Neuropsychiatr (2022) 36:69–88
https://doi.org/10.1007/s40211-022-00411-6

neuro-
psychiatrie
vereinigt mit
psychiatrie & psychotherapie

Global prevalence of anxiety and PTSD in immigrants: a systematic review and meta-analysis

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Received: 25 August 2021 / Accepted: 9 January 2022 / Published online: 11 February 2022

Summary
Background A systematic and meta-analysis of the prevalence of anxiety and posttraumatic stress disorder (PTSD) in immigrants was conducted.
Methods Based on the keywords, scientific databases were systematically searched to identify articles. The search included the three databases PubMed, Google Scholar and Research Gate until June 2020. The analysis was performed to assess the prevalence of anxiety and PTSD; subgroups were examined based on anxiety disorders.
Results The prevalence of agoraphobia, PTSD, generalized anxiety disorder (GAD), panic disorder, obsessive–compulsive disorder (OCD), social phobia and specific phobia were 4, 25, 9, 4, 3, 5 and 8%, respectively.
Conclusions Considering the findings of the present study regarding the significant prevalence of anxiety and PTSD in the immigrant population, it is necessary to pay special attention to the mental health of this population.

Keywords Agoraphobia · Post-traumatic stress disorder · Generalized anxiety disorder · Panic disorder · Obsessive-compulsive disorder

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Globale Prävalenz von Angst und PTSD bei Migranten: systematischer Review und Metaanalyse

Zusammenfassung
Grundlagen Wir haben eine systematische Metaanalyse zur Prävalenz von Angstzuständen („anxiety“) und posttraumatischen Belastungsstörungen (PTSD) bei Migranten durchgeführt.
Methodik Anhand von Schlüsselbegriffen wurden in wissenschaftlichen Datenbanken systematisch Artikel identifiziert. Die Suche umfasste die 3 Datenbanken PubMed, Google Scholar und Research Gate bis Juni 2020. Die Analyse wurde durchgeführt, um die Prävalenz von Angstzuständen und PTSD zu bewerten; Subgruppen wurden auf der Grundlage von Angststörungen untersucht.
Ergebnisse Die Prävalenzwerte für Agoraphobie, PTSD, generalisierte Angststörung (GAD), Panikstörung, Zwangsstörung (OCD), soziale Phobie und spezifische Phobie lagen bei 4, 25, 9, 4, 3, 5 bzw. 8%.
Schlussfolgerungen Angesichts der Ergebnisse der vorliegenden Studie zur signifikanten Prävalenz von Angstzuständen und PTSD unter Migranten ist es notwendig, der psychischen Gesundheit dieser Bevölkerungsgruppe besondere Aufmerksamkeit zu widmen.

Schlüsselwörter Agoraphobie · Posttraumatische Belastungsstörung · Generalisierte Angststörung · Panikstörung · Zwangsstörung

Introduction

Anxiety disorders are the most common type of psychiatric illness [1, 2]. According to a report in 2013, one in nine people in the world has had an anxiety disorder in the past 12 months [3]. In the general population, the estimated current prevalence of anx-

iety was between 0.9 and 28.3% and past-year prevalence was between 2.4 and 29.8% [3]. According to Burden of Diseases (GBD), anxiety plays a major role in global burden [4]. Anxiety is associated with several risk factors, including stroke [5] and diabetes [6]. Another factor in anxiety disorder is immigrant status [7].

Migration is the process by which a person moves from one culture to another for a long time [8]. In recent decades, the immigrant population has increasingly grown and the economic and social factors have influenced this trend [9, 10]. The United Nations estimates that there were about 195 million immigrants in the world in 2005 and about 10.4 million international refugees had been reported by the end of 2011 [11, 12]. A new study shows that there are about one billion immigrant populations in the world [13]. Most immigrants live in European countries and Asia and North America were in second and third places which go from developing countries to developed countries [8, 14]. Immigrant populations are exposed to higher levels of physical and mental illness [15, 16].

Because immigration affects different aspects of mental health, studies have examined mental health problems in the immigrant population, including mental illness [17–19], depression [20], mood, and anxiety disorders [21, 22], psychotic disorders [23] and posttraumatic stress disorder [24]. Extensive studies have examined the dimensions of mental health in the immigrant population and studies have looked at the prevalence of mental disorders in this population, as mentioned in the previous section. A recently published meta-analysis study examined suicide among immigrants and refugees [25]. According to that study, the prevalence of suicidal ideation is 16%, and the prevalence of suicide attempts and suicide plans is 6 and 4%, respectively [25]. A study of research history shows that despite the high prevalence of anxiety disorders, less attention has been paid to this category of mental illness. The only meta-analysis study that looked at the prevalence of anxiety in the immigrant population was in 2009 [7]. That study included 19 studies in a meta-analysis and the prevalence of anxiety was 28% and the prevalence of posttraumatic stress disorder (PTSD) was 47% [7].

Studies have examined health-related dimensions in the immigrant population and valuable insights have been provided in this field [25–27], and meta-analytical studies in this field have been able to examine the prevalence of some mental health problems, including suicide [25]. But anxiety disorders, as the most common mental health problem, need further investigation [28]. The purpose of this research is to study the prevalence of anxiety in the world's immigrant population.

Methods

The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) [29] protocol was used to perform this research. MeSH (Medical Subject Headings) keywords were extracted and their syntax is available in the Appendix, Table 3. Based on these keywords, scientific databases were systematically searched to collect articles. The search included three databases, PubMed, Google Scholar and, Research Gate, and articles in these indexes were collected until June 2020. Manual search also included reviewing related article references to increase the scope of article retrieval.

Inclusion and exclusion

The target population in the study comprised immigrants, i.e., individuals who had immigrated to another country. These included labor immigration, refugees, and asylum seekers. The psychological event for study in this population was anxiety and posttraumatic stress disorder. Anxiety included any type of anxiety disorder, including generalized anxiety, panic, social phobia, agoraphobia, obsessive–compulsive disorder, and specific phobia. The age range was considered to be at least 14 years. Populations that had been faced with severe psychological trauma were not eligible. Immigrants with physical illnesses as well as a woman during pregnancy and postpartum were not eligible. A population of fewer than 100 people, as well as studies that did not report enough information to calculate the prevalence, were not eligible. Studies with mixed outcomes were not eligible nor were studies with the same database and editorial articles.

Data extraction

As shown in Table 1, a collection of detailed information was extracted from each of the eligible articles. The following information were recoreded: the authors of the article, the country in which the immigrants lived, the type of immigration, the study design, age and sex, the sample size included in the analysis, the type of anxiety and its scale of measurement, and finally the statistical results.

Qualitative measure

In measuring the quality of those studies that met the inclusion criteria of the study, three adjusted dimensions of EPHPP [30, 31] were used.

Statistical analysis

The data extracted from each of the articles are listed in Table 1. In studies where there were several subgroups for each type of anxiety, these subgroups were pooled together and the pooled number was used. An

Table 1 Data extracted from articles

Authors and year	Country	Population	Age	Sex and percent	Included Sample	Anxiety Measure	Anxiety Classification	Quality assessment			Results	Adjustment for other covariates
								Selection	Data collection method	Withdrawals and dropouts		
Aglipay 2013 [34]	Canada	Immigrant	≥18	55% women	17,308	Single question	Any anxiety	Low	High	Low	17,308 (631)	Unadjusted
Alegria 2008 [35]	USA	Immigrant	≥18	Both	6776	Composite International Diagnostic Interview	Any anxiety	Low	Low	Low	Any anxiety 6776 (1713) Agoraphobia without panic 6776 (262) Panic disorder 6776 (352) GAD 6776 (537) Social phobia 6776 (879) PTSD 6776 (516)	Age, Gender, education, income
Alexander 2013 [36]	Tibet	Refugees	≥16	Both	192	Beck's Anxiety Inventory	Anxiety symptoms	High	Moderate	High	192 (57)	Unadjusted
Allden 1996 [37]	Thailand	Refugees	≥15	15.4% women	104	Hopkins Symptom Checklist-25 Harvard Trauma Questionnaire	PTSD	High	Moderate	Moderate	Total 104 (24) Men 88 (17) Women 16 (7)	Unadjusted
Alpak 2015 [38]	Turkey	Refugees	18–65	49.1% women	352	Diagnostic psychiatric interview	PTSD	Moderate	Low	Low	352 (118)	Unadjusted
Berthold 2014 [39]	USA	Refugees	≥32	61% women	136	Yes/no questions	PTSD	Moderate	High	Low	136 (7)	Unadjusted
Beutel 2016 [40]	Germany	Immigrant	35–74	46.8% women	3525	Generalized Anxiety Disorder [GAD]-7 Scale Mini-Social Phobia Inventory Patient Health Questionnaire	Generalized anxiety disorder Panic attack Social phobia	Low	Moderate	Low	GAD First generation 1425 (135) Second generation 1918 (123) Panic attack First generation 1393 (116) Second generation 1869 (90) Social phobia First generation 1418 (65) Second generation 1918 (65)	Unadjusted

Table 1 (Continued)

Authors and year	Country	Population	Age	Sex and percent	Included Sample	Anxiety Measure	Anxiety Classification	Quality assessment			Results	Adjustment for other covariates
								Selection	Data collection method	Withdrawals and dropouts		
Bhui 2006 [41]	UK	Refugees	≥18	50.3% women	143	Mini Neuropsychiatric Interview	OCD, GAD, PTSD	High	Moderate	Low	Panic 143 (9) panic and agoraphobia 143 (2) Agoraphobia 143 (16) OCD 143 (2) GAD 141 (1) PTSD 143 (20)	Unadjusted
Blair 2000 [42]	USA	Refugees	18–76	60.5% women	124	Diagnostic Interview Schedule	PTSD	High	Low	Moderate	124 (56)	Unadjusted
Bogic 2012 [43]	Germany, Italy, UK	Refugees	18–65	51.3% women	854	Mini International Neuro-psychiatric Interview	Any anxiety	Low	Low	Low	Any anxiety 854 (373) Panic disorder 851 (85) Panic disorder with agoraphobia 852 (57) Agoraphobia without panic disorder 853 (70) Social phobia 854 (55) Obsessive–compulsive disorder 854 (41) PTSD 854 (283) GAD 854 (74)	Unadjusted
Brink 2015 [44]	USA	Refugees	18–80	70% women	180	Structured Clinical Interview	PTSD	Moderate	Low	Low	180 (14)	Unadjusted
Sánchez 2014 [92]	USA	Immigrant	≥18	58% women	250	Self-reported	Anxiety	Moderate	High	Low	Total 250 (116) Men 102 (42) Women 145 (74)	Unadjusted

Table 1 (Continued)

Authors and year	Country	Population	Age	Sex and percent	Included Sample	Anxiety Measure	Anxiety Classification	Quality assessment			Results	Adjustment for other covariates
								Selection	Data collection method	Withdrawals and dropouts		
Carta 2002 [45]	France	Immigrant	≥18	50% women	153	Composite International Diagnostic Interview	Generalized anxiety, Panic and social phobia	High	Low	Moderate	6-month GAD 153 (9) Panic 153 (2) Social phobia 153 (1) Lifetime prevalence GAD 153 (20) Panic 153 (4) Social phobia\ 153 (4)	Age, sex
Carta 2018 [46]	Burkina Faso	Refugees	Unknown	Both	128	PTSD Screening Scale	PTSD	High	Moderate	High	128 (86)	Unadjusted
Chen 2017 [47]	Australia	Immigrant	35.5 ± 13.9	46% women	2287	Kessler Screening Scale Posttraumatic Stress Disorder	PTSD	Low	Moderate	Low	2287 (762)	Unadjusted
Cheung 1994 [48]	New Zealand	Refugees	≥18	53.4% women	223	Diagnostic Interview Schedule	PTSD	Moderate	Low	Low	223 (27)	Unadjusted
Chung 2018 [49]	Turkey and Sweden	Refugees	≥18	Both	1197	The Harvard Trauma Questionnaire	PTSD	Low	Moderate	Low	1197 (520)	Unadjusted
Cleveland 2013 [50]	Canada	Asylum Seekers	Mean >31	39.2% women	186	Hopkins Symptoms Checklist	Anxiety PTSD	Moderate	Moderate	Low	Anxiety 186 (108) PTSD 186 (51)	Unadjusted
Davison 2020 [51]	Canada	Immigrant	45–85	46.1% women	4733	Yes/no question	Anxiety	Low	High	Low	4733 (279)	Unadjusted
Lucia 2010 [74]	Italy	Immigrant	14–24	52.5% women	305	Hopkins Symptom Checklist	Anxiety	Moderate	Moderate	Low	Total 305 (61) Men 140 (22) Women 165 (39)	Unadjusted
Dietrich 2019 [53]	Germany	Refugees	18–25	12.6% women	175	Short Screening Scale for Posttraumatic Stress Disorder Essen Trauma Inventory	PTSD	Moderate	Moderate	Low	175 (14)	Unadjusted

Table 1 (Continued)

Authors and year	Country	Population	Age	Sex and percent	Included Sample	Anxiety Measure	Anxiety Classification	Quality assessment			Results	Adjustment for other covariates
								Selection	Data collection method	Withdrawals and dropouts		
Dingoyan 2017 [54]	Germany	Immigrant	18–65	62% women	653	Composite international diagnostic interview	Any anxiety	Low	Low	Low	Any anxiety 653 (224) Panic disorder 653 (71) Agoraphobia 653 (125) Social phobia 653 (38) Generalized anxiety disorder 653 (21) Specific phobias 653 (125) OCD 653 (61) PTSD 653 (131)	Age, gender, education
Di Thiene 2018 [52]	Sweden	Immigrant	19–64	59.9% women	6198	ICD-10	Any anxiety	Low	Low	Low	6198 (1177)	Unadjusted
Fuhr 2020 [55]	Turkey	Refugees	≥18	51.6% women	1659	Hopkins Symptoms Checklist Posttraumatic Stress Disorder Checklist	Anxiety symptoms PTSD	Low	Moderate	Moderate	Anxiety 1659 (582) PTSD 1646 (328)	Unadjusted
Garcini 2017 [56]	USA	Immigration	≥18	69% women	248	Mini International Neuropsychiatric Interview	Generalized Anxiety, Panic, PTSD	Moderate	Low	Moderate	Panic disorder 248 (21) GAD 248 (16) PTSD 248 (7)	Unadjusted
Georgiadou 2018 [57]	Germany	Refugees	≥18	30.5% women	200	7-item Generalized Anxiety Scale	GAD	High	Moderate	High	Total 200 (27) Men 139 (12) Women 61 (15)	Unadjusted
Gerritsen 2006 [58]	The Netherlands	Refugees Asylum seekers	≥18	41.2% women	410	Trauma Questionnaire	PTSD	Low	Moderate	Low	Total 394 (81) Refugees 170 (18) Asylum seekers 124 (63)	Unadjusted

Table 1 (Continued)

Authors and year	Country	Population	Age	Sex and percent	Included Sample	Anxiety Measure	Anxiety Classification	Quality assessment			Results	Adjustment for other covariates
								Selection	Data collection method	Withdrawals and dropouts		
Heeren 2014 [59]	Switzerland	Refugees Asylum seekers Immigration	Unknown	Both	120	Harvard Trauma Questionnaire Posttraumatic Diagnostic Scale Hopkins Symptom Checklist-25	Anxiety PTSD	Moderate	Moderate	Moderate	Anxiety Asylum seekers 65 (41) Refugees 34 (13) Immigration 21 (10) PTSD Asylum seeker 65 (34) Refugees 34 (12) Immigration 21 (1)	Unadjusted
Jamil 2007 [60]	USA	Immigration Refugees	Unknown	44% women	350	PTSD checklist Generalized anxiety (eight items) Panic (three items)	PTSD GAD Panic	Low	Moderate	Low	GAD 350 (58) Panic 350 (82) PTSD 350 (28)	Unadjusted
Javanbakht 2019 [61]	USA	Refugees	18–65	47.1% women	157	Hopkins Symptom Checklist 25 items	Anxiety	Moderate	Moderate	Low	157 (3) Men 83 (2) Women 74 (1)	Unadjusted
Kang 2009 [62]	Brazil	Immigration	≥18	50% women	324	Composite International Diagnostic Interview	PTSD GAD Panic Agoraphobia Specific phobia Social phobia	Low	Low	Low	Total 324 (42) GAD 324 (15) Panic 324 (1) Agoraphobia 324 (2) Specific phobia 324 (1) Social phobia 324 (1) PTSD 324 (31)	Unadjusted

Table 1 (Continued)

Authors and year	Country	Population	Age	Sex and percent	Included Sample	Anxiety Measure	Anxiety Classification	Quality assessment			Results	Adjustment for other covariates
								Selection	Data collection method	Withdrawals and dropouts		
Karno 1989 [63]	USA	Immigration	Mean >39	52.5% women	1244	Diagnostic Interview schedule	Any anxiety	Low	Low	Low	Any anxiety 1244 (219) OCD 1244 (24) Panic 1244 (13) Simple phobia 1244 (123) Agoraphobia 1244 (74) Agoraphobia with panic 1244 (24) Agoraphobia without panic 1244 (52) Social phobia 1244 (34) GAD 1244 (47)	Unadjusted
Karunakara 2004 [64]	Uganda	Refugee	29.7 ± 9.6	77.9% women	1240	Posttraumatic Stress Diagnostic Scale	PTSD	Moderate	Moderate	High	1240 (570)	Unadjusted
Kazour 2017 [65]	Lebanon	Refugees	18–65	55.7% women	452	Mini International Neuropsychiatric Interview	PTSD	Low	Low	Low	Lifetime prevalence 452 (160) Point prevalence 452 (123) Men 200 (55) Women 252 (68)	Unadjusted
Koh 2018 [66]	USA	Immigrant	≥18	59.5% women	602	Generalized Anxiety Disorder 7-item	GAD	Low	Moderate	Low	592 (100)	Unadjusted
Kroll 1989 [67]	USA	Refugees	Unknown	59.9% women	404	19-item checklist	PTSD	Low	Moderate	Low	404 (56)	Unadjusted
Laban 2005 [68]	The Netherlands	Asylum Seekers	≥18	35.4% women	294	Composite International Diagnostic Interview	Any anxiety	Moderate	Low	Low	Any anxiety 294 (66) Panic/agoraphobia 294 (14) Phobia 294 (42) OCD 294 (4) GAD 294 (20) PTSD 294 (108)	Unadjusted

Table 1 (Continued)

Authors and year	Country	Population	Age	Sex and percent	Included Sample	Anxiety Measure	Anxiety Classification	Quality assessment			Results	Adjustment for other covariates
								Selection	Data collection method	Withdrawals and dropouts		
Lee 2001 [69]	China	Immigrant	32.0 ± 10.2	52.4% women	170	Hopkins Symptom Checklist-25	PTSD	Moderate	Moderate	Moderate	170 (95)	Unadjusted
Leiler 2018 [70]	Sweden	Asylum seekers/Refugees	≥18	26.6% women	510	General Anxiety Disorder Primary Care PTSD Screen	GAD PTSD	High	Moderate	High	GAD 510 (298) PTSD 510 (287) Asylum seekers GAD 367 (241) PTSD 367 (231)	Unadjusted
Levecque 2007 [71]	Belgium	Immigration	18–65	54.3% women	786	Symptom Checklist 90-subscales	GAD Panic	Low	Moderate	Low	GAD 786 (48) Panic 786 (23)	Unadjusted
Liddell 2016 [72]	Australia	Immigration	16–85	Both	308	Composite International Diagnostic Interview	Any anxiety	Moderate	Low	Low	308 (33)	Unadjusted
Lies 2019 [73]	Australia	Asylum seekers/Refugees	Unknown	Both	1892	Clinical interview	Anxiety PTSD	Low	Moderate	Low	Anxiety 1892 (804) PTSD 1892 (611)	Unadjusted
Marshall 2005 [75]	USA	Refugee	52 ± 13.4	61% women	490	Composite International Diagnostic Interview	PTSD	Low	Low	Low	490 (301)	Unadjusted
McColl 2006 [76]	UK	Asylum seekers/Refugees	34.6 ± 9.6	40% women	104	Harvard Trauma Questionnaire	PTSD	High	Moderate	High	104 (43)	Unadjusted
Mollica 2007 [77]	Croatia	Refugees	≥18	64.9% women	376	Hopkins Symptom Checklist-25	PTSD	Low	Moderate	Low	376 (20)	Unadjusted
Mufti 2007 [78]	Pakistan	Refugees	15–65	44.2% women	1500	Mini International Neuropsychiatry Interview	PTSD GAD Panic	Low	Low	Low	GAD 1500 (81) OCD 1500 (5) PTSD 1500 (918) Panic 1500 (27)	Unadjusted
Mulugeta 2019 [79]	USA	Refugee	≥18	52.1% women	1055	ICD Clinical history	Anxiety	Low	Low	Low	1055 (44)	Unadjusted

Table 1 (Continued)

Authors and year	Country	Population	Age	Sex and percent	Included Sample	Anxiety Measure	Anxiety Classification	Quality assessment			Results	Adjustment for other covariates
								Selection	Data collection method	Withdrawals and dropouts		
Nesterko 2020 [80]	Germany	Refugees	≥18	30.6% women	502	PTSD Checklist	PTSD	High	Moderate	Moderate	Total 502 (143) Men 347 (89) Women 149 (52)	Unadjusted
Orozco 2013 [82]	USA	Immigration	18–65	46.7% women	1208	Composite International Diagnostic Interview	Any anxiety	Low	Low	Low	Agoraphobia without panic disorder 1208 (26) Social phobia 1208 (57) GAD 1208 (23) Panic 1208 (29) PTSD 1208 (32)	Unadjusted
Pernice 1994 [83]	New Zealand	Refugees Immigrant	≥18	Unknown	249	Hopkins Symptom Checklist	Anxiety	Moderate	Moderate	Low	Total 249 (31) Refugees 129 (19) Immigrant 120 (12)	Unadjusted
Ponizovsky 2009 [84]	Israel	Immigration	≥21	54.6% women	952	Composite International Diagnostic Interview	Any anxiety	Low	Low	Low	952 (27)	Unadjusted
Poudel-Tandukar 2019 [85]	USA	Refugees	≥18	49.8% women	225	Hopkins Symptom Checklist	Anxiety	Moderate	Moderate	Low	226 (77)	Unadjusted
Qureshi 2012 [86]	Spain USA	Immigration	32.5 ± 9.3	61.3% women	1503	MINI International Neuro-psychiatric Interview	Any anxiety	Low	Low	Low	Panic 1503 (19) Agoraphobia 1503 (8) Social phobia 1503 (30) OCD 1503 (25) PTSD 1503 (26)	Unadjusted
Ramos 2016 [87]	Spain	Immigrant	Unknown	46.7% women	562	Post-Traumatic Stress Disorder Checklist General Anxiety Disorder	GAD PTSD	Low	Moderate	Low	GAD 562 (35) PTSD 562 (271)	Unadjusted

Table 1 (Continued)

Authors and year	Country	Population	Age	Sex and percent	Included Sample	Anxiety Measure	Anxiety Classification	Quality assessment			Results	Adjustment for other covariates
								Selection	Data collection method	Withdrawals and dropouts		
Sabin 2003 [88]	Mexico	Refugees	16–80	58.2% women	170	Hopkins Symptom Checklist-25 Harvard Trauma Questionnaire	Anxiety PTSD	Moderate	Moderate	Moderate	PTSD 170 (20) Anxiety 160 (87) Men 70 (40) Women 90 (47)	Unadjusted
Sacchetti 2019 [89]	Italy	Asylum Seekers	15–44	Men	200	PTSD Checklist	PTSD	Moderate	Moderate	Low	200 (19)	Unadjusted
Salas-Wright 2018 [90]	USA	Immigrant	≥18	Both	6404	AUDADIS-V	Generalized Anxiety, Panic, Social and Specific Phobia	Low	Low	Low	GAD 6404 (257) Panic 6404 (128) Social phobia 6404 (96) Specific phobia 6404 (259) PTSD 6404 (177)	Unadjusted
Salinero-Fort 2015 [91]	Spain	Immigrant	18–55	59.7% women	691	Primary care evaluation of mental disorders	Any anxiety	Low	Moderate	Low	Any anxiety 691 (142) Men 278 (50) Women 413 (92) Panic 691 (11) Men 278 (6) Women 413 (5) GAD 691 (50) Men 278 (17) Women 413 (33) Other anxiety 691 (65)	Unadjusted
Schrier 2011 [93]	The Netherlands	Immigrant	≥18	55% women	391	Composite International Diagnostic Interview	Panic disorder, agoraphobia, social phobia and/or generalized anxiety disorder	High	Low	Moderate	391 (14)	Unadjusted

Table 1 (Continued)

Authors and year	Country	Population	Age	Sex and percent	Included Sample	Anxiety Measure	Anxiety Classification	Quality assessment			Results	Adjustment for other covariates
								Selection	Data collection method	Withdrawals and dropouts		
Segal 2018 [94]	Lebanon	Refugees	≥18	55.1% women	208	Primary Care Posttraumatic Stress Disorder	PTSD	Moderate	Moderate	Low	208 (36)	Unadjusted
Siddiqui 2014 [95]	Sweden	Immigrant	30–75	59.4% women	1255	Hospital Anxiety and Depression Scale	Anxiety	High	Moderate	Low	1255 (665)	Unadjusted
Silove 2007 [96]	Australia	Refugees	≥18	50.3% women	1161	Composite International Diagnostic Interview	PTSD	Low	Low	Low	1161 (40)	Unadjusted
Siman-Tov 2019 [97]	Israel	Asylum-seekers	29.03 ± 7.71	36.8% women	861	Diagnose	PTSD	Low	Low	Low	861 (134)	Unadjusted
Steel 2002 [98]	Australia	Refugees	41 ± 14.2	59% women	1161	Composite international diagnostic interview	Any anxiety	Low	Low	Low	1161 (57)	Unadjusted
Steiner 2007 [99]	Sweden	Immigrant	27–60	Both	526	Questionnaire	Anxiety	Low	High	Low	Total 526 (153) Men 285 (55) Women 241 (98)	Unadjusted
Sundquist 2005 [100]	Sweden	Refugees	19–59	Women	120	Hopkins Symptom Checklist	Anxiety PTSD	High	Moderate	Moderate	Anxiety 120 (76) PTSD 120 (34)	Unadjusted
Tay 2015 [102]	Australia	Refugees	37 ± 9.8	40.4% women	230	Culturally adapted measure	PTSD	Moderate	Moderate	Moderate	230 (28)	Unadjusted
Tay 2019 [101]	Malaysia	Refugees	≥18	17.8% women	959	Interview	PTSD GAD	Low	Low	Low	GAD 959 (83) PTSD 959 (306)	Unadjusted
Taylor 2013 [103]	USA	Refugees	≥18	40% women	366	Hopkins Symptom Checklist 25-item, self-administered assessment	Anxiety PTSD	Low	Low	Low	Anxiety 366 (182) Men 218 (95) Women 144 (87) PTSD 366 (112) Men 218 (63) Women 144 (49)	Unadjusted

Table 1 (Continued)

Authors and year	Country	Population	Age	Sex and percent	Included Sample	Anxiety Measure	Anxiety Classification	Quality assessment			Results	Adjustment for other covariates
								Selection	Data collection method	Withdrawals and dropouts		
Tinghög 2017 [104]	Sweden	Refugees	18–64	37.2% women	1215	Hopkins Symptom Checklist	Anxiety PTSD	High	Moderate	Moderate	Anxiety 1215 (386) Men 763 (211) Women 452 (175) PTSD 1215 (363) Men 763 (221) women 452 (141)	Unadjusted
Turner 2003 [105]	UK	Refugees	38.1 ± 16.1	52.9% women	645	Beck Anxiety Inventory	Anxiety	Low	Moderate	Low	645 (220)	Unadjusted
Vallières 2018 [106]	Lebanon	Refugees	18–60	80.2% women	112	International Trauma Questionnaire	PTSD	High	Moderate	Moderate	112 (27)	Unadjusted
van Ommeren 2004 [81]	Nepal	Refugees	Mean >43	Men	574	Composite International Diagnostic Interview	PTSD Phobia GAD	Moderate	Low	High	PTSD 12-month 574 (154) Lifetime 574 (245) Specific phobia 12-month 574 (114) Lifetime 574 (119) GAD 12-month 574 (27) Lifetime 574 (56)	Unadjusted
Vega 2006 [107]	USA	Immigrant	18–59	49.7% women	1834	Composite International Diagnostic Interview	Anxiety	Low	Low	Low	Total 1834 (229) Men 922 (82) Women 912 (155)	Unadjusted
Vervliet 2013 [108]	Belgium	Refugees	14–17	15.5% women	101	Hopkins Symptom Checklist	Anxiety PTSD	High	Moderate	Moderate	Anxiety 101 (26) PTSD 100 (48)	Unadjusted

Table 1 (Continued)

Authors and year	Country	Population	Age	Sex and percent	Included Sample	Anxiety Measure	Anxiety Classification	Quality assessment			Results	Adjustment for other covariates
								Selection	Data collection method	Withdrawals and dropouts		
Vonnahme 2014 [109]	USA	Refugees	≥18	47.1% women	386	Hopkins Symptom Checklist-25	Anxiety PTSD	Moderate	Moderate	Low	PTSD 386 (14) Men 204 (4) Women 182 (10) Anxiety 386 (69) Men 204 (28) Women 182 (41)	Unadjusted
Whitley 2016 [110]	Canada	Immigrant	15–65	60.1% women	441	Composite International Diagnostic Interview	Panic Social phobia Agoraphobia	Moderate	Moderate	Low	Panic 441 (1) Social phobia 441 (6) Agoraphobia 441 (1)	Unadjusted
Zaghloul 2019 [111]	Saudi Arabia	Immigrant	Mean >30	98.7% women	999	Depression Anxiety Stress Scales	Anxiety	Low	Moderate	Low	999 (334)	Unadjusted

analysis was performed to assess the prevalence of anxiety disorders and PTSD. In studies that examined more than one type of anxiety in a sample, the average sample and event were used to calculate the total. In the following, I^2 was used to assess the degree of heterogeneity in the studies included in the meta-analysis [32, 33]. EPHPP [30, 31] dimensions were used to assess qualitative bias as well as statistical tests to evaluate quantitative bias, as mentioned above.

Results

Study inclusion

Fig. 1 shows the screening steps of the meta-analysis. Nearly 20,000 articles were retrieved based on keywords. The screening continued in several stages to identify eligible studies. Based on screening, 266 articles were qualitatively synthesized and finally, 78 eligible articles [34–111] were identified, which are reported in Table 1.

Quality assessment

The quality of studies was assessed in three dimensions. In the selection bias dimension, most of the studies had a low and moderate bias. In the anxiety assessment method, based on the qualitative evaluation, most of the studies had a low and moderate bias. In the withdrawals and dropouts dimension, most of the studies had a low bias.

Anxiety and PTSD prevalence

Table 2 shows the prevalence of anxiety disorders. The prevalence of agoraphobia was 4% with 95% confidence interval (CI) = 3–4% (I^2 = 97.5%). The prevalence of PTSD was 25% with 95% CI = 22–29% (I^2 = 99.4%). The prevalence of GAD was 9% with 95% CI = 7–11% (I^2 = 97.8%). The prevalence of panic disorder was 4% with 95% CI = 3–5% (I^2 = 96.9%). The prevalence of OCD was 3% with 95% CI = 1–4% (I^2 = 94.5%). The prevalence of social phobia was 5% with 95% CI = 3–7% (I^2 = 99.1%). The prevalence of specific phobia was 8% with 95% CI = 4–12% (I^2 = 98.8%).

Table 2 Anxiety and its subtypes in immigrants

Anxiety disorder	Number of studies	Prevalence (%)	Confidence interval (%)	Heterogeneity (I^2), P
Agoraphobia	N = 10	4	3–4	97.58%, P < 0.001
PTSD	N = 51	25	22–29	99.47%, P < 0.001
GAD	N = 22	9	7–11	97.84%, P < 0.001
Panic disorder	N = 17	4	3–5	96.96%, P < 0.001
OCD	N = 7	3	1–4	94.58%, P < 0.001
Social phobia	N = 12	5	3–7	99.17%, P < 0.001
Specific phobia	N = 4	8	4–12	98.89%, P < 0.001

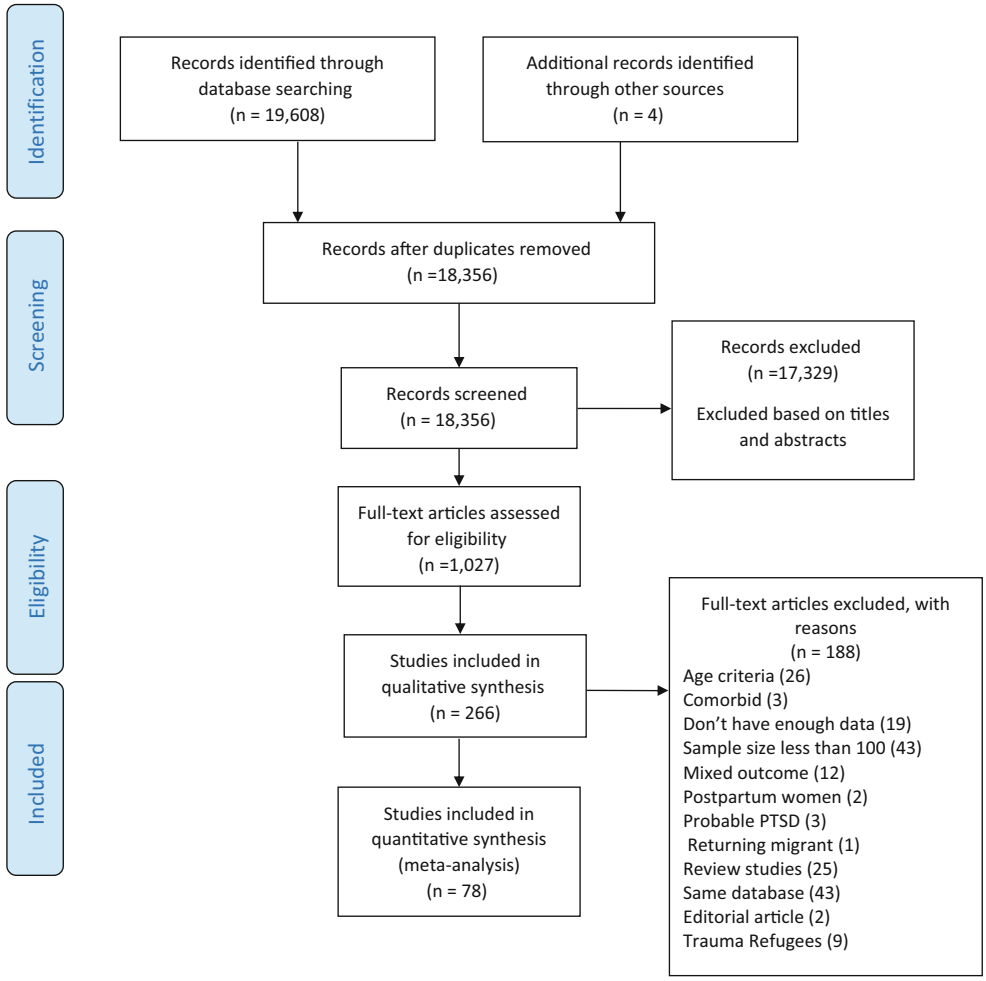

Fig. 1 Selection flow diagram. *PTSD* posttraumatic stress disorder. (From Moher et al. [29]. For more information, visit www.prisma-statement.org)

Heterogeneity

The level of heterogeneity (I^2) in the total number of studies included in the meta-analysis was high, which indicates that there is a high level of heterogeneity ([32]; Table 2).

Discussion

This study aimed to investigate the global prevalence of anxiety and PTSD in the immigrant population based on a systematic review and meta-analysis. The first findings of this study showed that 4–9% of the immigrant population have different anxiety disorders, while the prevalence of PTSD was 25%. In the general population, one in nine people have anxiety [3]. The prevalence of anxiety in immigrants is almost no different from the general population. But, the findings of the current study show that the prevalence of PTSD in immigrants is high. A mechanism for the link between migration and anxiety can be the level of income, as the level of income is associated with anxiety [112]. Also, a low level of education is a factor in the increased risk of anxiety [112, 113]. Therefore, low economic and educational levels may be factors in migrating to another country and at the same time have a direct relationship with the level of anxiety of immigrants. The process of accepting immigrants, as well as the length of time it takes to be accepted, can be a factor in increased anxiety, as the study shows, the asylum process is associated with an increased risk of psychiatric illness [68, 114]. Postimmigration conditions are also important in determining the prevalence of mental health problems, as studies have shown [104, 115, 116]. Other causes of anxiety need to be addressed in determining the causes of higher prevalence anxiety; especially the lifestyle and nutrition of the immigrant population, as previous studies have shown people with smoking [117], obesity [117], and annual medical visits [118] are more likely to report lifetime anxiety disorders. Also, the reduction of resources is one of the factors that decreased after migration and can affect psychological health [119]. Among the subgroups, the highest prevalence rate was for PTSD with 25% prevalence and GAD prevalence was 8%. As the study shows, immigrants are less likely to have access to mental health services [120]. Of course, the role of stigma has also been discussed, with stigma being

a major barrier to accessing psychological services in the immigrant population [121].

This meta-analysis updated the previous meta-analysis and also performed a comprehensive meta-analysis on the prevalence of anxiety in immigrants. Overall, the findings of the current study provide a perspective on the prevalence of anxiety in the immigrant population, but there are limitations. The separation of different generations of immigrants should be considered in future studies. Periods of anxiety (lifetime anxiety, 12 month, 6 month, and 1 month) are another topic that needs attention. Most of the studies included in the meta-analysis did not provide these results and this is a limitation. Residence time in the destination country is a factor that can affect the results. The issue of heterogeneity in studies included in the meta-analysis is a methodological limitation and can affect the power of the study. Of course, in the case of heterogeneity, the sources of heterogeneity should also be considered because heterogeneity has two main sources: one of which is the clinical difference and the other is statistical heterogeneity [122]. Clinical heterogeneity refers to differences in measurement methods, differences in population and subjects, and the like [122]. Statistical heterogeneity also refers to differences in quantitative methods of outcome measurement, study design, and so on [122]. Finally, another issue is the generalizability of the findings of this meta-analysis. Generalizability is limited because the study populations were from very diverse cultures that this socio-cultural-economic difference can determine the prevalence of anxiety. Another important issue is that most of the results of the studies included in the present meta-analysis were crude and in the meantime other mixed variables should be considered as possible influential variables. Therefore, in future studies, adjusted results can reduce the limit of generalizability and increase the strength of the results.

Health and clinical implications

Overall, the findings show a high prevalence of anxiety. Explanations for these different rates were provided in the previous sections. Considering the findings on the significant prevalence of anxiety and PTSD in the immigrant population and the increasing population of immigrants in recent decades, it is necessary to pay special attention to the mental health of this population. In this regard, health policies need to move towards screening this population for prevention and treatment.

Anxiety disorders are the most common mental disorders and according to the results of studies, one-third of the general population are affected by anxiety during their lifetime [28]. Also, the financial burden of anxiety disorders is very high and this has a great burden on the health of the community [123]. Anxiety disorders are effectively treatable by a range of psychological and pharmacological therapies [124, 125]. On the other hand, studies show that a significant percentage of people with anxiety disorders do not seek treatment [126]. The reasons and descriptions presented above were intended to show that the rate of health problems caused by anxiety is very high. Furthermore, given that the immigrant population is more exposed to mental health problems and their access to psychological and psychiatric health care becomes much more necessary due to economic problems and other related factors in immigrations, health-related policies need to provide wider access to mental health care. A higher percentage of people with anxiety problems should receive treatment to reduce the individual, social and economic consequences of anxiety disorders.

Conflict of interest S. Amiri declares that he has no competing interests.

Appendix

Table 3 Keywords used for PubMed and Google Scholar, Research Gate search until June 2020

Search	Query
19,608	
#1	Immigrants [Mesh] OR Immigrants [Text Word] OR Emigrants [Mesh] OR Emigrants [Text Word] OR Foreigners [Text Word] OR Aliens [Text Word] OR Foreign nationals [Text Word] OR Refugees [Mesh] OR Refugees [Text Word] OR Migrant [Text Word] OR Expatriate [Text Word] OR Foreign-origin persons [Text Word] OR Migration [Text Word] OR asylum-seekers [Text Word]
#2	Agoraphobia [Mesh] OR Agoraphobia [Text Word] OR Neurotic Disorders [Mesh] OR Neurotic Disorders [Text Word] OR Obsessive-Compulsive Disorder [Mesh] OR Obsessive-Compulsive Disorder [Text Word] OR Hoarding Disorder [Mesh] OR Hoarding Disorder [Text Word] OR Phobic Disorders [Mesh] OR Phobic Disorders [Text Word] OR Social Phobia [Mesh] OR Social Phobia [Text Word] OR generalized anxiety disorder [Mesh] OR generalized anxiety disorder [Text Word] OR post-traumatic stress disorder [Mesh] OR post-traumatic stress disorder [Text Word] OR phobia [Mesh] OR phobia [Text Word] OR specific phobia [Mesh] OR specific phobia [Text Word] OR Panic Disorder [Mesh] OR Panic Disorder [Text Word] OR Obsessive-Compulsive [Mesh] OR Obsessive-Compulsive [Text Word] OR Neurosis [Mesh] OR Neurosis [Text Word] OR Obsessive-Compulsive Neurosis [Mesh] OR Obsessive-Compulsive Neurosis [Text Word] OR GAD [Mesh] OR GAD [Text Word] OR PTSD [Mesh] OR PTSD [Text Word] OR fear [Mesh] OR fear [Text Word] OR Panic [Mesh] OR panic [Text Word] OR anxiety [Mesh] OR anxiety [Text Word] OR Post-Traumatic [Mesh] OR Post Traumatic [Text Word] OR mental disorders [Mesh] OR mental disorders [Text Word] OR Stress [Mesh] OR Stress [Text Word] OR psychiatric disorders [Mesh] OR psychiatric disorders [Text Word] OR Mental illness [Mesh] OR Mental illness [Text Word]
Final	#1 AND #2

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