Title: Prevalence of mental disorders in South Asia: an umbrella review of systematic reviews and meta-analyses

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Abstract:

Objectives: Mental disorders are highly prevalent in eight South Asian countries, yet there is a gap of a synthesized overview of the prevalence of mental disorders in this region. This umbrella review aims to summarize the prevalence of mental disorders from systematic reviews and meta-analyses of South Asian studies.

Materials and methods: A systematic search of 11 major databases and additional sources was conducted until December 11, 2019. Articles were included if they were systematic reviews or meta-analyses, reported the prevalence of mental disorders, and reported primary studies conducted in South Asian countries only.

Results: Among 2591 citations, a total of 23 reviews met all the criteria of this umbrella review. The synthesized findings from those reviews suggest high prevalence rates for mental disorders, including depressive disorders, anxiety disorders, mood disorders, suicidal behavior and self-harm, schizophrenia, substance use disorders, neurodevelopmental disorders, dementia, and other mental health problems. Also, findings suggest a high burden of maternal depression, psychiatric comorbidities in chronic physical illnesses, and various mental disorders among children, elderly adults, refugees, and other vulnerable populations. Most studies were from India whereas evidence from Afghanistan, Bhutan, and Maldives was limited.

Conclusion: The findings of this review are constrained with heterogeneity in prevalence estimations, methodologies, sampling issues, and limitations in the existing literature, which should be addressed in future research. The evidence synthesized in this review provides national and regional overview of the prevalence of mental disorders, which may inform better policymaking and practice advancing mental health in South Asia.

Keywords: Mental Health; Mental Disorders; South Asia; Systematic Review; Meta-analysis; Prevalence

1. Introduction

South Asia is home to more than 23% of the global population, where the number of people suffering from mental disorders is estimated to be 150 to 200 million (Trivedi et al., 2007). Eight South Asian countries, namely Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka, have a high burden of mental disorders, which is often under-addressed due to several common challenges (Trivedi et al., 2007). Many sociocultural barriers, including stigma to mental disorders and lack of awareness, often lead to underreporting or late reporting of mental disorders, which contribute to the population-level burden of mental disorders (Trivedi et al., 2007). Moreover, these nations have critically low human resources for mental health, which affect the diagnosis, treatment, and prevention of mental disorders (Thara and Padmavati, 2013; Trivedi et al., 2007). Furthermore, mental health is poorly recognized as a health policy priority in those nations. Many of the South Asian countries do not have effective policies, legislations, strategic plans, programs, and other instrumental measures to address mental health problems across communities (Hossain et al., 2019; Trivedi et al., 2007). Also, the epidemiological and psychosocial burden of mental disorders is not widely studied through rigorous research, which critically affects the development and implementation of mental health policies and services (Hossain and Purohit, 2019; Sharma and Razzaque, 2017; Trivedi et al., 2007). In addition, mental health is deeply rooted in the social, cultural, religious, spiritual, historical, and holistic aspects of human lives (Gopalkrishnan, 2018). People living in South Asian countries share all these psychosocial constructs in varying extents (Rama et al., 2014), which also warrants cross-cultural and multi-national perspectives in studying mental health in this region. To address these issues and improve the knowledge base for better decision-making and future research, an overall evaluation of the prevalence of mental disorders among the South Asian nations is essential.

In the discourse of knowledge synthesis, cross-sectional or longitudinal studies may provide a partial picture of the population-level burden of mental disorders, which can be synthesized in evidence-based reviews. Such systematically conducted reviews of empirical studies offer high-quality evidence for clinical and policy-level decision-making (Garg et al., 2008). Given that more than 11 systematic reviews are published in a day (Bastian et al., 2010), there is a growing interest in synthesizing knowledge from existing reviews, which is termed as umbrella review, or systematic review of the reviews (Aromataris et al., 2015; Hossain, 2020). Umbrella reviews have shown advantages over meta-analyses due to their bird's eye view of evidence (Ioannidis, 2009). Furthermore, umbrella reviews are increasingly being used for clinical risk prediction and evidence-based actions through synthesizing prior knowledge on several mental disorders (Fullana et al., 2019; Hossain et al., 2020). This article aims to conduct an umbrella review and systematically evaluate the current evidence on the prevalence of mental disorders in South Asia from systematic reviews and meta-analyses.

2. Materials and methods

2.1 Search strategy of the review

This umbrella review was conducted adopting the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Liberati et al., 2009), and the Joanna Briggs Institute (JBI) methodology for umbrella reviews (Aromataris et al., 2015). Both of these guidelines have been used in earlier umbrella reviews (Hutchens and Kearney, 2020; Jarvis et al., 2020; Turrini et al., 2017). While PRISMA guidelines is commonly used in conducting systematic literature reviews, the use of JBI methodology provides more systematic approach in conducting umbrella reviews of either experimental or observational studies. Especially, JBI method allows to summarize the evidence for a particular research or review question which may facilitate further research and policymaking in the domain of interest. Major databases, including MEDLINE, Academic Search Ultimate, PsycINFO, CINAHL Complete, Health Policy Reference Center, ERIC, Health Source, Nursing and Allied Health Collection, EMBASE, PubMed, and the Cochrane Library were searched using specific keywords (Table 1). In addition, references of selected articles and citing articles from Google Scholar were searched and evaluated. The titles, abstracts, subject headings, and general keywords were searched with no language restrictions. Moreover, leading mental health researchers in South Asia were communicated to retrieve potential studies that could meet the purpose of this review. All databases and additional sources were searched from their inception to December 11, 2019, for the last time and the citations uploaded to Rayyan cloud-based systematic review management system for further evaluation (Ouzzani et al., 2016).

Table 1: Search strategy and keywords for this umbrella review

Search query	Keywords (searched within titles, abstracts, subject headings like MeSH, and general keywords)
1	“mental” OR “psychological” or “psychiatric” OR “mental health” OR “mental health services” OR “mental disorders” OR “mental illness” OR “common mental disorders” OR “psychosocial” OR “psychosomatic” OR “emotional” OR “psychiatric disorders” OR “psychiatric illness” OR “behavio*” OR “obsessive compulsive” OR “dementia” OR “depress*” OR “suicid*” OR “schizophrenia” OR “bipolar disorder” OR “mood disorder” OR “alcohol” OR “anxiety” OR “substance abuse” OR “substance use” OR “panic” OR “addiction” OR “posttraumatic” OR “Alzheimer’s” OR “post-traumatic” OR “PTSD” OR “dissociative” OR “personality disorder”
2	prevalence OR incidence OR epidemiology OR frequency OR cases
3	Systematic review OR Meta-analysis OR pooled effect OR pooled estimate
4	Afghanistan OR Bangladesh OR Bhutan OR India OR Maldives OR Nepal OR Pakistan OR Sri Lanka OR South Asia
Final search query	1 AND 2 AND 3 AND 4

2.2 Inclusion and exclusion criteria

In this review, systematically conducted narrative, qualitative, or meta-analytic reviews reporting the prevalence of mental disorders were included. Also, quantitative measures of disease burden, including odds ratio or relative risk were also considered in the absence of a prevalence estimation. To further specify the mental disorders of interest, mental health conditions were included if they were defined by the current or earlier versions of the International Classification of Diseases (ICD) (World Health Organization (WHO), 2016), or the Diagnostic and Statistical Manual (DSM) (American Psychiatric Association, 2013). Moreover, reviews were included if they reviewed primary studies conducted in one or more South Asian countries as defined within the World Bank region (World-Bank, 2019). Reviews were recruited if they fulfilled all the inclusion criteria and excluded if they had conflicts with at least one of the exclusion criteria, as listed in Table 2. Two authors independently evaluated the citations, and potential conflicts were addressed through discussion in the presence of a third author.

Table 2: Eligibility criteria for this review

Inclusion criteria	Exclusion criteria
1. Articles published as systematically conducted narrative, qualitative, or quantitative literature reviews	1. Articles which were not systematically conducted reviews (for example, narrative and unstructured reviews, primary studies, opinions, commentaries, or editorials were excluded
2. Articles reported prevalence (or other quantitative measures like incidence, cases with denominators, odds, or relative risks etc.) of mental disorders only	2. Articles which did not report prevalence (or other quantitative measures) of mental disorders only, were excluded; articles reporting mental disorders alongside general health outcomes were also excluded
3. Articles reported primary observational studies which were conducted in one or more South Asian countries	3. Articles reported any studies conducted in countries outside of South Asia (for example, multi-country reviews including at least one country outside South Asia was considered ineligible)
4. Articles published in peer-reviewed journals	4. Articles not published in peer-reviewed journals were excluded (for example, dissertations, theses, policy papers, or institutional reports were excluded)
5. Articles with full-texts available in English language	5. Articles were excluded if the full-texts were not available in English

2.3 Data extraction and synthesis

A data extraction tool was developed using the JBI data extraction tool for systematic reviews and research synthesis (Munn et al., 2014). Two authors extracted data on the objectives and types of the review articles, year of publication, names of databases, the timeframe of searching literature, originating country of the primary studies, sample characteristics, and key findings on

the prevalence of mental disorders among the study population. Considering the goal of umbrella reviews to summarize the evidence, and high heterogeneity in terms of methodological approaches and study outcomes across studies, a narrative synthesis of the summary evidence was conducted with a quantitative reporting of prevalence rates (percentage, proportion, relative risk [RR], or other quantitative measures) as found in the respective reviews.

2.4 Evaluation of the methodological quality

In this umbrella review, the JBI critical appraisal checklist for systematic reviews and research synthesis checklist was used to assess the methodological quality of the included studies (Aromataris et al., 2015). Two authors independently evaluated each of the articles, which was finalized following discussions at the presence of a third author. The checklist consists of ten items; each item can receive one point, and the overall quality score of a study can range from zero to ten. In this review, studies receiving zero to four, five to seven, and eight to ten were categorized as low, medium, and high-quality studies, respectively.

Figure 1: Flow diagram of the umbrella review

3. Results

Systematic searching of 11 databases and additional sources yielded a total of 2591 citations (see Figure 1). After removing 1053 duplicate citations, 1538 unique records were evaluated as per the inclusion and exclusion criteria. At the end of the primary evaluation, 1398 citations were excluded due to non-compliance with the eligibility criteria. The full texts of the remaining 140 citations were evaluated, and 117 articles were excluded, which did not fulfill the eligibility criteria. Finally, 23 articles meeting all the criteria were recruited in this umbrella review (see Table 3), including 12 systematic reviews (Aggarwal and Berk, 2015; Arora and Aeri, 2019; Hossain et al., 2017, 2014; Math and Srinivasaraju, 2010; Mills et al., 2008; Mirza and Jenkins, 2004; Nadkarni et al., 2013; Naskar et al., 2017; Newman, 2013; Rajapakse et al., 2013; Thapa et al., 2018) and 11 meta-analyses (Chauhan et al., 2019; Ganguli, 2000; Hendrickson et al., 2019; Hussain et al., 2018; Mahendran et al., 2019; Malhotra and Patra, 2014; Pilania et al., 2019; Prabhu et al., 2019; Ranjan and Asthana, 2017; Reddy and Chandrashekar, 1998; Upadhyay et al., 2017).

3.1 Characteristics of the recruited reviews

The earliest review included in this study was published in 1998 (Reddy and Chandrashekar, 1998). A total of five reviews were published till 2010 (Ganguli, 2000; Math and Srinivasaraju, 2010; Mills et al., 2008; Mirza and Jenkins, 2004; Reddy and Chandrashekar, 1998), whereas the majority ($n=18$) of the reviews were published after 2010. The number of databases searched within those reviews ranged from two to thirteen. The number of primary studies included among the reviews ranged from four to 61. Most of the reviews evaluated mental disorders in India ($n=13$), followed by two studies on Bangladesh (Hossain et al., 2014; Newman, 2013), one study each from Nepal (Thapa et al., 2018), Pakistan (Mirza and Jenkins, 2004), and Sri Lanka (Rajapakse et al., 2013). One study evaluated mental disorders among Bhutanese refugees living in Nepal (Mills et al., 2008), and four studies evaluated mental disorders in multiple South Asian nations (Hossain et al., 2017; Mahendran et al., 2019; Prabhu et al., 2019; Ranjan and Asthana, 2017). The quality evaluation found one study with low quality, nine studies with high quality, and remaining ($n=13$) studies with medium quality (see Supplementary material).

3.2 Sample size and characteristics of the study participants

Sample sizes within individual studies in respective reviews ranged from 11 to 101,438, whereas highest pooled sample was reported as 158,555 in a meta-analysis (Ranjan and Asthana, 2017). All the reviews reported primary studies that recruited participants from diverse populations across South Asian countries. Four reviews focused on mental disorders among children and adolescents (Aggarwal and Berk, 2015; Chauhan et al., 2019; Malhotra and Patra, 2014), three reviews evaluated mental disorders among elderly adults (Nadkarni et al., 2013; Pilania et al., 2019; Thapa et al., 2018), and three reviews studies maternal depression in pregnant and postpartum women (Arora and Aeri, 2019; Prabhu et al., 2019; Upadhyay et al., 2017). Moreover, one study evaluated psychiatric comorbidities among people with a history of alcohol use (Hendrickson et al., 2019), whereas two studies evaluated psychiatric comorbidities among

Table 3: Characteristics and the key findings of the included systematic reviews and meta-analyses

Source	Name(s) and timeframe of searching Databases	Number and type of primary studies; meta-analysis or systematic review	Country of the study population	Sample size and characteristics of the study population (if reported)	Prevalence rates (or other quantitative measures of epidemiological burden as specified), and related key findings
(Reddy and Chandrashekar, 1998)	Not reported	13; Meta-analysis	India	Total sample was 33,572 (ranged from 1060 to 5941 across studies); all age groups and participants from both rural and urban areas were included	The prevalence rates for overall psychiatric disorders (5.82%), organic psychosis (0.04%), schizophrenia (0.27%), affective disorders (1.23%), mental retardation (0.69%), epilepsy (0.44%), neurotic disorders (2.07%), manic depression (0.27%), endogenous depression (0.89%), neurotic depression (0.31%), alcohol or drug addiction (0.69%), emotional disorders (0.27%), and other mental disorders (0.39%) were reported. Participants of 35-44 age group, females, urban living, and low socioeconomic conditions had higher prevalence. Rural participants had higher prevalence of hysteria and epilepsy, and male participants had higher prevalence of affective psychosis, addiction, mental retardation, and personality disorders
(Ganguli, 2000)	Not reported	15; Meta-analysis	India	Sample size was not specified; 6 studies focused on rural population whereas 9 studies focused on urban population	Overall prevalence of mental disorders was 7.3% (range: 1.8% to 20.7%); prevalence of schizophrenia, affective disorder, anxiety neurosis, hysteria, and mental retardation was 0.20% (0.11-1.42), 3.4% (0.05-5.3), 1.65% (1.1-7), 0.33% (0.25-1.7), and 0.53% (0.14-2.53) respectively. Rural participants had higher prevalence if schizophrenia, affective disorder, and hysteria whereas urban participants had higher prevalence of anxiety, mental retardation, and overall mental disorders
(Mirza and Jenkins, 2004)	Applied Social Sciences Index and Abstracts, Cumulative Index to Nursing and Allied Health (CINAHL), Cochrane	20; Systematic review	Pakistan	Total sample was 9,170 for 17 prevalence studies (ranged from 113 to 2620); most studies recruited adult participants from rural and urban settings	The prevalence of anxiety disorders ranged from 28.8% to 66% among women and 10% to 33% among men among community-based samples; participants attending faith or traditional healers had different prevalence (11.5% to 52% for women and 2.65% to 27% for men) rates;

	Trials Register, Excerpta Medica, National Library of Medicine Gateway, MEDLINE (PubMed), PsycINFO, Science Citation Index, Social Science Citation Index, and additional sources; 2002				psychiatric morbidity reported in primary care ranged from 18% to 50%; prevalence of depressive disorders ranged from 19.1% to 66.3% in psychiatric outpatients
(Mills et al., 2008)	MEDLINE (PubMed), EMBASE, Cochrane Central, AMED, CINAHL, Development and Reproductive Toxicology, PsycINFO and Web of Science; 2007	6; Systematic review	Bhutan, Nepal	Total sample was 3,036 (ranged from 372 to 1,052); Bhutanese refugees living in Nepal were recruited	Tortured Bhutanese refugees had higher prevalence of posttraumatic stress disorder (prevalence 25%-33%, odds ratio [OR] 4.6 [95% CI: 2.7-8.0], relative risk [RR] 5.1 [95% CI: 4.6-5.5]), depression (prevalence 2%, OR 1.9 [95% CI: 1.4-2.6], mean 23.0 [SD 7]), anxiety (prevalence 4%, OR 1.5 [95% CI: 1.1-1.9], RR 1.6 [1.2-2.2], mean 14.3 [SD 5]), affective disorder (RR 2.3 [95% CI: 1.8-2.8]), somatic disorder (RR 2.0 [95% CI: 1.7-2.2], mean 25.3 [SD 8.30] to 26.1 [SD 16]), phobias (RR 0.8 [95% CI: 0.6-1.0], prevalence 8%), dissociative disorders (RR 4.2 [95% CI: 2.7-6.3], prevalence 8%), psychosocial problems (RR ranging from 0.9 to 0.95)
(Math and Srinivasaraju, 2010)	PubMed, Neuromed, MEDLAR, Additional journals; 1960-2009	16; Systematic review	India	Sample size ranged from 462 to 29468; general population from diverse settings were recruited	The prevalence of psychiatric morbidities ranged from 0.95% to 10.28% in general population; overall population-level estimated prevalence was reported as nearly 20%; prevalence rates for schizophrenia (0.5% to 1%), mood disorders (1.5% to 3%). Cannabis abuse (0.5% to 1%), opiate users (0.1% to 0.3%), alcohol dependence (0.3% to 0.4%), mental retardation (0.5% to 0.6%), dementia (0.2% to 0.5%), common mental disorders (0.2% to 0.3%), child and adolescent mental disorders (1.3% to 12.4%), geriatric mental disorders (2.5% to 3%) were reported. High risk populations including tribal, uprooted, marginalized individuals, and urban slum dwellers had a prevalence of 3.7% to 12.9% for different psychiatric morbidities

(Nadkarni et al., 2013)	PubMed, PsycINFO, Indmed; timeframe was not specified	31; Systematic review	India	Sample size ranged from 100 to 7554; population of interest was elderly adults from diverse settings; 27 studies recruited male participants only, remaining four had both male and female participants	The prevalence of alcohol use disorder among elderly adults ranged from .45% to 8% among the included studies. Also, a high prevalence of current alcohol use (ranging from 4.5% to 13.5%), regular alcohol use (up to 28.7%), and non-specific alcohol use (up to 72.3%) were reported across studies. Male participants had higher prevalence in most samples. Moreover, the prevalence of alcohol use was different among people in rural and urban areas and different age groups
(Newman, 2013)	Academic Search Premier, Anthropology Plus, PsycInfo, PubMed (MEDLINE), BioMedCentral, CINAHL, Bangladesh Journals Online (BanglaJol) and Ovid; 2012-13	61; Systematic review	Bangladesh	Sample size ranged from 97 to 2,005 among prevalence studies; primary studies that included adults aged fifteen years or above were recruited in this review	Samples from different population groups had varying levels of depressive disorders. The prevalence of depression ranged from 6.6% to 37% among general population. Men had lower prevalence (20.6%) than women. Maternal depression ranged from 11% among postpartum women with livebirth to 43% among women after perinatal death. Also, high prevalence of depression was found in participants with diabetes (29.7% to 36%) and fistula (97%). Moreover, people experiencing violence had suicidal ideation (11% to 28%) and depression (18% to 33%)
(Rajapakse et al., 2013)	PsycINFO, ProQuest Central, MEDLINE, Cochrane library, and additional journals; 2011	23; Systematic review	Sri Lanka	Varying sizes of random samples from clinical records (n = 41,579) were used alongside the reported cases (n = 64); participants of all age groups were recruited; however, majority of the participants were adolescents and young adults	Three studies reported self-poisoning or self-harm using pesticides with estimated rates of 79, 163, and 260 cases per 100,000 population. Four studies reported self-poisoning or self-harm using any substances with estimates rates of 26.2, 54.7, 318, 350, and 315 cases per 100,000 population. People who attempted self-poisoning had higher prevalence of psychiatric disorders (5% to 15.9%), alcoholism and related intoxication (2% to 50%), schizophrenia (1.2%), and depressive disorders (up to 18.5%)
(Hossain et al., 2014)	PubMed, Bangladesh Journals Online, and additional sources including grey literature and offline journals; 2013	32; Systematic review	Bangladesh	Sample size ranged from 210 to 3,564 for children and 327 to 13,080 for adult participants; study participants were recruited	Among the adult participants, the overall prevalence of mental disorders ranged from 6.5% to 31% with most common diagnosis as depression. The prevalence of mental disorders among children ranged from 13.4% to 22.9%. The rates were different for boys and girls, whereas

				from diverse rural and urban settings	children living in urban slums had high prevalence of mental disorders (15.2% to 22.9%). Also, high prevalence of depression was reported among people living with stroke (47%), cancer (54% to 56.6%), and diabetes (15.3% to 34%)
(Malhotra and Patra, 2014)	PubMed, Indian Journal of Psychiatry, Google; timeframe was not specified	23; Meta-analysis	India	Sample size ranged from 273 to 2064 in community-based studies and 460 to 982 in school-based studies; study population were children and adolescents	The prevalence of psychiatric disorders was 6.46% (95% CI: 6.08-6.88) and 23.33% (95% CI: 22.25-24.45) in the community-based and school-based studies, respectively
(Aggarwal and Berk, 2015)	MEDLINE, PsycINFO, Cochrane Central Register of Controlled Trials (CCRCT), Google Scholar, Embase, and additional sources; 2014	27; Systematic review	India	Sample size ranged from 80 to 6,721; participants were adolescents aged 10 to 19 years; most participants were recruited from educational settings	Overall prevalence of psychiatric morbidities (1.81% to 24.7%), depressive disorders (0.5% to 60%), suicidal ideation and attempts (3.9% to 25.4% were reported). Girls had higher prevalence of psychiatric problems compared to boys. Also, school dropouts had higher prevalence of psychiatric morbidities.
(Hossain et al., 2017)	PubMed, MEDLINE, EMBASE, Bangladesh Journals Online, Indian Journals, Pakistani Medical Journals and Drugs Database (PakMediNet), Sri Lanka Journals Online, Nepal Journals Online, and additional sources; 2016	6; Systematic review	Bangladesh (n = 3), India (n = 2), Sri Lanka (n = 1)	Sample size ranged from 374 to 18,480; age of the study population ranged from 18 months to 30 years' all participants were recruited from community settings	The prevalence of autism spectrum disorders ranged from 0.15% in Bangladesh to 1.07% in Sri Lanka
(Naskar et al., 2017)	PubMed, PubMed Central, Google scholar and Directory of Open Access Journal (DOAJ); 2016	41; Systematic review	India	Sample size ranged from 40 to 24,503; people living with diabetes; most studies had participants aged above 45 years	The prevalence of depression among people with diabetes ranged from 2% to 84%; the rates varied between 2% to 7% and 8% to 84% in type I and type II diabetes mellitus. People with advanced age, female gender, low education, longer duration of diabetes, rural residence and lower socioeconomic status had higher prevalence of depression

(Ranjan and Asthana, 2017)	PubMed, PsycINFO, EBSCOHost, Google Scholar, and additional sources; 2015	34; Meta-analysis	India (n = 20), remaining (n = 14) studies were from Bangladesh, Nepal, Bhutan, Bangladesh, Sri Lanka, Pakistan, and Afghanistan	Total sample was 158,555 (84,265 for Indian studies and 74,290 for remaining studies); diverse population from rural and urban areas of respective countries were recruited	Overall prevalence of mental disorders was 12.2% (95% CI: -8-25.2); for Indian studies, the prevalence was 5.6% (95% CI: 3.7-7.4); for remaining studies, the prevalence was 18.9% (95% CI: 16.5-21.2)
(Upadhyay et al., 2017)	PubMed, EMBASE, Google Scholar and additional sources; 2016	38; Meta-analysis	India	Total sample size was 20,043; postpartum mothers were the study population in the recruited studies	The pooled prevalence of postpartum depression was 22% (95% CI: 19-25, I ² = 96.8%); hospital-based studies reported higher prevalence (23%) than community-based studies (17%); urban participants had higher prevalence (24%) than rural participants (17%); depression was higher within 2 weeks postpartum (30%); the prevalence was 19% after excluding studies reporting depression within 2 weeks postpartum
(Hussain et al., 2018)	MEDLINE, Embase, and additional sources; 2018	43; Meta-analysis	India	Total sample size was 10,270; participants were diagnosed as type 2 diabetes	The pooled prevalence of depression among the participants was 38% (95% CI: 31-45). Studies comprising of female participants, less than 100 samples, published on/after 2014, and conducted in Southern states had higher prevalence of depression. Also, the presence of depression was more often associated with the presence of complications (OR 2.33, 95% CI: 1.62-3.36, p<0.00001),
(Thapa et al., 2018)	PubMed, CINAHL, Scopus, PsycINFO, and additional sources; 2000-2018	26; Systematic review	Nepal	Sample size ranged from 34 to 489; 100 to 489 in the community settings, 78 to 203 in aged care facilities and 34 to 257 in hospitals; participants were	The prevalence of depressive symptoms ranged from 25.5% to 60.6% in the community-based studies, 17.3% to 89.1% in aged-care facilities, 53.2% to 57.1% in hospital settings. The prevalence of depressive disorders ranged between 4.4% (in community) to 53.2% (in hospital). The

				elderly adults with mean age of age ranging from 67.3 to 78.2 years	prevalence of anxiety symptoms ranged from 21.7% to 32.3%. Other psychiatric morbidities among elderly included loneliness (69%), stress disorders (60%), neurotic and somatoform disorders (14%), mood affective disorders (46%), cognitive impairment (21%), dementia (11%-21%), schizophrenia and other forms of psychosis (20%)
(Hendrickson et al., 2019)	MEDLINE, Google Scholar, and additional sources; 2017	20; Meta-analysis	India	Sample size ranged from 11 to 2757; all the participants had history of alcohol use and most of them were men	The prevalence of comorbid mood disorders ranged from 6 to 65%; overall effect from a linear random-effects model was 18.0% (95% CI: 5.6-45.1) and rates of comorbid anxiety disorders ranging from 0 to 30%, overall effect was 2.4% (95% CI: 0.9-5.8)
(Arora and Aeri, 2019)	Google Scholar, PubMed, and additional sources; 2017	8; Systematic review	India	Sample size ranged from 80 to 302; all participants were pregnant women, most of them were in the third trimester	The prevalence of antenatal depression ranged from 9.18% to 65% within the recruited studies
(Chauhan et al., 2019)	PubMed, OvidSP, and EMBASE; 2018	4; Meta-analysis	India	Sample sizes ranged from 4,200 to 101,438; participants were children aged up to 15 years	The prevalence of autism spectrum disorder was 0.11% (95% CI: 0.01–0.20) and 0.09% (95% CI: 0.02–0.16) among children in rural and urban areas, respectively
(Mahendran et al., 2019)	PubMed, Science Direct, Scopus, Web of Science, PsycINFO, CINAHL, Global Health, Bangladesh Journals Online, Indian Citation Index, Index Medicus for South-East Asia Region, LILACS, Nepal Journals Online, PakMediNet, and additional sources; 2007-2018	33; Meta-analysis	South Asian countries; Pakistan (n = 14), India (n = 12), Bangladesh (n = 3), Sri Lanka (n = 2), Maldives (n = 1), Nepal (n = 1)	Total sample was 13,087 (sample size ranged from 45 to 1,400 across countries); all participants were pregnant women, most studies (n = 26) recruited participants from health facilities	The pooled prevalence of antenatal depression was 24.3% (95% CI: 19.03-30.47). The prevalence rates for India (17.74%, 95% CI: 11.19-26.96), Sri Lanka (12.95%, 95% CI: 8.29-19.68), Pakistan (32.2%, 95% CI: 23.11-42.87), Nepal (50%, 95% CI: 35.64-64.36), Bangladesh (22.52%, 95% CI: 14.86-32.6), and Maldives (24.02%, 95% CI: 20.32-28.14). No studies were found reporting antenatal depression in Afghanistan and Bhutan

(Pillania et al., 2019)	PubMed, Scopus, Web of Science, Embase, PsycINFO, IndMed, Google Scholar, and additional sources; 1997-2016	51; Meta-analysis	India	Total sample was 22,005 (sample size ranged from 41 to 2186); all studies were community-based and recruited elderly adults aged 60 years and above	The pooled prevalence of depression was 34.4% (95% CI: 29.3-39.7). Among the sub-groups, the pooled prevalence was higher among females (41%, 95% CI: 33.8-48.4), people living in rural areas (37.8%, 95% CI: 29.9-45.9) and eastern part of India (47.9%, 95% CI: 30.1-66.1). Studies using non-probability sampling, and GDS and CES-D screening tool had higher pooled prevalence and studies excluding dementia had lower prevalence. Also, studies with small sample size and low quality did not have significantly different prevalence estimations
(Prabhu et al., 2019)	PubMed, CINAHL, ProQuest, Scopus, and Google Scholar; 2005-2016	28; Meta-analysis	South Asian countries; Nepal (n = 5), Maldives (n = 1), Bangladesh (n = 1), Pakistan (n = 9), India (n = 12)	Total sample size was 15,345; postnatal women participants; most studies (n = 16) recruited participants from health facilities	The pooled prevalence of postnatal depression was 26% (95% CI: 21-30); the lowest reported prevalence was found in a study from Nepal (4.9%) whereas highest prevalence (57%) was reported in a study conducted in Pakistan; No studies were found from Sri Lanka, Bhutan, and Afghanistan

patients with diabetes mellitus (Hussain et al., 2018; Naskar et al., 2017). Studies recruited participants from diverse institutional and community-based settings. For example, Malhotra and Patra (2014) reviewed primary studies that recruited children and adolescents from communities and educational institutions (Malhotra and Patra, 2014). Thapa et al. (2018) reported primary studies that recruited elderly participants from communities, hospitals, and care homes (Thapa et al., 2018). Most studies reported multiple recruitment settings and strategies as per the objectives and contexts of the respective studies.

3.3 Prevalence of mental disorders in South Asia

The overall prevalence of mental disorders varied across studies. For example, a meta-analysis of 34 South Asian studies found the prevalence of mental disorders as 12.2% (Ranjan and Asthana, 2017), whereas the prevalence of mental disorders ranged from 0.95% to 10.28% in a systematic review of Indian studies (Math and Srinivasaraju, 2010) and 6.5% to 31% in a review of Bangladeshi studies (Hossain et al., 2014). The prevalence of mental disorders ranged from 1.81% to 23.3% among children and adolescents (Aggarwal and Berk, 2015; Malhotra and Patra, 2014). Moreover, the prevalence of various mental disorders ranged from 4.4% to 60.6% among elderly participants (Nadkarni et al., 2013; Pilia et al., 2019; Thapa et al., 2018). Also, the prevalence of specific mental disorders varied across reviews and populations within the respective primary studies. Differences in the prevalence rates were observed between rural and urban samples, the gender of the participants, community, and institutional settings (Aggarwal and Berk, 2015; Malhotra and Patra, 2014; Pilia et al., 2019; Reddy and Chandrashekar, 1998). Moreover, children who dropped out of schools, people living in urban slums, and other marginalized populations had a higher prevalence of mental disorders (Aggarwal and Berk, 2015; Hossain et al., 2014; Math and Srinivasaraju, 2010).

3.3.1 Depressive disorders, anxiety disorders, and mood disorders

Fourteen studies reported the prevalence of depressive disorders among different population groups ranging from 0.5% to 97%, which was heterogeneous among participants with diverse sociodemographic and pathophysiological conditions (Aggarwal and Berk, 2015; Arora and Aeri, 2019; Hossain et al., 2014; Hussain et al., 2018; Mahendran et al., 2019; Mills et al., 2008; Mirza and Jenkins, 2004; Naskar et al., 2017; Newman, 2013; Pilia et al., 2019; Prabhu et al., 2019; Reddy and Chandrashekar, 1998; Thapa et al., 2018; Upadhyay et al., 2017). For example, Newman (2013) reported the prevalence of depression was 6.6% to 37% among the general population, whereas 97% of patients with fistula experienced depressive disorders (Newman, 2013). Hossain et al. (2014) reported the prevalence of depressive disorders ranged from 15.3% to 56.6% among people living with noncommunicable diseases like diabetes, stroke, and cancer (Hossain et al., 2014). A meta-analysis found the prevalence of depressive disorders as 38% (95% confidence interval [CI]: 31-45) among type 2 diabetes patients (Hussain et al., 2018). The severity of depressive disorders also varied with age; another meta-analysis found 34.4% (95% CI: 29.3-39.7) of elderly adults had depressive disorders (Pilia et al., 2019). Moreover, maternal depressive disorders was reported in five reviews (Arora and Aeri, 2019; Mahendran et al., 2019; Newman, 2013; Prabhu et al., 2019; Upadhyay et al., 2017). A meta-analysis reported the prevalence of antenatal depressive disorders as 24.3% (95% CI: 19.03-30.47) (Mahendran et

al., 2019), whereas another meta-analysis reported the prevalence of postpartum depressive disorders as 26% (95% CI: 21-30) (Prabhu et al., 2019).

Three reviews reported the prevalence of anxiety, which ranged from 1.1% to 66% across independent samples (Ganguli, 2000; Mirza and Jenkins, 2004; Thapa et al., 2018). For example, community-based studies reported the prevalence of anxiety as 10% to 66%, whereas 2.65% to 52% of people attending traditional healers had anxiety disorders (Mirza and Jenkins, 2004).

Six reviews reported studies with prevalence rates for mood or affective disorders, which ranged from 1.23% to 65% (Ganguli, 2000; Hendrickson et al., 2019; Math and Srinivasaraju, 2010; Mills et al., 2008; Reddy and Chandrashekar, 1998; Thapa et al., 2018). For example, Ganguli (2000) reported 3.4% (95% CI: 0.05-5.3) of Indian samples had affective disorders, whereas Thapa et al. (2018) found 46% of Bhutanese refugees had affective disorders (Ganguli, 2000; Thapa et al., 2018).

3.3.2 Schizophrenia and other psychotic disorders

Four reviews found the prevalence of schizophrenia and other psychotic disorders among South Asian populations (Ganguli, 2000; Math and Srinivasaraju, 2010; Reddy and Chandrashekar, 1998; Thapa et al., 2018). A meta-analysis by Ganguli (2018) reported the prevalence of schizophrenia as 0.2% (95% CI: 0.11-1.42). Another meta-analysis reported a 0.04% prevalence of organic psychosis among Indian samples (Reddy and Chandrashekar, 1998).

3.3.3 Substance use disorders

Four reviews reported substance abuse and related mental disorders; the prevalence of alcohol use disorders was reported as 0.3% to 8% among diverse samples, whereas the prevalence of cannabis and opiate use was 0.5% to 1% and 0.1% to 3%, respectively (Hendrickson et al., 2019; Math and Srinivasaraju, 2010; Nadkarni et al., 2013; Reddy and Chandrashekar, 1998). A meta-analysis found a higher prevalence of multiple psychiatric comorbidities among people with a history of alcohol use (Hendrickson et al., 2019).

3.3.4 Suicidal behavior and self-harm

Three reviews reported a varying prevalence of suicidal behavior, including suicidal ideation, attempts, and self-harm (Aggarwal and Berk, 2015; Newman, 2013; Rajapakse et al., 2013). Newman found (2013) 11% to 28% of the victims of violence had suicidal ideation, whereas another review found 3.9% to 25.4% of adolescents had suicidal ideation and attempts (Aggarwal and Berk, 2015; Newman, 2013). A review from Sri Lanka reported 79 to 260 cases of self-harm per 100,000 population, where the affected individuals had a high prevalence of multiple psychiatric morbidities (Rajapakse et al., 2013).

3.3.5 Neurodevelopmental disorders

Two reviews reported the prevalence of autism spectrum disorders, which was 0.09% to 0.23% in India, 0.15% to 0.84% in Bangladesh, and 1.07% in Sri Lanka (Chauhan et al., 2019; Hossain et al., 2017). No other neurodevelopmental disorders were reported across the included reviews.

3.3.6 Dementia and cognitive impairments

Two reviews evaluated dementia and cognitive impairments; the prevalence of dementia was reported as 0.2% to 0.5% among the general population in India, whereas the rate of dementia and other forms of cognitive impairments ranged from 11% to 21% among the elderly population in Nepal (Math and Srinivasaraju, 2010; Thapa et al., 2018).

3.3.7 Other mental disorders

Several mental disorders are reported across studies with varying prevalence rates, which include phobias (8%), mental retardation (0.5% to 0.69%), , psychosocial disorders (0.9%), posttraumatic stress disorders (25% to 33%), somatic symptoms and related disorders (prevalence 14%, RR 2.0, 95% CI: 1.7-2.2), dissociative disorders (RR 4.2, 95% CI: 2.7-6.3), and stress disorders (69%) (Ganguli, 2000; Mills et al., 2008; Reddy and Chandrashekar, 1998; Thapa et al., 2018).

4. Discussion

4.1 Key findings and implications for future research

To the best of our knowledge, this is the first umbrella review that synthesized the current evidence on the prevalence of mental disorders in South Asia from evidence-based reviews. This review found high prevalence rates for various mental disorders in South Asian region. The current evidence informs that mental disorders including depressive and anxiety disorders, mood disorders, schizophrenia and psychotic disorders, neurodevelopmental disorders, substance use, suicidal behavior, dementia and cognitive disorders and many others are prevalent among diverse population groups among the South Asian nations. Moreover, most reviews searched a low number of databases within last two decades, which provide a limited overview of the recent studies on mental disorders. Such overview of epidemiological evidence may play critical roles in informing further research or interventions in different regions or populations. For example, an umbrella review identified prevalent mental disorders in refugee populations and informed evidence-based interventions which may improve mental health outcomes (Turrini et al., 2017). Furthermore, overview of regional psychiatric epidemiology may inform the need for further policymaking or research for mental disorders. For example, a review found a high prevalence of mental disorders among European countries with different odds of mental disorders among men and women (Fryers et al., 2004). Such regional synthesis of epidemiological evidence may provide a broader understanding of complex psychiatric problems and associated psychosocial and cultural determinants of mental health in a region. The current review summarized evidence from multiple reviews, which may offer critical insights on the current burden of mental disorders in South Asian region. However, the variability of the prevalence rates can be attributable to several factors, which should be discussed to better contextualize the findings and inform the scope of future research in this area.

First, the methodological differences including small samples, sampling methods, instruments used in measuring mental conditions, and operational definitions that evolved over time and used differently across contexts (Hussain et al., 2018; Malhotra and Patra, 2014; Pilania et al., 2019;

Reddy and Chandrashekar, 1998), which may have contributed to the variability of the prevalence estimates. Second, a major proportion of the recruited reviews had medium quality, which also limits the generalizability of the synthesized findings. High-quality reviews with quantitative synthesis using random or mixed-effects models could have provided a better estimation of the epidemiological burden of mental disorders in the respective reviews. Third, primary studies in the recruited reviews were conducted in diverse settings, including communities and health facilities (Malhotra and Patra, 2014; Math and Srinivasaraju, 2010; Ranjan and Asthana, 2017). This variability in sampling and recruitment strategies could have induced inappropriate estimations of the true burden of mental disorders within the study populations. Fourth, very few studies mentioned about vulnerable population groups, including slum dwellers, school dropouts, and refugees (Aggarwal and Berk, 2015; Hossain et al., 2014; Malhotra and Patra, 2014; Mills et al., 2008), who are more likely to experience higher psychosocial stressors and have lesser access to mental health services (Hossain and Purohit, 2018; Schulz et al., 2006). The epidemiological burden of mental disorders can be higher for such population groups, which necessitates further research focusing on vulnerable individuals. Fifth, this review synthesized the prevalence rates from reviews. Therefore, the prevalence of mental disorders that are not included in the published reviews may not be included in the synthesized findings. For example, primary studies have reported high prevalence rates of eating disorders in India and Pakistan (Memon et al., 2012; Nivedita et al., 2018), which has not been synthesized in the existing evidence-based reviews. Another example can be drawn from a study which found a high prevalence of somatization disorder in India (Chander et al., 2019). The existing reviews did not report such studies, which highlights a critical gap in the knowledge synthesis process and informs the need to synthesize evidence on less reported or recently published mental health issues. Sixth, people with preexisting medical conditions have shown a higher prevalence of depressive disorders. The number of studies presenting such evidence appears to be low compared to the high burden of noncommunicable diseases in South Asia (Ghaffar et al., 2004). Also, people with mental disorders may have non-communicable disease risk factors as found in a study from North India (Singh et al., 2019). Such coexistence of mental disorders with other medical conditions is a major population health concern in South Asia. Therefore, future psychiatric epidemiological studies should explore the mental health outcomes associated with other medical conditions to inform the evidence base better. Seventh, many reviews reported multiple mental disorders within the same study population, which indicates that some individuals may have co-occurring psychiatric multimorbidity. Such epidemiological issues require further evaluations of complex psychopathological phenomena in the South Asian population. Eighth, findings of this review show a similar burden in the South Asian countries where cultural diversity, as well as connectedness, may play critical roles in determining the mental health status and outcomes across population groups. It is essential to conduct transcultural psychiatric research to understand the cultural aspects of mental health and how those are associated with different mental conditions. Ninth, most reviews provided national-level estimates; however, fewer studies from Afghanistan, Bhutan, and the Maldives suggest potential gaps in primary research or research synthesis. In both scenarios, the mental health conditions of those nations should be evaluated to better understand the national and regional burden of mental disorders. Last but not least, the moderating effects of social, economic,

religious, and ecological variables may have resulted in a wide variability within the prevalence estimates (Kramer et al., 2002; Viswanath and Chaturvedi, 2012). Future research evaluating these constructs may complement the findings of this review and strengthen the knowledge base on mental health in South Asia.

4.2 Implications for mental health policymaking and practice

The findings of this review may have critical implications for mental health policymaking and practice. Epidemiological evidence including prevalence rates of mental disorders can be useful for evaluating the current burden of specific mental disorders or overall mental health in a given population (Aldrich et al., 2015). Therefore, the summarized findings of this review can facilitate in setting the country-level and regional mental health priorities and develop targeted systems-level interventions and policies in South Asian countries. Moreover, policy-level decisions on allocating resources for large scale epidemiological or experimental studies may necessitate a clear understanding of the prior evidence on epidemiological burden of mental disorders. This umbrella review can provide the summarized evidence for facilitating such decision-making. Also, the findings of this review suggest that South Asian countries have an overall high prevalence of mental disorders, which can be evaluated through the lens of shared sociocultural values and demographics in South Asia, allowing the collaborative development of educational contents for mental health providers, supportive caregivers, and community health workers, in this region. Such transcultural considerations may also enable regional collaborations to design and implement similar mental health interventions that are culturally appropriate for people living in different states or nations yet sharing a similar language or sociocultural constructs. In addition, a high epidemiological burden of mental disorders at the community settings illustrate the necessity to strengthen community mental health services to promote positive mental health, prevent mental disorders, and diagnose mental problems to ensure early management (Thornicroft et al., 2016). Such considerations can be made depending on context-specific determinants of mental disorders. For example, a population-based study from Sri Lanka found a high prevalence of postpartum depression alongside key risk and protective factors (Fan et al., 2020). An evaluation of such factors may complement the findings of this review and inform the development of prospective interventions for prevalent mental disorders across populations. Also, evidence-based mental health services should be evaluated and integrated in community health and primary care services, which may alleviate the burden of mental disorders in South Asia. Moreover, higher prevalence of mental disorders among children and adolescents in school-based studies informs potential avenues to improve school mental health services and engage parents, teachers, and other stakeholders to address mental health problems at early ages, which may substantially reduce the population burden of mental disorders at later stages of life (Hossain and Purohit, 2019; Malhotra and Patra, 2014). Also, socioeconomically marginalized populations may not have institutional measures to address mental disorders, which should be addressed through inclusive social health approaches. Local and national institutions may create meaningful partnerships engaging the community organizations, healthcare providers, and voluntary groups to ensure holistic care of persons with mental disorders (Acharya et al., 2017). Furthermore, a high prevalence of mental disorders can impose major economic challenges by reducing productivity and increasing the cost of mental health care. Therefore, developing and

implementing evidence-based policies to launch mental programs, financing strategies, and capacity building initiatives can be helpful in reducing the burden of mental disorders. As most of the South Asian countries have inadequate resources and capacities to address mental health problems (Hossain and Purohit, 2019), the updated evidence may facilitate mental health advocacy and promote the need to strengthen policies and programs for better mental health in this region. In addition, the national and regional burden of mental disorders also informs the need for national, regional, multilateral institutions, and global stakeholders to collaborate and facilitate mental health research and practice in South Asia. Such collaborations may facilitate sharing of the resources, development of multi-level mental health interventions, effective exchange of data, and collaborative research and actions to address mental health problems in South Asia.

4.3 Limitations of this review

This umbrella review has several limitations, which should be acknowledged. First, there are possibilities of publication bias as studies with insignificant findings may not have been published and communicated across the scientific community, which may limit knowledge synthesis from those studies. Second, potential selection bias may exist as databases that were not selected and searched in this review may contain articles meeting the criteria of this review. Third, reports, dissertations, and studies with mixed health outcomes or multiple countries outside South Asia may contain data relevant to this review, which were excluded in this review. Those findings could have added more insights into the burden of mental disorders in this region. Fourth, meta-epidemiological analyses synthesizing the patient-level data could have provided further insights for mental health research, which was not performed in this review as umbrella reviews aim to summarize the evidence rather than re-synthesis of primary studies (Aromataris et al., 2015). Although such evaluation was beyond the scope of our review, future evidence synthesis adopting diverse objectives and relevant methods can inform research hypotheses on psychiatric epidemiology. However, this review searched major databases in health sciences and systematically synthesized the findings with more than two authors involved in each stage of review, minimizing potential biases. Moreover, this review summarized the current evidence which is coherent with the existing guidelines and recommendations for conducting umbrella reviews (Aromataris et al., 2015; Biondi-Zoccai, 2016). Future evidence synthesis addressing the limitations of this umbrella review will improve the knowledge base on mental health in South Asia.

5. Conclusions

This umbrella review summarized the existing evidence on the prevalence of mental disorders in South Asia. Most studies in the recruited reviews inform a high epidemiological burden of mental disorders in South Asian countries, which need multi-level and multi-pronged interventions engaging the local, national, regional, and international stakeholders. Moreover, mental health policies, strategies, action plans, and services should be revisited to leverage the evidence and make informed decisions for mental health in this region. Despite sharing a major proportion of the global population, South Asian countries are historically constrained with low resources and many other socio-economic challenges, which affect the research capacities and

measures to address mental disorders at communities and institutions. However, in the past years, significant efforts to strengthen health systems in South Asia have yielded improved population health outcomes challenging the socioeconomic limitations (Chowdhury et al., 2013). Such opportunities should be explored and leveraged to address the burden and develop resilience in mental health care. The findings of this review may provide a scientific basis to prioritize critical mental health issues and develop cost-effective and evidence-based mental health interventions alleviating the burden of mental disorders. Lastly, the limitations of the existing literature should be addressed in future research and enable the mental health authorities, providers, patient communities, and other stakeholders to improve mental health in South Asia.

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Supplemental file 1: Critical appraisal of the systematic reviews and meta-analyses

Author and year of publication	Is the review question clearly and explicitly stated?	Were the inclusion criteria appropriate for the review question?	Was the search strategy appropriate?	Were the sources and resources used to search for studies adequate?	Were the criteria for appraising studies appropriate?	Was critical appraisal conducted by two or more reviewers independently ?	Were the methods used to combine studies appropriate?	Was the likelihood of publication bias assessed?	Were recommendations for policy and/or practice supported by the reported data?	Were the specific directives for new research appropriate ?	Overall score and quality rating
Reddy and Chandrashekar (1998)	Yes	CD	No	No	No	CD	Yes	No	No	Yes	3 (Low)
Ganguli (2000)	Yes	Yes	No	No	No	No	Yes	No	Yes	Yes	5 (Medium)
Mirza and Jenkins (2004)	Yes	Yes	Yes	Yes	Yes	No	CD	No	Yes	Yes	7 (Medium)
Mills et al. (2008)	Yes	Yes	CD	Yes	Yes	CD	Yes	No	Yes	Yes	7 (Medium)
Math and Srinivasaraju (2010)	Yes	Yes	Yes	CD	No	No	CD	No	Yes	Yes	5 (Medium)
Nadkarni et al. (2013)	Yes	Yes	Yes	Yes	No	No	Yes	No	Yes	Yes	7 (Medium)
Newman (2013)	Yes	Yes	Yes	Yes	No	No	Yes	No	Yes	Yes	7 (Medium)
Rajapakse et al. (2013)	Yes	Yes	Yes	Yes	No	No	Yes	No	Yes	Yes	7 (Medium)
Hossain et al. (2014)	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes	Yes	8 (High)
Malhotra and Patra (2014)	Yes	Yes	Yes	Yes	No	No	CD	No	Yes	Yes	6 (Medium)
Aggarwal and Berk (2015)	Yes	Yes	Yes	Yes	No	Yes	Yes	No	No	Yes	7 (Medium)
Hossain et al. (2017)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	9 (High)
Naskar et al. (2017)	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes	Yes	8 (High)
Ranjan and Asthana (2017)	Yes	Yes	Yes	Yes	No	No	Yes	No	No	Yes	6 (Medium)
Upadhyay et al. (2017)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	10 (High)
Hussain et al. (2018)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	9 (High)

Thapa et al. (2018)	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes	8 (High)
Hendrickson et al. (2019)	Yes	Yes	Yes	Yes	Yes	No	Yes	No	No	Yes	7 (Medium)
Arora and Aeri (2019)	Yes	Yes	Yes	Yes	No	No	Yes	No	Yes	Yes	8 (High)
Chauhan et al. (2019)	Yes	Yes	Yes	Yes	No	No	CD	No	No	Yes	5 (Medium)
Mahendran et al. (2019)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	10 (High)
Pilania et al. (2019)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	10 (High)
Prabhu et al. (2019)	Yes	Yes	Yes	Yes	No	No	Yes	No	Yes	No	6 (Medium)