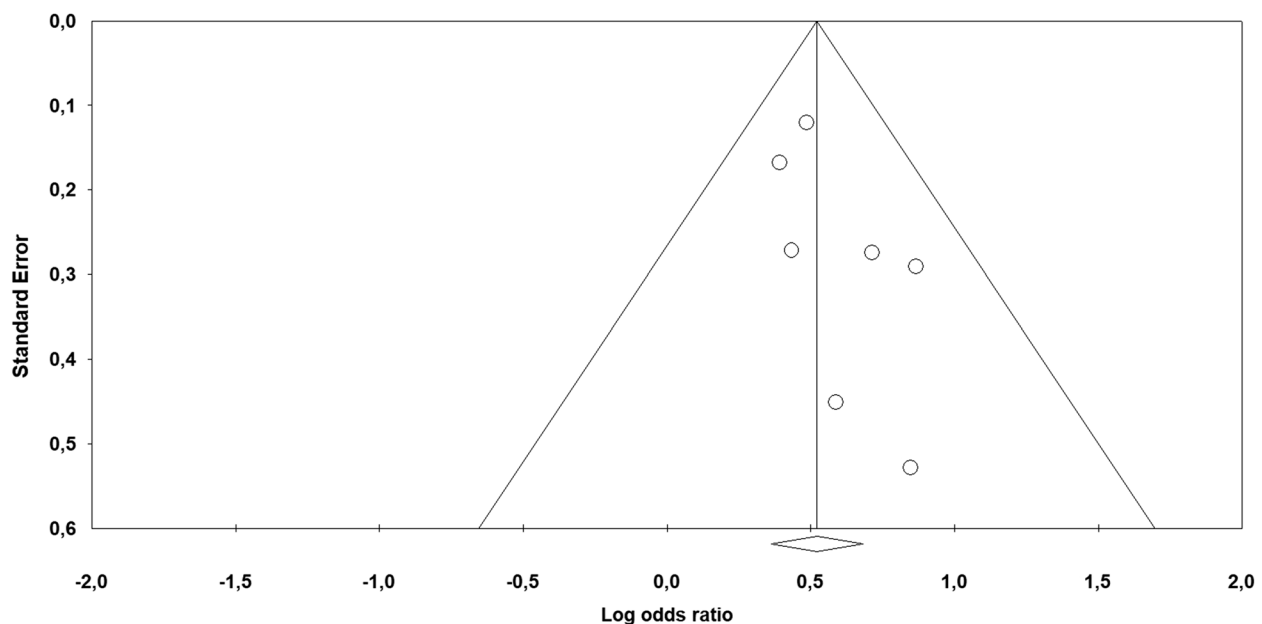


Fig. 7 Fibromyalgia funnel plot

psychological aspects involving life quality and personal characteristics components. On the one hand, there are biological infections; on the other hand, maybe there is sexual dissatisfaction, having first sexual intercourse at an age in which there are not adequate cognitive abilities to process the experience, and painful intercourse, which can be both infectious and traumatic. This concomitance of aspects requires us to study the category of pelvic pain more extensively which in the past was believed to be the exclusive consequence of sexual abuse while today it also appears to be the consequence of psychological abuse.

Limitations and potential bias

Our study has some limitations. Due to the unclear etiology and cause-effect relationship, it will be necessary to repeat a meta-analysis in the future when these data are available in the literature, in particular, when longitudinal studies are increased, and when there will be more clarity on which specific chronic pain diagnoses should be considered. In addition, the number of eligible studies was greater than the final number of included ones. Unfortunately, some important data was missing in the published version of these articles. Each first author was contacted by e-mail to gain missing data but no attempt was successful. Then, the chosen search strategy and the inclusion criteria may have been excluded from the analysis the paper from the Global South. Furthermore, the grey literature wasn't considered. Finally, some excluded terms, such as "violence against women", "sexual assault", and "trauma", could have detected other papers that could

be included. It's possible that publication bias was an issue, so the researchers looked into it to ensure the accuracy of their findings.

Despite the limitations, this review represents the first to examine the association between violence against women, in all its forms, and chronic pain, in most of its representations.

Conclusion

Gender violence is an underestimated public health problem but its consequences have serious short and long-term psychological and physical effects.

This review with meta-analysis shows strong associations between an adult history of violent victimization and chronic pain. This evidence should guide future studies on this type of association and be useful from a clinical point of view, not just a research one. Considering that many women don't refer their violence, each health-care professional working with chronic pain or in the emergency room should be careful and be prepared for these situations. Furthermore, the same attention should be paid by the health system in general, and by the institution to provide the correct path for these women.

Acknowledgements

Thanks to the "Area Ricerca, Biblioteche, Internazionalizzazione e Terza Missione" of the University of Siena for their contributions to the article.

Authors' contributions

AU and CR have been involved in conceptualization, formal analysis, methodology, data extraction, and data curation. FF has participated in data curation, formal analysis, and methodology software. GG and AC have participated in

conceptualization, and manuscript writing. All authors read and approved the final manuscript.

Funding

Not applicable.

Availability of data and materials

All data generated and analyzed during this study are included in this published article.

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

Received: 25 May 2023 Accepted: 16 April 2024

Published online: 04 June 2024

References

- Ellsberg M. Violence against women and the millennium development goals: facilitating women's access to support. *Int J Gynaecol Obstet*. 2006;94(3):325–32.
- United Nations. Declaration on the elimination of Violence Against Women. 1993. <https://digitallibrary.un.org/record/179739>.
- Barbier A, Chariot P, Lefevre T. Intimate partner violence against ever-partnered women in Europe: prevalence and associated factors—results from the violence against women EU-wide survey. *Front Public Health*. 2022;10:1033465.
- World Health Organization. World report on violence and health. 2002. <https://www.who.int/publications/i/item/9241545615>.
- García-Moreno C, Jansen HA, Ellsberg M, Heise L, Watts CH. Prevalence of intimate partner violence: findings from the WHO multicountry study on women's health and domestic violence. *Lancet*. 2006;368(9543):1260–9.
- CDC. Centers for Disease Control and Prevention Fast Facts: Preventing Intimate Partner Violence. 2021. <https://www.cdc.gov/violenceprevention/intimatepartnerviolence/fastfact.html>.
- Cirici AR, Soler AR, Cobo J, Soldevilla AJM. Psychological consequences and daily life adjustment for victims of intimate partner violence. *Int J Psychiatry Med*. 2023;58:6–19.
- Plichta S. The effects of woman abuse on health care utilization and health status: a literature review. *Women Health Issues*. 1992;2(3):154–63.
- Scholle SH, Rost KM, Golding JM. Physical abuse among depressed women. *J Gen Intern Med*. 1998;13(9):607–13.
- Stewart DE, Vigod SN. Update on mental health aspect of intimate partner violence. *Med Clin N Am*. 2019;103(4):735–49.
- Koss MP, Koss PG, Woodruff WJ. Deleterious effects of criminal victimization on women's health and medical utilization. *Arch Intern Med*. 1991;151(2):342–7.
- Pikarinen U, Saisto T, Schei B, Swahnberg K, Halmesmaki E. Experiences of physical and sexual abuse and their implications for current health. *Obstet Gynecol*. 2007;109(5):1116–22.
- Goldblatt H, Granot M. Domestic violence among Druze women in Israel as reflected by health status and somatization level. *Women Health*. 2008;42(3):19–36.
- Onur OS, Cesur E, Donmezler FG, Aydin FY, Vural M, Guru M. Evaluation of partner violence in female patients with fibromyalgia syndrome. *Med J Bakirkoy*. 2020;16(2):190–6.
- Rometsch C, Mansueto G, Maas Genannt Bempuhl F, Martin A, Cosci F. Prevalence of functional disorders across Europe: a systematic review and meta-analysis. *Eur J Epidemiol*. 2024. <https://doi.org/10.1007/s10654-024-01109-5>.
- Xuan Thanh N, Lopatina E, Montgomery LS, Rober M, Tanguay RL, Wasylak T. Treated versus self-reported prevalence of chronic pain and costs of patients' health services utilization: a population-based study of health administrative databases. *Br J Pain*. 2024;18(2):166–75.
- Yong RJ, Mullins P, Bhattacharyya N. Prevalence of chronic pain among adults in the United States. *Pain*. 2022;163(2):e328–32.
- As-Sanie S, Clevenger LA, Geisser ME, Williams DA, Roth RS. History of abuse and its relationship to pain experience and depression in women with chronic pelvic pain. *Am J Obstet Gynecol*. 2014;210(317):1–8.
- Gunduz N, Erzican E, Polat A. The relationship of intimate partner violence with psychiatric disorders and severity of pain among female patients with fibromyalgia. *Arch Rheumatol*. 2019;34(3):245–52.
- Ringel Y, Whitehead WE, Toner BB, Diamant NE, Hu Y, Jia H, et al. Sexual and physical abuse are not associated with rectal hypersensitivity in patients with irritable bowel syndrome. *Gut*. 2004;53(6):838–42.
- Bo M, Canavese A, Magnano L, Rondana A, Castagna P, Gino S. Violence against pregnant women in the experience of the rape centre of Turin: clinical and forensic evaluation. *J Forensic Leg Med*. 2020;20(76):102071.
- Progiante PS, Ficht DM, Lemos MS, Grossi PK, Grossi ML. Prevalence of temporomandibular disorders and orofacial pain in battered women in Brazilian shelters. *Revista Odonto Ciencia*. 2011;26(3):227–31.
- Johnson KM, Bradley KA, Bush K, Gardella C, Dobie JC, Laya MB. Frequency of mastalgia among women veterans. *J Gen Intern Med*. 2006;21:570–5.
- Cripe SM, Sanchez SE, Gelaye B, Sanchez E, Williams MA. Association between intimate partner violence, migraine and probable migraine. *Headache*. 2011;51(2):208–19.
- Vives-Cases C, Ruiz-Cantero MT, Escriba-Aguir V, Miralles JJ. The effect of intimate partner violence and other forms of violence against women on health. *J Public Health (Oxf)*. 2011;33(1):15–21.
- Shields LB, Corey TS, Weakley-Jones B, Stewart A. Living victims of strangulation: a 10-year review of cases in a metropolitan community. *Am J Forensic Med Pathol*. 2010;31(4):320–5.
- Ross WT, Snyder B, Stuckey H, Ross IR, McCall-Hosenfeld J, Harkins GJ, et al. Gynaecological care of women with chronic pelvic pain: patient perspectives and care preferences. *BJOG*. 2022;00:1–9.
- Coker AL. Does physical intimate partner violence affect sexual health? A systematic review. *Trauma Violence Abuse*. 2007;8(2):149–77.
- Gardoki-Souto I, Redolar-Ripoll D, Fontana M, Hogg B, Castro MJ, Blanch JM, et al. Prevalence and characterization of psychological trauma in patients with fibromyalgia: a cross-sectional study. *Pain Res Manag*. 2022;2022:2114451.
- Afari N, Ahumada SM, Wright LJ, Mostoufi S, Golnari G, Reis V, et al. Psychological trauma and functional somatic syndromes: a systematic review and meta-analysis. *Psychosom Med*. 2014;76(1):2–11.
- Palsdottir VH, Jonsdottir T, Oskarsson GK. Adult chronic pain in relation to psychological trauma in childhood. *Laeknabladid*. 2023;109(2):67–73.
- Bussieres A, Hartvigsen J, Ferreira ML, Ferreira PH, Hancock MJ, Stone LS, et al. Adverse childhood experience and adult persistent pain and disability: protocol for a systematic review and meta-analysis. *Syst Rev*. 2020;9(1):215.
- Li DJ, Chen MH, Bai YM, Tsai SJ, Cheng CM, Su TP, et al. Parental post-traumatic stress disorder and increased risk of chronic pain conditions and major psychiatric disorders in their offspring. *Gen Hosp Psychiatry*. 2022;79:152–7.
- Pacella ML, Hruska B, Delahanty DL. The physical health consequences of PTSD and PTSD symptoms: a meta-analytic review. *J Anxiety Disord*. 2013;27(1):33–46.
- Loxton D, Dolja-Gore X, Anderson AE, Townsend N. Intimate partner violence adversely impacts health over 16 years and across generations: a longitudinal cohort study. *PLoS One*. 2017;12(6):e0178138.
- Morris MC, Bailey B, Ruiz E. Pain in the acute aftermath of stalking: associations with posttraumatic stress symptoms, depressive symptoms, and posttraumatic cognitions. *Violence Against Women*. 2020;26(11):1343–61.

37. Lannon E, Sanchez-Saez F, Bailey B, Hellman N, Kinney K, Williams A, et al. Predicting pain among female survivors of recent interpersonal violence: a proof-of-concept machine-learning approach. *PLoS One*. 2021;16:e0255277.
38. Fisher BS, Regan SL. The extent and frequency of abuse in the lives of older women and their relationship with health outcomes. *Gerontologist*. 2006;46(2):200–9.
39. Hu JC, Link CL, McNaughton-Collins M, Barry MJ, McKinlay JB. The association of abuse and symptoms suggestive of chronic prostatitis/chronic pelvic pain syndrome: results from the Boston area community health survey. *J Gen Intern Med*. 2007;22(11):1532–7.
40. Peters KM, Kalinowski SE, Carrico DJ, Ibrahim IA, Diokno AC. Fact or fiction-is abuse prevalent in patients with interstitial cystitis? Results from a community survey and clinic population. *J Urol*. 2007;178(3):891–5.
41. Saito A, Creedy D, Cooke M, Chaboyer W. Effect of intimate partner violence on antenatal functional health status of childbearing women in northeastern Thailand. *Health Care Women Int*. 2013;34(9):757–74.
42. Friberg O, Emaus N, Rosenvinge JH, Bilden U, Olsen JA, Pettersen G. Violence affects physical and mental health differently: the general population based Tromsø study. *PLoS One*. 2015;10(8):e0136588.
43. Gibson C, Lisha NE, Walter LC, Huang AJ. Interpersonal trauma and aging-related genitourinary dysfunction in a national sample of older women. *Am J Obstet Gynecol*. 2019;220(94):1–7.
44. Riedl D, Beck T, Exenberger S, Daniels J, Dejado D, Unterberger I, et al. Violence from childhood to adulthood: the influence of child victimization and domestic violence on physical health in later life. *J Psychosom Res*. 2019;116:68–74.
45. Engel GL. The need for a new medical model: a challenge for biomedicine. *Science*. 1977;196(4286):129–36.
46. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ*. 2021;372:71.
47. Higgins JPT & Green S. *Cochrane handbook for systematic reviews of interventions* version 5.1.0. The Cochrane Collaboration. 2011. www.cochranehandbook.org.
48. Horsley S, Dingwall O, Sampson M. Checking reference lists to find additional studies for systematic reviews. *Cochrane Database Syst Rev*. 2011;8:MR000026.
49. Beynon R, Leeflang MMG, McDonald S, Eisinga A, Mitchell RL, Whiting P, et al. Search strategies to identify diagnostic accuracy studies in MEDLINE and EMBASE. *Cochrane Database Syst Rev*. 2013;9:00022.
50. Moola S, Munn Z, Tufanaru C, Aromataris E, Sears K, Sfet C. Systematic reviews of etiology and risk. In: Aromataris E, Munn Z (Editors). *JBI Manual for Evidence Synthesis*. JBI; 2020. <https://synthesismanual.jbi.global>.
51. Borenstein M, Hedges LV, Higgins JPT, Rothstein HR. A basic introduction to fixed-effect and random-effects models for meta-analysis. *Res Synth Methods*. 2010;1(2):97–111.
52. Higgins JP, Thompson SG. Quantifying heterogeneity in a meta-analysis. *Stat Med*. 2002;21(11):1539–58.
53. Hedges LV. Distribution theory for Glass's estimator of effect size and related estimators. *J Educ Stat*. 1981;6(2):107–28.
54. Borenstein M, Hedges LV, Higgins PT, Rothstein HR. *Introduction to meta-analysis*. Chichester: John Wiley & Sons; 2009.
55. Talley NJ, Fett SL, Zinsmeister AR, Melton J. Gastrointestinal tract symptoms and self-reported abuse: a population-based study. *Gastroenterology*. 1994;107(4):1040–9.
56. Boisset-Pioro MH, Esdaile JM, Fitzcharles MA. Sexual and physical abuse in women with fibromyalgia syndrome. *Arthritis Rheum*. 1995;38(2):235–41.
57. Taylor ML, Trotter DR, Csuka ME. The prevalence of sexual abuse in women with fibromyalgia. *Arthritis Rheum*. 1995;38(2):229–34.
58. Letourneau EJ, Holmes M, Chasedunn-Roark MD. Gynecologic health consequences to victims of interpersonal violence. *Women's Health Issues*. 1999;9(2):115–20.
59. Coker AL, Smith PH, Bethea L, King MR, McKeown RE. Physical health consequences of physical and psychological intimate partner violence. *Arch Fam Med*. 2000;9(5):451–7.
60. Dienemann J, Boyle E, Baker D, Resnick W, Wiederhorn N, Campbell J. Intimate partner abuse among women diagnosed with depression. *Issues Ment Health Nurs*. 2000;21(5):499–513.
61. Lown EA, Vega WA. Intimate partner violence and health: self-assessed health, chronic health, and somatic symptoms among Mexican American women. *Psychosom Med*. 2001;63(3):352–60.
62. Weinbaum Z, Stratton TL, Chavez G, Motylewski-Link C, Barrera N, Courtney JG. Female victims of intimate partner physical domestic violence (IPV-DV), California 1998. *Am J Prev Med*. 2001;21(4):313–9.
63. Campbell J, Jones AS, Dienemann J, Kub J, Schollenberger J, O'Campo P, et al. Intimate partner violence and physical health consequences. *Arch Intern Med*. 2002;162(10):1157–63.
64. Kramer A, Darcy L, George M. Prevalence of intimate partner violence and health implications for women using emergency departments and primary care clinics. *Women's Health Issues*. 2004;14(1):19–29.
65. John R, Johnson JK, Kukreja S, Found M, Lindow SW. Domestic violence: prevalence and association with gynecological symptoms. *BJOG*. 2004;111(10):1128–32.
66. Castro I, Barrantes F, Tuna M, Cabrera G, Garcia C, Recinos M, et al. Prevalence of abuse in fibromyalgia and other rheumatic disorders at a specialized clinic in rheumatic diseases in Guatemala City. *J Clin Rheumatol*. 2005;11(3):140–5.
67. Coker AL, Smith PH, Fadden MK. Intimate partner violence and disabilities among women attending family practice clinics. *J Women's Health*. 2005;14(9):829–38.
68. Salam A, Alim A, Noguchi T. Spousal abuse against women and its consequences on reproductive health: a study in the urban slums in Bangladesh. *Matern Child Health J*. 2006;10(1):83–94.
69. Plante AF, Kamm MA. Life events in patients with vulvodynia. *BJOG*. 2008;115(4):509–14.
70. Ellsberg M, Jansen HAFM, Heise L, Watts CH, Garcia-Moreno C. WHO multi-country study on women's health and domestic violence against women study team. Intimate partner violence and women's physical and mental health in the WHO multi-country study on women's health and domestic violence: an observational study. *Lancet*. 2008;371(9619):1165–72.
71. Kendall-Tackett K, Marshall R, Ness K. Chronic pain syndromes and violence against women. *Women Ther*. 2008;26(1–2):45–56.
72. Bonomi AE, Anderson ML, Reid RJ, Rivara FP, Carrell D, Thompson RS. Medical and psychosocial diagnoses in women with a history of intimate partner violence. *Arch Intern Med*. 2009;169(18):1692–5.
73. Ruiz-Perez I, Plazaola-Castano J, Caliz-Caliz R, Rodriguez-Calvo I, Garcia-Sanchez A, Ferrer-Gonzalez MA, et al. Risk factors for fibromyalgia: the role of violence against women. *Clin Rheumatol*. 2009;28:777–86.
74. Vung ND, Ostergren P, Krantz G. Intimate partner violence against women, health effects and health care seeking in rural Vietnam. *Eur J Pub Health*. 2009;19(2):178–82.
75. Becker-Dreps S, Morgan D, Pena R, Cortes L, Martin CF, Valladares E. Association between intimate partner violence and irritable bowel syndrome: a population-based study in Nicaragua. *Violence Against Women*. 2010;16(7):832–45.
76. Prosmann G, Lo Fo Wong SH, Bulte E, Lagro-Janssen ALM. Healthcare utilization by abused women: a case-control study. *Eur J Gen Pract*. 2012;18(2):107–13.
77. Eldoseri HM, Tufts KA, Zhang Q, Fisch JN. Adverse health effect of spousal violence among women attending Saudi Arabian primary health-care clinics. *East Mediterr Health J*. 2014;20(11):717–25.
78. Al-Modallal H. Effect of intimate partner violence on health of women of Palestinian origin. *Int Nurs Rev*. 2016;63:259–66.
79. Halpern L, Cho R, Rogers J, Padron V, Isaza S, Southerland J, et al. The impact of intimate partner violence exposure on orofacial and stress-related health consequences in female patients. *Violence Gend*. 2016;3(4):181–8.
80. Lacey KK & Mouzon DM. Severe physical intimate partner violence and the mental and physical health of U.S. Caribbean black women. *J Women's Health*. 2016. <https://doi.org/10.1089/jwh.2015.5293>.
81. Ford JD, Grasso DJ, Jones S, Works T, Andemariam B. Interpersonal violence exposure and chronic pain in adult sickle cell. *J Interpers Violence*. 2017;35(3–4):924–42.
82. Iverson KM, Sayer NA, Meterko M, Stolzmann K, Suri P, Gormley K, et al. Intimate partner violence among female OEF/OIF/OND veterans who were evaluated for traumatic brain injury in the veterans health administration: a preliminary investigation. *J Interpers Violence*. 2017;35(13–14):2422–45.

83. Campbell JC, Anderson JC, McFadgion A, Gill J, Zink E, Patch M, et al. The effects of intimate partner violence and probable traumatic brain injury on central nervous system symptoms. *J Women's Health*. 2018;27(6):761–7.
84. Chandan J, Thomas T, Bradbury-Jones C, Taylor J, Bandyopadhyay S, Nirantharakumar K. Intimate partner violence and temporomandibular joint disorder. *J Dent*. 2019;82:98–100.
85. Craner JR, Lake ES, Bancroft KE, Hanson KM. Partner abuse among treatment-seeking individuals with chronic pain: prevalence, characteristics, and association with pain-related outcomes. *Pain Med*. 2020;21(11):2789–98.
86. FitzPatrick KM, Brown S, Hegarty K, Mensah F, Gartland D. Physical and emotional intimate partner violence and women's health in the first year after childbirth: an Australian pregnancy cohort study. *J Interpersonal Violence*. 2020. <https://doi.org/10.1177/0886260520934426>.
87. Chandan JS, Thomas T, Raza K, Bradbury-Jones C, Taylor J, Bandyopadhyay S, et al. Intimate partner violence and the risk of developing fibromyalgia and chronic fatigue syndrome. *J Interpersonal Violence*. 2021;36(21–22):NP12279–98.
88. Trivedi M, Dumkrieger G, Chong CD, Dodick DW, Schwedt TJ. Impact of abuse on migraine-related sensory hypersensitivity symptoms: results from the American registry for migraine research. *Headache*. 2021;61(5):740–54.
89. Uvelli A, Duranti C, Salvo G, Coluccia A, Gualtieri G, Ferretti F. The risk factors of chronic pain in victims of violence: a scoping review. *Healthcare*. 2023;11(17):2421.
90. Ford-Gilboe M, Varcoe C, Wuest J, Campbell J, Pajot M, Heslop L, Perrin N. Trajectories of depression, post-traumatic stress, and chronic pain among women who have separated from an abusive partner: a longitudinal analysis. *J Interpersonal Violence*. 2022;38(1–2):NP1540–68.
91. Carroll LJ, Cassidy JD, Cote P. Factors associated with the onset of an episode of depressive symptoms in the general population. *J Clin Epidemiol*. 2023;56:651–8.
92. Currie SR, Wang J. Chronic back pain and major depression in the general Canadian population. *Pain*. 2004;107:54–60.
93. Carroll LJ, Cassidy JD, Cote P. Depression as a risk factor for onset of an episode of troublesome neck and low back pain. *Pain*. 2004;107:134–9.
94. Currie SR, Wang J. More data on major depression as an antecedent risk factors for first onset of chronic back pain. *Psychol Med*. 2005;35:1275–82.
95. Von Korff M, Crane P, Lane M, Miglioretti DL, Simon G, Saunders K, Stang P, Brandenburg N, Kessler R. Chronic spinal pain and physical-mental comorbidity in the United States: results from the national comorbidity survey replication. *Pain*. 2005;113:331–9.
96. Stang PE, Brandenburg NA, Lane MC, Merikangas KR, Von Korff MR, Kessler RC. Mental and physical comorbid conditions and days in role among persons with arthritis. *Psychosom Med*. 2006;68:152–8.
97. Demyttenaere K, Bruffaerts R, Lee S, Posada-Villa J, Kovess V, Angermeyer MC, Levinson D, de Girolamo G, Nakane H, Mneimneh Z, et al. Mental disorders among person with chronic back or neck pain: Results from the World Mental Health Survey. *Pain*. 2007;129:332–42.
98. Arnold LM, Hudson JI, Keck PE, Auchenbach MB, Javaras KN, Hess EV. Comorbidity of fibromyalgia and psychiatric disorders. *J Clin Psychiatry*. 2006;67:1219–25.
99. Zhao Y, Liu J, Zhao Y, Thethi T, Fonseca V, Shi L. Predictors of duloxetine versus other treatments among veterans with diabetic peripheral neuropathic pain: a retrospective study. *Pain Pract*. 2012;12:366–73.
100. Alonso-Moran E, Orueta JF, Fraile Esteban JI, Arteagoitia Axpe JM, Marques Gonzalez ML, Toro Polanco N, et al. The prevalence of diabetes-related complications and multimorbidity in the population with type 2 diabetes mellitus in the Basque Country. *BMC Public Health*. 2014;14:1059.
101. Cheatle MD, Wasser T, Foster C, Olugbodi A, Bryan J. Prevalence of suicidal ideation in patients with chronic non-cancer pain referred to a behaviorally based pain program. *Pain Physician*. 2014;17:E359–67.
102. Trinanès Y, Gonzalez-Villar A, Gomez-Peretta C, Carrillo-de-la-Pena MT. Suicidality in chronic pain: Predictors of suicidal ideation in fibromyalgia. *Pain Pract*. 2015;15:323–32.
103. Melzack R. Phantom limbs and the concept of a neuromatrix. *Trend Neurosci*. 1990;13:88–92.
104. Baliki MN, Apkarian AV. Nociception, pain, negative moods, and behavior selection. *Neuron*. 2015;87:474–91.
105. Chapman CR, Tuckett RP, Woo SC. Pain and stress in system perspective: reciprocal neural, endocrine and immune interactions. *J Pain*. 2008;9:122–45.
106. Blalock JE. The syntax of immune-neuroendocrine communication. *Immunol Today*. 1994;15:504–11.
107. Moreno-Ramos OA, Lating MC, Barrios AFG. Modeling of the hypothalamic-pituitary-adrenal axis-mediated interaction between the serotonin regulation pathway and the stress response using a Boolean Approximation: a novel study of depression. *Theor Biol Med Model*. 2013;10:59.
108. Kendall-Tackett K, Marshall AR, Ness E. Victimization, healthcare use, and health maintenance. *Fam Viol Sex Assault Bull*. 2000;16:18–21.
109. Dalton VK, Haifner HK, Reed BD, Senapati S, Cook A. Victimization in patients with vulvar dysesthesia/vestibulodynia. *J Reprod Med*. 2002;47:829–34.

Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.