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RESEARCH

Prevalence and associated factors of depression in Sri Lanka: a systematic review and meta-analysis

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Abstract

Purpose Epidemiological data on depression are required to inform policies and service planning in mental health in Sri Lanka. This review aimed to synthesise data from existing studies to calculate the pooled prevalence of depression in Sri Lanka, assess its variability across subgroups, and identify associated factors within each subgroup.

Methods PubMed, Embase, PsycINFO, Science Direct, Google Scholar and local journals were searched to identify peer-reviewed studies reporting the prevalence of depression among non-clinical adult, young, older, and maternal populations in Sri Lanka. A meta-analysis was performed using a random-effects model to calculate pooled prevalence estimates. Subgroup, sensitivity and moderator analyses were performed. A qualitative synthesis of factors associated with depression was conducted.

Results A total of 33 studies representing a total of 52,778 participants were included. Overall, the pooled prevalence of depression was 19.4% [14.44–25.54%]. Among subpopulations, the highest prevalence was reported among young persons (39%); the rates in adults, older persons and maternal populations were 8.7%, 18.4% and 16.9%, respectively. Prevalence estimates were higher when based on screening instruments (21.2%) compared to diagnostic interviews (4.3%). A high degree of heterogeneity ($I^2 = 99.2$) was observed. A qualitative synthesis of factors associated with depression, including individual attributes and behaviours, socio-economic circumstances and broader environmental factors, is reported for each age group.

Conclusion Approximately one-fifth of the population was detected to have depression. Notable variations in prevalence were observed across age groups. The heterogeneity of studies limits the inferences drawn from this review.

Keywords Depression · Prevalence · Epidemiology · Systematic review · Associated factors · Sri Lanka

Introduction

Depression is a leading cause of the global burden of mental disorders. In terms of morbidity, it is the second-highest cause of years-lived-with-disability among all diseases [1]. Depression-related mortality is mainly associated with other non-communicable diseases and suicides [2, 3]. Depression also causes an enormous economic burden on society [4].

Prevalence is a widely used measure of disease frequency that represents the proportion of cases in the population at a given point or period. The global prevalence of depression was estimated to be 3.44% in 2019 [5]. Age-standardised prevalence of depression in South Asia was noted to be 3.79% in the same year [5]. Nevertheless, cross-national prevalence rates of depression have been observed to vary markedly even within the same region [6]. Such variations in the background of the high disease burden warrant the need for data syntheses at national levels.

Sri Lanka is a South Asian country that provides free healthcare, including mental health services, to its population of twenty-two million [7]. Despite the country's well-established public health surveillance system, there is a gap in psychiatric epidemiology [8]. Outpatient data inflow is lacking in ambulatory care settings in the public and private sectors, where most patients with depressive symptoms may seek help [9]. Missed diagnosis of depression at the primary healthcare level leading to underreporting is another possibility [10]. Only a limited number of validated psychometric tools are available in Sri Lanka and likely affect

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the diagnostic accuracy in non-specialist settings [11]. Masked presentation of depression with somatic symptoms, which is not unusual in Sri Lankan society, would further increase false negatives [11]. Stigma towards mental illnesses is another important cause, especially in the South Asian region, that hinders the disclosure of symptoms and help-seeking [12]. This further adds to the hidden burden of depression in the community.

Accurate estimation of the community prevalence of depression is pivotal for healthcare planning and resource allocation. The last national-level, community-based survey of the prevalence of mental diseases in Sri Lanka had been conducted fifteen years before [8]. Furthermore, a tangible summative measure of disease frequency which can compare depression with other physical disorders may create better advocacy among policymakers and support the justification of investments in mental health.

Depression has been shown to have a significant association with people's age and gender [6]. The burden of depression was higher among females than males in South Asia [12]. The highest prevalence of depression has been observed among younger persons in high-income countries as opposed to the highest among older persons in low-income countries [13]. A subgroup analysis of depression prevalence may situate Sri Lanka within global patterns and help policymakers prioritise at-risk cohorts. These subpopulations also possess a set of unique and shared associations [14, 15]. A local understanding of those associations will facilitate more nuanced approaches to managing depression.

Thus, the main aim of this study was to determine the community prevalence of depression in Sri Lanka. Our other objectives were identifying how that prevalence varies between the young, adult, older-person and maternal subpopulations and the associated factors in each of those subgroups.

Methods

The protocol for this review was registered in the International Prospective Register of Systematic Reviews (PROSPERO) under registration number CRD42022299340. This review followed Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines [16].

Eligibility criteria

We included peer-reviewed observational studies available as full-text in English published from 1st January 2000 to 30th of April 2023. Experimental designs that provided baseline prevalence estimates were also included. Further, research theses where full-text was available online were also included. The studies were included if they calculated a point prevalence estimate of depression in a non-clinical community sample in Sri Lanka using either validated screening tools or clinical examinations. Depression was operationalised as fulfilling criteria for a major depressive disorder or any other form of depressive disorder. Community subpopulations were further defined as adults (between 25 and 60 years), young persons (between 10 and 24 years), older persons (above 60 years), and maternal populations (from the first trimester of pregnancy up to 12 months postpartum) [17, 18]. Studies related to clinical and at-risk populations were excluded. Surveys that calculated prevalence based on the response to a single question were excluded. Articles were not excluded based on sample size. An exception was made in including one non-peer-reviewed national mental health survey report due to the importance and relevance of the data. In studies conducted on the same cohort of individuals at different points in time or where samples overlapped, only the study with the largest sample was included in the meta-analysis.

Information sources and search strategy

We conducted a comprehensive search in the following electronic databases: PubMed, Embase, ScienceDirect and PsycINFO. We also accessed Google Scholar and key local journals, including Ceylon Medical Journal, Sri Lanka Journal of Medicine, Sri Lanka Journal of Psychiatry, Sri Lanka Journal of Child Health, and Journal of the College of Community Physicians. Snowballing of the references in the selected full-texts was also performed. The keywords "depression", "prevalence", and "Sri Lanka" were adopted accordingly for different databases. For example, the search strategy in PubMed was: (Depress*[Title/Abstract]) AND (SriLanka[Title/Abstract]). Searches were re-run prior to the final analysis.

Selection process

Search results were exported to 'Rayyan' online systematic review software [19]. Three investigators independently screened the titles and abstracts against the eligibility criteria, and disagreements were resolved by majority consensus. In the next stage, full-texts of the selected studies were retrieved and screened to confirm eligibility criteria; the authors were contacted whenever necessary. The PRISMA flow diagram in Fig. 1 summarises each stage of the selection process.

Data extraction

One investigator (IA) initially performed data extraction, and extracted datasets from each study were independently cross-examined for accuracy by the other two investigators

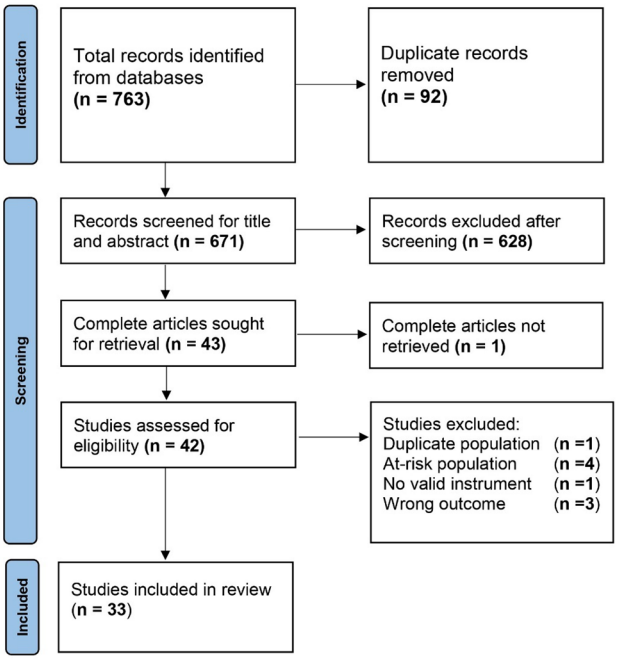

Fig. 1 PRISMA flow diagram

(AB & MC). The primary outcome variable was the prevalence of depression with the relevant numerator and denominator. The other variables extracted were the type of study, study setting, sample size, participant characteristics like the mean age, percentage of females, study instrument, and associated factors. Where data were missing, the original authors were contacted for additional details.

Risk of bias assessment

We used a tool to assess the risk of bias in prevalence studies developed by Hoy et al. [20]. This instrument was a ten-item checklist with good reliability and inter-rater agreement, which assessed the studies' internal and external validity. A total score was calculated based on the sum of item scores and studies with a final score of ≤ 3 were categorised as 'low-level of risk' and considered for the synthesis of results. Two investigators (IA & AB) independently assessed each study, and in cases of disagreements on the level of risk, the third investigator's (MC) opinion was sought to arrive at a majority decision.

Data analysis

The prevalence estimates in all the selected studies were meta-analysed to synthesise the overall community prevalence of depression. The pooled prevalence rate was calculated with 95% confidence intervals using the random intercept logistic regression method by the Meta and Metafor packages in RStudio. Heterogeneity was examined using the I^2 statistic and Cochran's Q test. Due to the high heterogeneity, a random-effects model was used for the meta-analysis. Synthesised results were displayed using forest plots and funnel plots. A subgroup analysis was performed to compare estimates across the specified subpopulations. Also, similar to the approach taken by previous meta-analyses on community prevalence of depression [21], a subgroup analysis was conducted to ascertain whether the type of tool assessing depression (screening versus diagnostic) influenced the prevalence findings. A sensitivity analysis of the overall prevalence was conducted by excluding maternal subpopulations as a risk category. Moderator analyses were performed to test the moderating effects of gender and year of publication on effect sizes due to the well-explored association of the former with depression [22] and the latter as a chronological proxy to the socio-political transitions in Sri Lanka. Publication bias was analysed by inspecting the funnel plots and Egger's test for funnel plot asymmetry; a significant p-value (<0.05) for Egger's test indicated publication bias.

Due to the inconsistency of data reporting related to associated factors, a qualitative synthesis was undertaken in place of a meta-analysis. A mental-health-determinants approach proposed by the World Health Organization was used to categorise associations [23]. Only statistically significant associations were considered for the synthesis. Multivariate analyses were preferred to bivariate analyses whenever available.

Results

Study characteristics

Study characteristics and the prevalence of depression in each study are presented in Table 1. All 33 included studies reported a point prevalence of depression, whereas two studies reported the lifetime prevalence of depression in addition to the point prevalence. The sample size in individual studies ranged from 92 to 18,182 (median = 505). Regarding age groups, five studies reported findings from adult populations, four among older persons, and eight among young persons. Sixteen studies reported findings from maternal (i.e., antenatal and postnatal) populations. The percentage of females in individual studies (excluding maternal populations) ranged from 44.6 to 75.6%. Of the 33 included studies, 30 used a validated screening tool, two used a diagnostic interview [11, 24], and one used both methods to detect depression [25]. Among the screening instruments, the most frequently used ones were Edinburgh Postnatal Depression Scale (EPDS) (14 studies), Geriatric Depression Scale (GDS-15) (4 studies), Depression Anxiety and Stress Scale (DASS-21) (4

Table 1 Study characteristics

No.	Study and year	Sample characteristics	Assessment method	Prevalence	Associated factors
Young persons					
1	Abayabandara-Herath et al. (2022)	Medical undergraduates of the University of Kelaniya n = 418 Mean age: NA Females: 67.2%	Depression, Stress and Anxiety Scale (DASS-21) Cut-off: NA	Point prevalence: 9.6%	Female gender ($p < 0.05$) Presence of economic difficulties ($p < 0.05$) Previous contact with psychiatric services ($p < 0.01$) Presence of medical or surgical impairments ($p < 0.01$)
2	Amarasuriya, Jorm and Reavley (2015)	Undergraduates of the University of Colombo n = 4304 Mean age: NA Females: 69.4%	Patient Health Questionnaire-9 (PHQ-9) Cut-off > /= 5	Point prevalence: Major Depression: 9.3% (95% CI 8.4 -10.2) Other Depression: 13.5% (95% CI12.5–14.5)	Living at a hostel (compared to coming from home) ($p < 0.05$) Being in 4th year (compared to 1st year) ($p = 0.007$) Being above 24 years (compared to 18–20 years) ($p < 0.05$) Exposure to two/multiple threatening events ($p < 0.001$) Harassment by another student (only among males) ($p = 0.01$)
3	Gamage et al. (2021)	Undergraduates of the Kotelawala Defense University n = 640 Mean age: NA Females: 75.8%	Depression Anxiety and Stress Scale (DASS-21) Cut-off > /= 10	Point prevalence: (Mild to extremely severe depression) 35.1%	The type of degree course ($p = 0.04$) Being under current medical treatment ($p = 0.002$) Coexisting anxiety ($r = 0.707$, $p = 0.000$) Coexisting stress ($r = 0.722$, $p = 0.000$)
4	Kodagoda and Meegoda (2020)	Undergraduates from a selected medical faculty n = 397 Mean age: 24.1 (SD 2.5) years Females: 44.6%	Depression Anxiety and Stress Scale (DASS-21) Cut-off: NA	Point prevalence: Normal level: 38.5% Severe:7.1% Extremely severe: 4.0%	Age ($p = 0.011$) Academic year ($p = 0.001$)
5	Perera et al. (2006)	Students from one semi-urban & two urban schools n = 891 Mean age: 16.4 (SD 1.2) years Females: 50.5%	Centre for Epidemiological Studies-Depression Scale (CES-D) Cut-off: > /= 16	Point prevalence: 57.7%	Among males, yearly alcohol use ($p = 0.001$) and yearly smoking ($p = 0.006$) Among females, yearly alcohol use ($p = 0.006$) and a low level of physical activity ($p = 0.002$)

Table 1 (continued)

No.	Study and year	Sample characteristics	Assessment method	Prevalence	Associated factors
6	Rathnayake and Ekanayaka (2016)	Nursing undergraduates from the University of Peradeniya n = 92 Mean age: 24.1 (SD 1.6) years Females: 69.6%	Depression Anxiety and Stress Scale (DASS-21) Cut-off: NA	Point prevalence: (Mild to extremely severe symptoms of depression) 51.1%	Older Age (25–27 years age group ($p < 0.001$) Being in 3rd/4th academic years ($p = 0.013$) Satisfaction with the nursing program ($p < 0.001$) Physical well-being factors ($p = 0.009$) Possible stressors ($p = 0.001$) Self-rated physical health ($p < 0.001$) Self-rated mental health ($p < 0.001$) Coexisting anxiety ($r = 0.689$, $p < 0.001$) Coexisting stress ($r = 0.785$, $p < 0.001$)
7	Rodrigo et al. (2010)	Students from two schools Rathnapura district n = 445 Age range: 14–18 years Females: 45.6%	Centre for Epidemiologic Studies Depression Scale (CES-D) Cut-off: > / = 16	Point prevalence: 36% (Mild: 17% Severe: 19%)	Female sex ($p < 0.001$) Being in classes facing barrier exams (Grade 11 & 13) ($p < 0.001$)
8	Wickramasinghe et al. (2023)	Second-year undergraduates of the University of Jaffna n = 637 Mean age: 23 (SD 0.98) years Females: 59%	Patient Health Questionnaire (PHQ-9) Cut-off: > / = 5	Point prevalence: 70% (Mild depression—39% Major depressive disorder—31%)	Factors associated with major depressive disorder, Sinhalese ethnicity (AOR: 2.87, 95% CI 1.30–2.75)
Adults					
9	Ball et al. (2010)	Sample of adult twins & non-twins living in the Colombo district n = 6014 Age range: 15 -84 years Females: NA	DSM-IV Criteria (Composite International Diagnostic Interview)	Point prevalence: 1.58% (95% CI 1.27–1.9) Lifetime prevalence: 6.6% (95% CI 5.9–7.2)	Female sex ($P < 0.01$) Middle/old age ($P < 0.01$) Sinhala ethnicity ($P < 0.01$) Being previously married ($P < 0.01$) Having been at school for less than ten years ($P < 0.01$) Living in an urban area (significant only among males) ($P < 0.01$) Lower standard of living (significant only among males) ($P < 0.01$) Period of unemployment in the last year (significant only among males of lower standard of living) (AOR 1.7)

Table 1 (continued)

No.	Study and year	Sample characteristics	Assessment method	Prevalence	Associated factors
10	Ferdinando et al. (2005)	Adults in Kalutara Divisional Director of Health Services area n = 939 Age range: 25–45 years Females: NA	DSM IV Criteria Composite International Diagnostic Interview (CIDI-Core lifetime version 2.1) The Center for Epidemiologic Studies Depression Scale (CES-D) Cut-off: > 15	Adjusted prevalence of life-time depression (using CIDI):7.8% (CI 6.1–9.5%) Point prevalence of depression (using CES-D): 11.2% (CI 9.2–13.2%)	Associated with current depression, Female sex Poor educational attainment Unemployment status Economic inactivity, being a 'samurdhi' recipient or being in debt Presently living in a rented house Abuse by partner Paternal antipathy Being fifth or more in the family Not taking 3 meals a day regularly Not undertaking exercises regularly Poor perceived social support Poor self-assessed health status
11	Institute for Research and Development in Health and Social Care (2007)	Adults from 17 districts in Sri Lanka n = 6120 Mean age:39.8 (SD 12.6) years Females: 62.0%	Primary Care Evaluation of Mental Disorders (PRIME-MD) Patient Health Questionnaire (PHQ) Cut-off: NA	Point prevalence: Major depressive disorder: 2.1% (95% CI 1.7–2.5) Other depressive disorder: 7.1% (95% CI 6.5–7.7)	
12	Jayasuriya et al. (2016)	Adults from 18 districts in Sri Lanka n = 18,182 Age range: 18 to above 60 years Females: 48%	Hopkins Symptoms Checklist (HSCL-25) Cut-off: > 1.75 for each subscale	Point prevalence: 12%	Predictive factors, Older age For those aged 51–60 years (OR 2·3 [95% CI 1·7–3·0]) For those aged older than 60 years (OR 2·4 [1·8–3·2]) Tamil ethnicity (OR 2·4 [1·8–3·1]) Membership of other ethnic minority groups (OR 2·7 [2·1–3·6]) Exposure to threat or protection issues (OR (1·8 [1·2–2·8]) Living in zones of, Severe conflict (OR (1·9 [1·4–2·6]) Moderate conflict (OR 1·7 [1·3–2·1]) Proximity to army camps (OR 1·6 [1·2–2·2]) Scarcity of food (OR 1·6 [1·2–2·2]) Protective factors, Safety in the community (OR 0·5 [0·4–0·7]) Access to healthcare (OR 0·7 [0·5–0·8]) Higher education (university or college level) (OR 0·6 [0·3–0·9])

Table 1 (continued)

No.	Study and year	Sample characteristics	Assessment method	Prevalence	Associated factors
13	Rodrigo, Kuruppuarachchi and Pathmeshwaran (2015)	Adults from Ragama and Ja-Ela Medical Officer of Health (MOH) areas n = 956 Mean age: 31.3 years Females: 56.2%	Structured Clinical Interview for DSM Disorders (SCID) Psychiatric evaluation	Point prevalence: 11.3%	
Older persons					
14	Khaltar et al. (2017)	> 60-year-old adults in the Kandy district n = 778 Mean age: NA Females: 61.3%	Geriatric Depression Scale (GDS-15) Cut-off score: ≥ 6	Point prevalence: 31.8%	Low economic status (AOR 1.9 CI 1.13–3.46) Low social support (AOR 3.6 CI 2.14–6.33) > 2 Self-reported diseases(AOR 2.9 CI1.63–5.32)
15	Malhotra, Chan and Ostbye (2010)	> 60-year-old adults from 13 districts of Sri Lanka n = 999 Mean age: NA Females: 55.2%	Geriatric Depression Scale (GDS-15) Cut-off score: ≥ 6	Point prevalence: 27.8%	Predictive of depression, Being a male in a minority group (AOR 3.64 [95% CI 1.60–8.26]) IADL limitation (AOR 2.26 [1.28–4.00]) Hearing difficulty (AOR 2.37 [1.51–3.72]) Physical disability (AOR 2.56 [1.08–6.10]) Perceived income inadequacy (AOR 1.97 [1.20–3.24]) Living alone (AOR 2.54 [1.21–5.33]) Protective of depression, Education above > 6 years of age (AOR 0.50 [0.33–0.76])

Table 1 (continued)

No.	Study and year	Sample characteristics	Assessment method	Prevalence	Associated factors
16	Rajapakshe, Sivayogan and Kulatunga (2018)	Adults between 60 and 74 years in urban areas of the Colombo district n = 1283 Mean age: 66.15 (SD 4.02) years Females: 52.8%	Geriatric Depression Scale (GDS-15) Cut-off score: ≥ 8	Point prevalence: Overall: 13.9% Mild Depression: 11.2% (95% CI 9.5–12.9) Moderate to Severe: 2.7% (95% CI 1.8–3.6)	Female sex (AOR 10.6, [95% CI 4.7–23.7]) Being 60–64 years old (AOR 1.6 [1.1–2.3]) Being unmarried/separated/divorced/widowed(AOR 3.7 [2.2–6.2]) Income ≤ 20 000 Sri Lankan rupees (AOR 2.2 [1.4–3.6]) Perceived financial burden (AOR 3.1 [2.0–4.9]) Smoking (AOR 2.1 [1.1–4.1]) Alcohol (AOR 7.58 [3.0–18.6]) Presence of Chronic Disease (AOR 1.5 [1.0–2.2]) Limitation in instrumental activities of daily living (AOR 1.7 [1.1–2.5]) Unsatisfactory partner relationship (AOR 2.9 [1.6–5.1]) Inadequate perceived social support (AOR 2.4 [1.6–3.7]) Experience of abuse (AOR 3.9 [2.0–7.2]) Experience of major life event (AOR 2.1 [1.4–3.1])
17	Senadheera et al. (2017)	Adults between 50–79 years in the Bope-Poddala MOH areas n = 300 Mean age: 62 (SD 8) years Females: 61%	Geriatric Depression Scale-Sinhala version (GDS-15) Cut-off: ≥ 6	Point prevalence: 8.3%	
Maternal populations					
18	Agampodi et al. (2011)	Postnatal mothers (with infants of 2–12 weeks) in 18 districts of Sri Lanka n = 1492 Mean age: 28.4 (SD 5.1) years	Edinburgh Postnatal Depression Scale (EPDS) Cut-off: > 10	Point prevalence: 27.1% (CI 24.9%- 29.4%)	Primiparous mothers and mothers with more than 3 pregnancies (compared to mothers with two or three pregnancies) (p < 0.001)
19	Agampodi and Agampodi (2013)	Antenatal mothers with POA of 24–36 weeks in the Anuradhapura district n = 376 Mean age: 27 (SD 5) years	Edinburgh Postnatal Depression Scale (EPDS) Cut-off: > 9	Point prevalence: 16.2% (95% CI 12.8–20.2%)	Symptoms of heartburn (p = 0.04)

Table 1 (continued)

No.	Study and year	Sample characteristics	Assessment method	Prevalence	Associated factors
20	Arachchi et al. (2019)	Antenatal mothers in the third trimester in the Anuradhapura district n = 475 Mean age: 28 (SD 6.5) years	Edinburgh Postnatal Depression Scale (EPDS) Cut-off: > 9	Point prevalence: 26.5%	Primary/post-primary or tertiary education compared to those who were in-between those two categories (OR1.94 [95% CI 1.1–3.3]) Reported suicidal ideation prior to pregnancy (OR 6.4 [95% CI 2.3–17.5])
21	Fan et al. (2020)	Postnatal mothers in two MOH areas in North Western and Southern province n = 1349 Age range: 15 to 49 years	Edinburgh Postnatal Depression Scale (EPDS) Cut-off: > 9	Point prevalence: 15.5% (10 days post-partum) 7.8% (4 weeks post-partum) (Only the first point prevalence was considered for this review)	Predictive factors, Delivery age over 35(AOR 7.73 95% CI [1.69–35.37]) Having more than 4 living children (AOR 6.62 [2.76–15.89]) Mothers' diseases before/after pregnancy (AOR 1.85 [1.18–2.90]) Protective factors, Attending prenatal care sessions(AOR 0.53 [0.32–0.90]) Partners being employed(AOR 0.36 [0.13–0.99])
22	Gankanda et al. (2021)	Postnatal mothers four clinics in Horana MOH area n = 225 Mean age: 28.3 (SD 5.52) years	Edinburgh Postnatal Depression Scale (EPDS) Cut-off: NA	Point prevalence: 7.1% (1-month post-partum) 4.3% (2 months) 0.9% (6 months) (Only the first point prevalence was considered for this review)	
23	Herath,Balasuriya and Sivayogan (2017)	Primigravid antenatal mothers in the second and third trimesters in the Kegalle district n = 1017 Mean age: 26.4 (SD 4.4) years	Edinburgh Postnatal Depression Scale (EPDS) Cut-off: > 9	Point prevalence: 10.4% (95% CI 8.7–12.4)	Protective factor, Husband helping with household work ($p < 0.0001$)
24	Herath, Sivayogan and Balasuriya (2016)	Quasi-experimental study (only the baseline value of the control group taken) Antenatal mothers in two MOH areas in the Kegalle district n = 234 Mean age: NA	Edinburgh Postnatal Depression Scale (EPDS) Cut-off: > 9	Point prevalence: 10.3%	

Table 1 (continued)

No.	Study and year	Sample characteristics	Assessment method	Prevalence	Associated factors
25	Jayakody and Hemachandra (2015)	Antenatal mothers in the Galigamuwa MOH area n = 346 Mean age: 28 (SD 5.1) years	Edinburgh Postnatal Depression Scale (EPDS) Cut-off: > 9	Point prevalence 22.8%	Total family income of ≤ 5000 rupees (p = 0.002) Low social class (p = 0.005) Undergoing 4th or 5th pregnancy (p = 0.001) Unplanned pregnancy (p = 0.001) Pregnancy-related complications (p = 0.005) Non-availability of social support (p = 0.001) Ever physical abuse (p = 0.001) Presence of two or more life events (p = 0.001)
26	Jayasinha and Perera (2019)	Antenatal mothers followed up at maternity clinics in the Galle district n = 203 Mean age: 29.5 (SD 4.8) years	Edinburgh Postnatal Depression Scale (EPDS) Cut-off: > 9	Point prevalence: 42.9%	Predictive factors, High income (compared to low income) (p = 0.007) Lack of support by husband (p < 0.000) Protective factors, Marital satisfaction (r = -0.44, p < 0.001)

Table 1 (continued)

No.	Study and year	Sample characteristics	Assessment method	Prevalence	Associated factors
27	Palfreyman (2021)	Antenatal mothers in the Gampaha district from all trimesters of pregnancy n = 1000 Age range: 16 to 42 years	Edinburgh Postnatal Depression Scale Cut-off score: > 9	Point prevalence: 29.6%	Predictive factors Unemployment of spouse (AOR 4.5 95% CI [1.2–17.]) Problematic drinking of spouse (AOR 2.2[1.4–3.3]) Spouse being jealous or angry (AOR 1.6 [1.1–2.5]) Spouse limiting family contact (AOR 3.0 [1.3–7.1]) Spouse not trusting with money (AOR 2.1 [1.2–3.6]) Experience of physical intimate partner violence (AOR 1.7 [1.04–2.9]) Lifetime history of only suicidal ideation (AOR 3.4[2.2–5.3]) Lifetime history of only suicidal behavior (AOR 9.0[1.9–42.2]) Lifetime history of both suicidal intention and behavior (AOR 8.7[4.7–15.9]) Protective factors Having secondary education (AOR 0.6[0.44–1.0]) Family history of mental disorder (AOR 0.3 [0.1–0.8]) Justifying intimate partner violence in the event of perceived neglect (AOR 0.6 [0.4–0.9])
28	Patabendige et al. (2020)	Antenatal mothers attending clinics at Castle Street Hospital for Women, Colombo n = 257 Mean age: 29.2 (SD 5.7) years	Hospital Anxiety and Depression Scale (HADS) Cut-off: ≥ 8	Point prevalence: 19.5%	Monthly family income of less than 50,000 rupees (p = 0.01) Watching television to seek COVID-19- related information for less than 6 h per day (p = 0.02)
29	Patabandige et al. (2022)	Antenatal mothers attending clinics at Castle Street Hospital and De Soysa Maternity Hospital n = 311 Mean age: 28.8 (SD 5.6) years	Hospital Anxiety and Depression Scale (HADS) Cut-off score: ≥ 8	Point prevalence: 27%	No significant associations detected

Table 1 (continued)

No.	Study and year	Sample characteristics	Assessment method	Prevalence	Associated factors
30	Solas et al. (2022)	Postnatal moths in Bope-Poddala MOH area in the Galle district n = 975 Mean age: 29 years	Edinburgh postnatal depression questionnaire (EPDS) Cut-off score: > 9	Point prevalence: 9.4%	Predictive factors Mothers aged 30–39 years (compared to mothers aged 20–29 years) (AOR 2.2 [95%CI1.3–3.8]) Mothers who had experienced newborn (AOR 28.9 [4.5–185.1]) Mothers who reported a former history of mental illness (AOR 32.9 [7.9–136.2]) Mothers with a BMI < 18.5 (AOR 3.0 [1.4–6.3]) Mothers with a BMI of 25.0–29.9 (AOR 2.6 [CI 1.5–4.5]) Mothers with hypertension (AOR 3.6 [1.2–10.9])
31	Tsuneta, Arai and Tamashiro (2022)	Postnatal mothers visiting the outpatient paediatric clinic at the Teaching Hospital Peradeniya in the Kandy district n = 490 Mean age: 28.6 (SD 5.3) years	Edinburgh postnatal depression questionnaire (EPDS) Cut-off: 9/10	Point prevalence: 15.5%	Mother's physical discomfort (p = 0.01) Present illness (p = 0.01) Primiparity (p = 0.04) Caesarian delivery (p = 0.01)
32	Wijesooriya, Palihawadana and Rajapaksha (2015)	Cohort study (Only the baseline value of the control group was taken) Antenatal mothers attending clinics at the Colombo North Teaching Hospital n = 179 Mean age: 27.5 years	Edinburgh postnatal depression questionnaire (EPDS) Cut-off score > 9	Point prevalence: 10.1%	
33	Wyatt et al (2021)	Antenatal mothers in Bope-Poddala MOH area in the Galle district n = 505 Age range: 16 – 43 years	Edinburgh postnatal depression questionnaire (EPDS) Cut-off: > 9	Point prevalence: 7.5%	Predictive factors: Pregnant women over 30 (AOR 3.15; 95% CI 1.31–8.53) (compared to women aged 26 – 30 years) Protective factors: Employed women (AOR 0.38; 95% CI 0.13–0.98) (compared to housewives) Primiparity (AOR 0.20 (0.05–0.74)

NA not available, *n* sample size, *SD* standard deviation, *p* p-value, *CI* confidence interval, *OR* odds ratio, *AOR* adjusted odds ratio, *r* Pearson's correlation r, *POA* period of amenorrhoea

studies), Center for Epidemiological Studies-Depression Scale (CES-D) (3 studies), Patient Health Questionnaire (PHQ-9) (3 studies), and Hospital Anxiety and Depression Scale (HADS) (2 studies); Hopkins Symptoms Checklist (HSCL) was used in one study. The three studies which used diagnostic interviews utilised the Composite International Diagnostic Interview (CIDI) and Structured Clinical Interview for DSM Disorders (SCID).

Risk of bias in studies

Thirty-two studies were adjudged to have a low risk of bias according to the risk of bias tool developed by Hoy et al. [20], with one study showing a moderate risk. The risk-of-bias assessments are presented in Table 2.

Prevalence of depression

The point prevalence of depression in individual studies ranged from 1.6 to 61%. The total number of participants

Table 2 Risk of bias assessment

Study	Score	Level of risk
Young persons		
Abayabandara-Herath et al. (2022)	4	Moderate risk
Amarasuriya, Jorm and Reavley (2015)	2	Low risk
Gamage et al. (2021)	2	Low risk
Kodagoda and Meegoda (2020)	3	Low risk
Perera et al. (2006)	3	Low risk
Rathnayake and Ekanayaka (2016)	3	Low risk
Rodrigo et al. (2010)	1	Low risk
Wickramasinghe et al. (2023)	3	Low risk
Adults		
Ball et al. (2010)	1	Low risk
Ferdinando et al. (2005)	2	Low risk
Institute for Research and Development in Health and Social Care (2007)	2	Low risk
Jayasuriya et al. (2016)	0	Low risk
Rodrigo, Kuruppuarachchi and Pathmeshwaran (2015)	3	Low risk
Older persons		
Khaltar et al. (2017)	3	Low risk
Malhotra, Chan and Ostbye (2010)	0	Low risk
Rajapakshe,Sivayogan and Kulatunga (2018)	1	Low risk
Senadheera et al. (2017)	3	Low risk
Maternal population		
Agampodi et al. (2011)	2	Low risk
Agampodi and Agampodi (2013)	1	Low risk
Arachchi et al. (2019)	3	Low risk
Fan et al. (2020)	3	Low risk
Gankanda et al. (2021)	3	Low risk
Herath,Balasuriya and Sivayogan (2017)	3	Low risk
Herath, Sivayogan and Balasuriya (2016)	1	Low risk
Jayakody and Hemachandra (2015)	2	Low risk
Jayasinha and Perera (2019)	2	Low risk
Palfreyman (2021)	1	Low risk
Patabendige et al. (2020)	3	Low risk
Patabendige et al. (2022)	3	Low risk
Solas et al. (2022)	2	Low risk
Tsuneta, Arai and Tamashiro (2022)	2	Low risk
Wijesooriya, Palihawadana and Rajapaksha (2015)	2	Low risk
Wyatt et al. (2021)	3	Low risk

in the 33 studies was 52,778, and the number of cases of depression was 9548. When pooled using a random-effects model, the aggregate point prevalence of depression was 19.4% [14.44–25.54%]. A high degree of heterogeneity was present among the studies ($I^2 = 99.2\%$ [95% CI 99.1%; 99.3%]; $tau^2 = 1.0640$; $Q = 4045$, $p < 0.001$). The forest plot with studies grouped according to subpopulations is shown in Fig. 2. The pooled lifetime prevalence of depression based on two studies [11, 25] was 6.76% (95% CI 6.19–7.38%).

Subgroup and sensitivity analysis

The pooled point prevalence rates of depression were calculated separately for the four subpopulations (Fig. 2): adults (8.66% [3.9–18%], k = 5, N = 32,121, $I^2 = 99.7\%$, Q = 1248), young persons (39% [22.69–58.16%], k = 8, N = 7669, $I^2 = 99.6\%$, Q = 1710), older persons (18.44% [10.75–29.8%], k = 4, N = 3323, $I^2 = 97.7\%$, Q = 129.8), and maternal populations (16.87% [12.92–21.74%], k = 16, N = 9665, $I^2 = 96.5\%$, Q = 430). These subgroup differences were statistically significant (Q = 11.3, p = 0.0101).

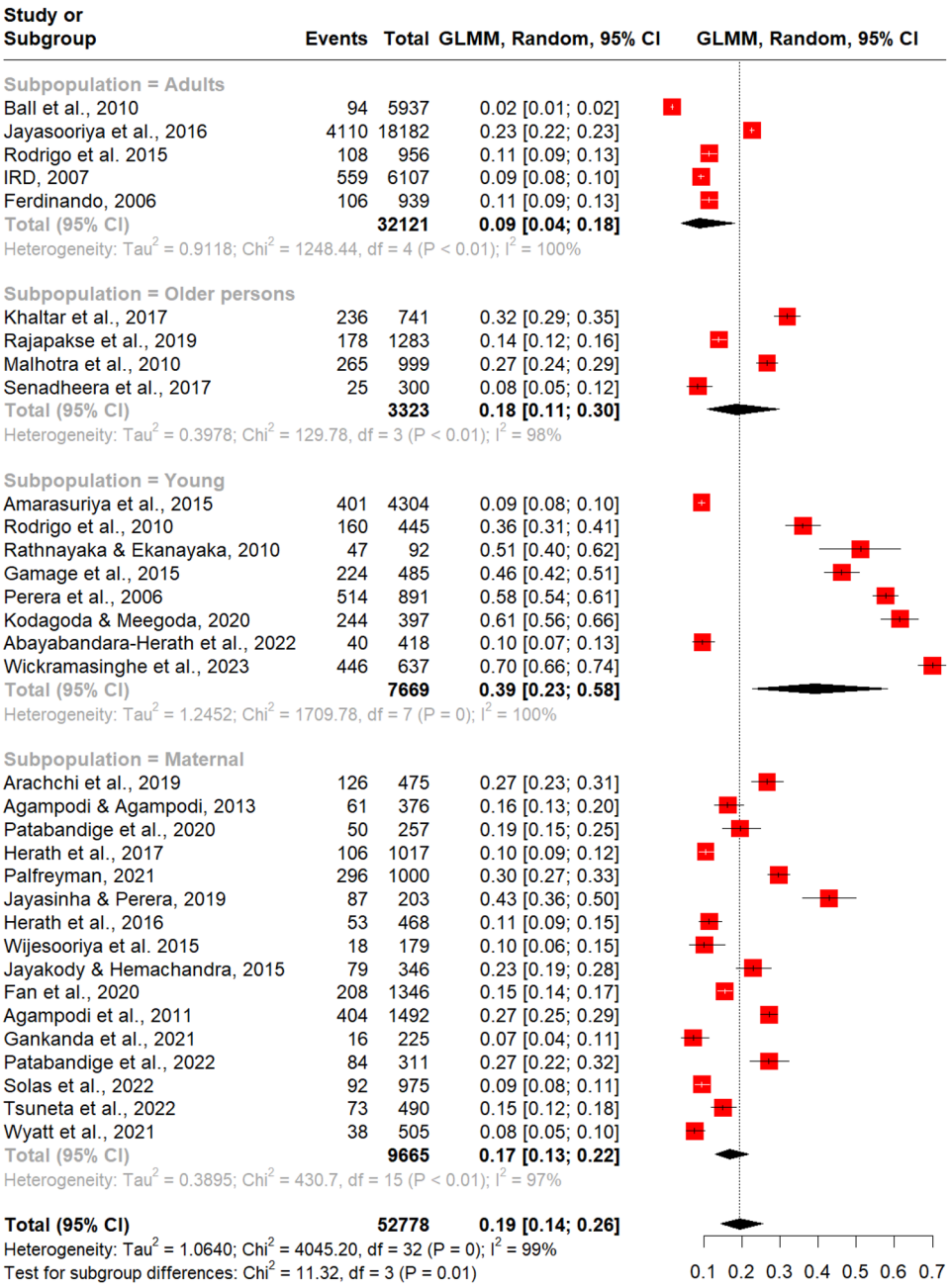

Fig. 2 Forest plot showing the findings from the meta-analysis of the prevalence of depression

A subgroup analysis compared the prevalence rates in studies that used screening instruments versus diagnostic interviews. The pooled prevalence of depression in screening-tool-based studies and interview-based studies was 21.16% (16.16–27.21%, $I^2 = 99.1\%$, $Q = 3243$) and 4.31% (95% CI 1.06–15.910–28%], $I^2 = 99.5\%$, $Q = 201$), respectively. This difference was statistically significant ($Q = 5.64$, $p = 0.0175$).

In a sensitivity analysis, when the maternal populations were excluded, the overall pooled prevalence increased slightly (22.12%; 95% CI 13.38–34.3%). In a separate sensitivity analysis, the exclusion of the study with a moderate risk of bias from the meta-analysis did not lead to a notable change in the overall pooled prevalence (19.8% [14.66–26.17%]).

Moderator analysis

A moderator analysis was conducted to assess whether the percentage of females in the sample and the year of publication moderated the prevalence estimates and heterogeneity. Neither the female percentage (regression coefficient = −0.0086, $p = 0.293$) nor the publication year (regression coefficient = 0.0044, $p = 0.903$) significantly moderated the studies' effect sizes. The heterogeneity accounted for by these two moderator variables (R^2) was close to zero.

Publication bias

Although the distribution of studies in the funnel plot showed some degree of asymmetry on visual inspection (Fig. 3), Egger's test did not evidence significant asymmetry of the funnel plot (t = −0.33, 0.7436, intercept = −1.2584 [SE = 0.2204]).

Associated factors

Associated factors were categorised into individual attributes and behaviours, social and economic circumstances, and broader environmental factors. The life course approach used in the original WHO discussion paper was followed according to the subgroups [23].

Young persons

Most studies showed no association between gender and depression among young persons [26–29]. Being older was associated with depression among university students [27, 30]. Students in senior grades in schools and senior batches in universities were more likely to show depressive symptoms [27, 28, 30, 31]. Ethnicity was also associated with depression among university students [32]. Tobacco use among male school students, alcohol use among both male and female students, and low physical activity among female students were significantly associated with depression [26]. Stress and anxiety were common associations with depression among university students [29, 30].

Concerning the immediate socio-economic circumstances, Amarasuriya et al.[27] reported that exposure to physical threats, family deaths, romantic break-ups, a problem with a close associate, educational difficulties, unemployment and domestic violence were significantly associated with depression among university students. Harassment by peers was an associated factor only among male students. The likelihood of depression was positively correlated with the frequency of exposure to threatening life events among these students [27]. Depression was also associated with economic difficulties among university students [33].

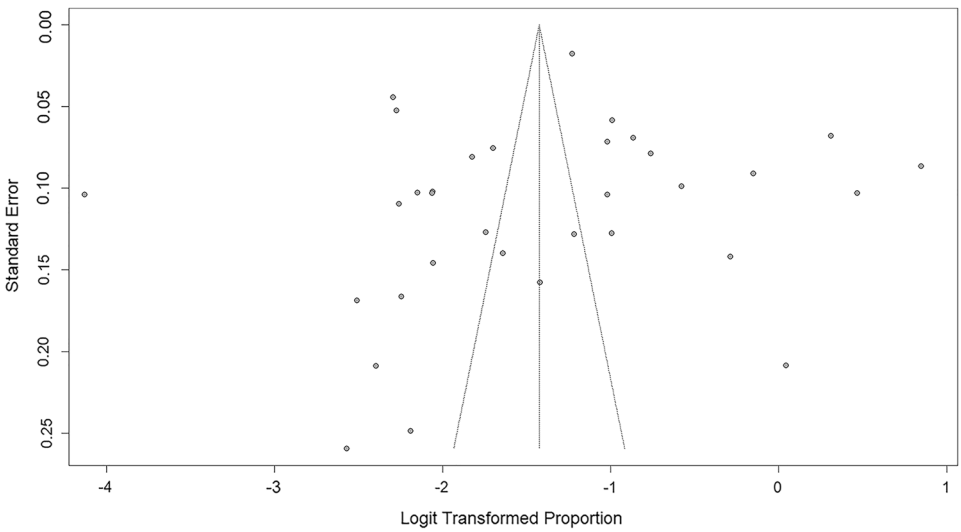

Fig. 3 Funnel plot of the included studies

Adults

Female gender and older age were identified as individual attributes that showed associations with depression in adults [11, 25, 34]. Ball et al. [11] studied the genetic and environmental contributions to depression as part of the CoTASS study and reported a higher genetic contribution in females (61%) than in males (4%). Ethnicity showed mixed results, with one study showing increased odds among the Sinhalese majority [11], whereas another study reported belonging to an ethnic minority to be associated with depression [34].

Being widowed, separated or divorced increased the odds of having depression [11]. Abuse by the partner and lack of perceived social support were also associated with depression [25, 34]. Lower educational status was another factor associated with adult depression [25, 34]. Self-rated financial difficulty and indebtedness were associated with depression [11, 25]. Ferdinando et al.[25] identified unemployment to be significantly associated with depression. However, according to Ball et al. [11], underemployment was significantly associated with depression only among males with lower living standards. In contrast, being employed was an associated factor for depression among females with lower living standards [11].

According to Ball et al. [11], the urban environment was associated with depression in men but not in women; they further reported that lower standards of living, including poor-quality structural material, poor-quality water and toilets, were associated with depression among males. In many studies, food insecurity was associated with adult depression [11, 25, 34]. At more structural levels, living in zones of civil conflicts and poor access to health care were associated with depression [34].

Older persons

The association between gender and depression among older persons was inconsistent. Three studies showed no significant relationship [35–37], whereas Rajapakshe et al.[38] found female gender as the strongest associated factor by multivariable analyses. Another study showed more complex gender-ethnicity interactions with depression, where only males in the ethnic minorities had increased odds of depression compared to males in the majority [36]. With regard to age, the 'young old' and 'middle old' categories were seen to have more odds of depression compared to the 'oldest old' categories [36, 38]. However, this association with age lost its significance when adjusted for the health status of the participants [36]. Chronic diseases were frequently associated with depression among older persons [35, 36, 38]. However, when adjusted for independent activities of daily living, this association was not significant [36]. Smoking and alcohol use were also associated with geriatric depression [38].

Low-income status and lack of social support were frequently associated with depression among older persons [35, 36, 38]. Being unmarried, widowed, separated, or divorced and experiencing abuse increased the odds of depression among older persons [38]. Post-primary education protected older persons against depression [36].

Maternal population

The association of depression with maternal age and parity was inconclusive. Arachchi et al., Agampodi et al., Patabandige et al. and Palfreyman [39–42] detected no significant association of maternal age and parity with depression. However, in other studies, advanced maternal age, primiparity and multiparity over three pregnancies were associated with depression [43–45]. Association with ethnicity was not significant [40, 41, 46]. Association with maternal diseases and pregnancy complications gave varied results [44, 45, 47, 48]. Both low and high maternal BMI increased the odds of depression [48]. History of lower-segment caesarean section was associated with depression [49]. Mothers' history of mental illness and suicidal ideation was a frequent association with depression [39–41, 48].

The husband's lack of support and exposure to intimate partner violence were frequently associated with maternal depression [41, 47, 49, 50]. Jayasinha and Perera[47] identified a weak negative correlation between marital satisfaction and depression among antenatal mothers. Both low and high-income statuses were associated with maternal depression [45, 47]. Studies failed to detect any association of depression with employment and the education level of mothers [40, 45–48]. Palfreyman[41] and Fan et al.[44] reported that having an employed spouse protected mothers against depression.

Discussion

To our knowledge, this is the first systematic review of depression in Sri Lanka. In this review, we performed a quantitative synthesis of data from 33 studies reporting the prevalence of depression among 52,778 subjects representing non-clinical samples in Sri Lanka to generate pooled prevalence estimates. We also qualitatively synthesised the factors associated with depression. Approximately one-fifth of the population (19.4%) was detected with depression. Among subpopulations, the highest prevalence was reported among young persons (39%); in contrast, the rates in adults, older persons and maternal populations were 8.7%, 18.4% and 16.9%, respectively. Prevalence estimates were higher when based on screening instruments (21.1%) versus

diagnostic interviews (4.3%). Many studies reported several factors associated with depression, including individual attributes and behaviours, socio-economic circumstances, and broader environmental factors.

The overall prevalence of depression

Cross-cultural comparison of depression becomes a challenging exercise since the variability of prevalence estimates could be related to the study design, type of instrument, diagnostic cut-off, and possible category fallacy [6]. Therefore, our findings on the prevalence of depression being significantly higher than the global (3.4%) and regional (3.7%) prevalence estimates in the Global Burden of Disease (GBD) studies need to be viewed with caution. Since we applied similar case definitions of depression used in GBD studies, this disparity could be mainly attributed to the epidemiological modelling techniques used in GBD studies [5].

The prevalence of depression found by this systematic review was higher than the estimates detected by two extensive population-based studies from neighbouring India (14.6% and 15.1%), which exclusively used screening tools [51, 52]. It was also higher than the prevalence (16.1%) for the Asian region reported in a systematic review, where data were predominantly obtained via screening tools [21]. These findings suggest that, compared to the regional counterparts, the community prevalence of depression in Sri Lanka may be higher.

Prevalence of depression in the subgroups

Regarding age groups, younger people showed the highest prevalence of depression. One possible reason for the remarkably high prevalence (39%) among young people may be that many studies were conducted among university students. University students may be at risk of becoming depressed due to academic stress. Akhtar et al.[53] have reported a 25% prevalence of depression among university students in low- and-middle-income countries. Among university students in Pakistan, the corresponding prevalence rate in a meta-analysis was 42.6% [54].

Among older persons, 18.4% were depressed in our analysis. In a meta-analysis of studies from neighbouring India, the estimated prevalence of depression among older persons was 34.4% [55]. Further, a WHO survey found that the prevalence of self-reported depression among adults above 50 years was lower in Sri Lanka compared to Bangladesh, India, and Nepal [56]. The reasons for the low prevalence of depression among older adults in Sri Lanka compared to regional countries are unclear. It may be related to the country's overall human development, health parameters and access to mental health care.

The prevalence of maternal depression in Sri Lankan studies was 16.9%. Similar figures (17.22%) have been found in global reviews for postnatal depression [57].

Associated factors

Among young people, most studies showed no association between gender and depression in our analysis. However, females have consistently demonstrated a preponderance of depression compared to men [22]. Further, among young participants, students in senior grades in schools and senior batches in universities were more likely to show depressive symptoms. Similar findings were seen among students in several Malaysian universities [58]. Higher academic demands and competitive examinations in senior years likely precipitate depression in students.

The current systematic review showed mixed results for depression and ethnicity. It is known that depression is underdiagnosed in ethnic minorities due to cultural variations in help-seeking and presentations [59, 60]. In Sri Lanka, ethnic and religious variations of depression have not been studied adequately. We would also have to consider the collective trauma experienced by minorities in the country during the armed conflict that lasted nearly three decades and its lasting psychological impact [61].

Among Sri Lankans, being widowed, separated or divorced increased the odds of having depression. Previous studies have suggested similar associations, but marital status, age, gender and depression have shown a complex interrelationship [62]. Therefore, when screening and treating depression in individuals, clinicians must carefully consider the existing psychosocial supports while understanding other contextual factors.

Several Sri Lankan studies found that unemployment and financial difficulty were associated with depression. These findings are aligned with worldwide data [63]. One of the Sri Lankan studies showed that, among people with lower standards of living, underemployment was significantly associated with depression only among males, and being employed was associated with depression among females [11]. Therefore, it appears that employment may have different impacts on depression among men and women.

In a few Sri Lankan studies, food insecurity was associated with depression. This is compatible with previous evidence [64, 65]. Currently, Sri Lanka is facing an unprecedented economic crisis with increased food insecurity, especially among the less-affluent groups [66]. The rates of depression are likely to increase in this context, and urgent measures need to be implemented to protect the vulnerable [67].

The association between chronic diseases and depression is well known and was also shown in several Sri Lankan studies, especially among older adults [68]. Moreover,

smoking and alcohol use were associated with depression across the subgroups. Worldwide studies have shown that comorbid substance use, especially alcohol use, is closely associated with depression [69, 70]. In Sri Lanka, old age and addiction psychiatry subspecialty services are at a rudimentary level, and combined substance and mood disorder management would be a more pragmatic approach.

Our analysis provided inconclusive results about maternal depression and its association with age and parity, and no association was observed with maternal education. Other multi-country reviews have found that maternal depression is significantly associated with maternal age, education, and parity [71]. Similar to our analysis, global reviews have also found that maternal depression is higher among women exposed to intimate partner violence [72]. Therefore, strategies to stop intimate partner violence should be components of the prevention of depression in Sri Lanka.

Limitations

The evidence presented in this review needs to be interpreted against several limitations. A wide range of methods has been used to assess depression. A remarkable disparity in prevalence rates was observed according to the type of assessment, where the prevalence of depression was much higher when assessed using screening tools (about five-fold) than in diagnostic interviews. Screening tools are generally developed aiming for high sensitivity, and their specificity may not be on par with sensitivity. Levis et al. [73] compared the prevalence of depression in meta-analyses based on screening tools versus diagnostic interviews and found a higher average prevalence in screening-based meta-analyses (31% vs 17%). Similarly, Lim et al. [21], who studied the prevalence of depression in thirty countries, found the aggregate prevalence with screening tools to be higher (17.3% vs 8.5%). It has been demonstrated that false positive rates with screening tools are disproportionately higher in populations where the true prevalence is low [73, 74].

As evinced by the findings of the studies that utilised structured diagnostic interviews in the present review [11, 24], the true prevalence of the depressive disorder in Sri Lanka may be lower than suggested by our aggregate estimates. Out of the preceding two studies, the more extensive study by Ball et al. [11] where DSM-IV criteria were used, reported a remarkably low point prevalence (1.6%). Thus, screening tools seem to exaggerate the prevalence of depression in epidemiological studies. Conversely, most diagnostic interviews may overlook milder forms of depression. This may be problematic as it could delay the detection and management of the early stages of depression and lead to unmet mental health needs in the community [21]. Moreover, diagnostic interviews are time-consuming and labour-intensive, limiting their application in epidemiological studies. Some approaches suggested for overcoming these problems include back calculation, prevalence matching and two-stage estimation [74].

Limited sample sizes of the included studies, especially in the subgroup analysis, were a major limitation of the evidence, which widened the confidence intervals. The paradoxically low lifetime prevalence of depression compared with point prevalence is likely due to recall bias. The cross-sectional nature of the included studies only allowed a synthesis of "associated factors" instead of 'risk factors'. The negative results of Egger's test may not exclude the possibility of reporting bias, given its low power and apparent asymmetry of the funnel plot on visual inspection [75]. But, this asymmetry could also have resulted from the high between-study heterogeneity observed in this review.

Clear-cut case definitions in the review helped in minimising clinical heterogeneity. Subgroup analysis based on the assessment method was performed in response to possible methodological heterogeneity [21]. However, statistical heterogeneity limited the inferences to be drawn from the meta-analysis. Female gender and publication year considered in the moderator analysis failed to explain the heterogeneity. The diverse age composition, geographic factors, and socio-economic status, in addition to the assessment method, could have contributed to this heterogeneity. But, insufficient and inconsistently reported data for the former variables precluded corresponding moderator analyses.

Implications for research and public health

Our study provides important implications for future research. First, it highlights the need for more population-based studies with larger samples to assess the true burden of depression in Sri Lanka. It showed that the bias in measuring depression using screening tools applies to Sri Lanka and emphasised the importance of choosing the right tools aligned with the objectives and feasibility. For example, using diagnostic interviews for future research on depression among young persons can help clarify whether the high prevalence of depression among youth in previous studies is an overdiagnosis.

The prevalence of depression detected by this study gives an alarming indication of the unmet burden of depression within the Sri Lankan community. This underscores the importance of 'community mental health' in the policy agenda of mental health service provision. For practice, this paper recommends integrated, community-based approaches with the involvement of mental health staff, public health personnel and community-based organisations that can strengthen primary and secondary prevention of depression. Currently, population-level screening for depression is done only for postpartum mothers in Sri Lanka. Nevertheless, the high prevalence of depression among young and older

persons compared to maternal populations calls for early detection strategies in these cohorts, at least to cover vulnerable groups identified in the paper. Furthermore, culturally relevant practices such as mindfulness could be incorporated into routine management to improve help-seeking and acceptability [76]. On balance, these empirical findings should encourage the state actors in Sri Lanka to increase financing and resource generation for preventive and curative mental healthcare.

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Data availability Data associated with this study are available upon reasonable request from the corresponding author.

Declarations

Conflict of interest The authors have no competing interests to declare relevant to this article's content.

References

1. Vos T, Lim SS, Abbafati C et al (2020) Global burden of 369 diseases and injuries in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. Lancet 396:1204–1222
2. Read JR, Sharpe L, Modini M, Dear BF (2017) Multimorbidity and depression: a systematic review and meta-analysis. J Affect Disord 221:36–46. https://doi.org/10.1016/J.JAD.2017.06.009
3. Hossain HUAD, Aftab A, Soron TR et al (2016) Suicide and depression in the World Health Organization South-East Asia Region: a systematic review. WHO South-East Asia J Public Heal 6:60–66
4. Greenberg PE, Kessler RC, Birnbaum HG et al (2003) The economic burden of depression in the United States: how did it change between 1990 and 2000? J Clin Psychiatry 64:5373
5. Collaborators GBD 2019 MD (2022) Global, regional, and national burden of 12 mental disorders in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. The Lancet Psychiatry
6. Kessler RC, Bromet EJ (2013) The epidemiology of depression across cultures. Annu Rev Public Health 34:119–138
7. Rajapaksa L, De Silva P, Abeykoon P et al (2021) Sri Lanka health system review
8. Institute for Research and Development in Health and Social Care (2007) National Mental Health Survey Sri Lanka. https://www.ird.lk/mental-health-survey/. Accessed 8 May 2022
9. Rathnayake D, Wikramasinghe C, Weerabaddana C (2019) Introduce new paper-based outpatient morbidity recording system to outpatient departments of public hospitals in Sri Lanka: feasibility study. J Hosp Manag Heal Policy 3:27
10. Mitchell AJ, Vaze A, Rao S (2009) Clinical diagnosis of depression in primary care: a meta-analysis. Lancet 374:609–619. https://doi.org/10.1016/S0140-6736(09)60879-5
11. Ball HA, Siribaddana SH, Kovas Y et al (2010) Epidemiology and symptomatology of depression in Sri Lanka: a cross-sectional population-based survey in Colombo District. J Affect Disord 123:188–196. https://doi.org/10.1016/j.jad.2009.08.014
12. Ogbo FA, Mathsyaraja S, Koti RK et al (2018) The burden of depressive disorders in South Asia, 1990–2016: findings from the global burden of disease study. BMC Psychiatry 18:1–11
13. Kessler RC, Birnbaum HG, Shahly V et al (2010) Age differences in the prevalence and co-morbidity of DSM-IV major depressive episodes: results from the WHO World Mental Health Survey Initiative. Depress Anxiety 27:351–364
14. Thapar A, Collishaw S, Pine DS, Thapar AK (2012) Depression in adolescence. Lancet (London, England) 379:1056–1067. https://doi.org/10.1016/S0140-6736(11)60871-4
15. Maier A, Riedel-Heller SG, Pabst A, Luppa M (2021) Risk factors and protective factors of depression in older people 65+. A systematic review. PLoS ONE. https://doi.org/10.1371/JOURNAL.PONE.0251326
16. Page MJ, McKenzie JE, Bossuyt PM et al (2021) The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. Int J Surg 88:105906
17. World Health Organization (2022) Adolescent health. https://www.who.int/southeastasia/health-topics/adolescent-health. Accessed 8 May 2022
18. United Nations (2022) Older persons—UNHCR|Emergency Handbook. https://emergency.unhcr.org/entry/43935/older-persons. Accessed 8 May 2022
19. Ouzzani M, Hammady H, Fedorowicz Z, Elmagarmid A (2016) Rayyan-a web and mobile app for systematic reviews. Syst Rev 5:1–10. https://doi.org/10.1186/S13643-016-0384-4/FIGURES/6
20. Hoy D, Brooks P, Woolf A et al (2012) Assessing risk of bias in prevalence studies: modification of an existing tool and evidence of interrater agreement. J Clin Epidemiol 65:934–939
21. Lim GY, Tam WW, Lu Y et al (2018) Prevalence of Depression in the Community from 30 Countries between 1994 and 2014. Sci Rep 8:2861. https://doi.org/10.1038/s41598-018-21243-x
22. Wang K, Lu H, Cheung EFC et al (2016) "Female preponderance" of depression in non-clinical populations: a meta-analytic study. Front Psychol. https://doi.org/10.3389/FPSYG.2016.01398/FULL
23. World Health Organization (2012) RISKS TO MENTAL HEALTH. https://www.who.int/publications/m/item/risks-to-mental-health. Accessed 25 May 2022
24. Rodrigo A, Kuruppuarachchi L, Pathmeswaran A (2015) Validation of the Beck Depression Inventory II among the Sinhalese speaking population in Sri Lanka. Sri Lanka J Psychiatry 6:20. https://doi.org/10.4038/sljpsyc.v6i2.8076
25. Ferdinando R, Seneviratne R, de silva D, Sumathipala A (2020) Title: Prevalence of depression in adults of 25–45 years in Kalutara Divisional Director of Health Services (DDHS) Area
26. Perera B, Torabi MR, Jayawardana G, Pallethanna N (2006) Depressive symptoms among adolescents in Sri Lanka: prevalence and behavioral correlates. J Adolesc Heal 39:144–146. https://doi.org/10.1016/j.jadohealth.2005.10.013
27. Amarasuriya SD, Jorm AF, Reavley NJ (2015) Prevalence of depression and its correlates among undergraduates in Sri Lanka. Asian J Psychiatr 15:32–37. https://doi.org/10.1016/j.ajp.2015.04.012
28. Kodagoda AS, Meegoda MKD (2020) The prevalence of depression among undergraduates of a selected medical faculty in Sri Lanka. J Heal Sci Innov Res 1:10. https://doi.org/10.31357/JHSIR.V1I01.4772
29. Gamage C, Perera V, Sivendran K, et al (2021) Depression, anxiety and stress levels among allied health undergraduates in a Defence University, Sri Lanka

30. Rathnayake S, Ekanayaka J (2016) Depression, anxiety and stress among undergraduate nursing students in a Public University in Sri Lanka. Int J Caring Sci 09:1020
31. Rodrigo C, Welgama S, Gurusinghe J et al (2010) Symptoms of anxiety and depression in adolescent students; a perspective from Sri Lanka. Child Adolesc Psychiatry Ment Health 4:10
32. Wickramasinghe A, Essén B, Surenthirakumaran R, Axemo P (2023) Prevalence of depression among students at a Sri Lankan University: a study using the Patient Health Questionnaire-9 (PHQ-9) during the COVID-19 pandemic. BMC Public Health 23:528
33. Abayabandara-Herath T, Premaratne I, Ediriweera D et al (2022) Psychological impact of COVID-19 among a cohort of Sri Lankan medical students: preliminary results. Age 20:0–2
34. Jayasuriya D, Jayasuriya R, Tay AK, Silove D (2016) Associations of mental distress with residency in conflict zones, ethnic minority status, and potentially modifiable social factors following conflict in Sri Lanka: a nationwide cross-sectional study. Lancet Psychiatry 3:145–153. https://doi.org/10.1016/S2215-0366(15)00437-X
35. Khaltar A, Priyadarshani NG, Delpitiya NY et al (2017) Depression among older people in Sri Lanka: with special reference to ethnicity. Geriatr Gerontol Int 17:2414–2420. https://doi.org/10.1111/ggi.13090
36. Malhotra R, Chan A, Ostbye T (2010) Prevalence and correlates of clinically significant depressive symptoms among elderly people in Sri Lanka: findings from a national survey. Int Psychogeriatrics 22:227–236. https://doi.org/10.1017/S1041610209990871
37. Senadheera C, Pathirana K, Jayasekara K et al (2017) Undiagnosed depression among older adults living in a semi urban community in Southern Sri Lanka. Gall Med J 22:1. https://doi.org/10.4038/gmj.v22i2.7967
38. Rajapakshe OBW, Sivayogan S, Kulatunga PM (2019) Prevalence and correlates of depression among older urban community-dwelling adults in Sri Lanka. Psychogeriatrics 19:202–211. https://doi.org/10.1111/psyg.12389
39. Arachchi NSM, Ganegama R, Husna AWF et al (2019) Suicidal ideation and intentional self-harm in pregnancy as a neglected agenda in maternal health; an experience from rural Sri Lanka. Reprod Health 16:166. https://doi.org/10.1186/s12978-019-0823-5
40. Agampodi SB, Agampodi TC (2013) Antenatal depression in Anuradhapura, Sri Lanka and the factor structure of the Sinhalese version of Edinburgh post partum depression scale among pregnant women. PLoS ONE 8:e69708. https://doi.org/10.1371/journal.pone.0069708
41. Palfreyman A (2021) Addressing psychosocial vulnerabilities through antenatal care-depression, suicidal ideation, and behavior: a study among urban Sri Lankan Women. Front Psychiatry 12:554808. https://doi.org/10.3389/fpsyt.2021.554808
42. Patabendige M, Wanniarachchi D, Weerasinghe M et al (2022) The sustained adverse impact of COVID-19 pandemic on mental health among pregnant women in Sri Lanka: a reassessment during the second wave. BMC Res Notes 15:3. https://doi.org/10.1186/s13104-021-05893-1
43. Agampodi TC, Agampodi SB, Wickramasinghe WAND et al (2011) Post partum depression—a problem that needs urgent attention. Ceylon Med J 56:183–184
44. Fan Q, Long Q, De Silva V et al (2020) Prevalence and risk factors for postpartum depression in Sri Lanka: a population-based study. Asian J Psychiatr 47:101855. https://doi.org/10.1016/j.ajp.2019.101855
45. Jayakody JMSNHNM (2015) Prevalence and psychosocial correlates of depression during antenatal period in pregnant women of medical officer health area Galigamuwa | Surangi Jayakody—Academia.edu. https://www.academia.edu/21530204/PREVALENCE_AND_PSYCHOSOCIAL_CORRELATES_OF_DEPRESSION_DURING_ANTENATAL_PERIOD_IN_PREGNANT_WOMEN_OF_MEDICAL_OFFICER_HEALTH_AREA_GALIGAMUWA. Accessed 5 Jun 2022
46. Wyatt S, Ostbye T, De Silva V et al (2021) Predictors and occurrence of antenatal depressive symptoms in Galle, Sri Lanka: a mixed-methods cross-sectional study. BMC Pregnancy Childbirth 21:758. https://doi.org/10.1186/s12884-021-04239-w
47. Jayasinha B, Perera N (2019) Exploring the relationship between depression and marital satisfaction amongst pregnant women residing in southern Sri Lanka. Sri Lanka J Psychiatry 10:4. https://doi.org/10.4038/sljpsyc.v10i1.8193
48. Røysted-Solås T, Hinderaker SG, Ubesekara L, De Silva V (2022) Mothers at risk of postpartum depression in Sri Lanka: a population-based study using a validated screening tool. PLoS ONE 17:1–12. https://doi.org/10.1371/journal.pone.0268748
49. Tsuneta M, Arai A, Tamashiro H (2022) Moderate effects of sense of coherence on the relationship between postpartum depression and its related factors at a teaching hospital in Sri Lanka
50. Herath INS, Balasuriya A, Sivayogan S (2017) Physical and psychological morbidities among selected antenatal females in Kegalle district of Sri Lanka: a cross sectional study. J Obstet Gynaecol J Inst Obstet Gynaecol 37:849–854. https://doi.org/10.1080/01443615.2017.1306697
51. Shidhaye R, Gangale S, Patel V (2016) Prevalence and treatment coverage for depression: a population-based survey in Vidarbha, India. Soc Psychiatry Psychiatr Epidemiol 51:993–1003. https://doi.org/10.1007/s00127-016-1220-9
52. Poongothai S, Pradeepa R, Ganesan A, Mohan V (2009) Prevalence of depression in a large urban South Indian population—the Chennai Urban Rural Epidemiology Study (CURES-70). PLoS ONE 4:e7185. https://doi.org/10.1371/journal.pone.0007185
53. Akhtar P, Ma L, Waqas A et al (2020) Prevalence of depression among university students in low and middle income countries (LMICs): a systematic review and meta-analysis. J Affect Disord 274:911–919. https://doi.org/10.1016/j.jad.2020.03.183
54. Khan MN, Akhtar P, Ijaz S, Waqas A (2020) Prevalence of depressive symptoms among university students in Pakistan: a systematic review and meta-analysis. Front Public Heal 8:603357
55. Pilania M, Yadav V, Bairwa M et al (2019) Prevalence of depression among the elderly (60 years and above) population in India, 1997–2016: a systematic review and meta-analysis. BMC Public Health. https://doi.org/10.1186/S12889-019-7136-Z
56. Bishwajit G, O'Leary DP, Ghosh S et al (2017) Physical inactivity and self-reported depression among middle- and older-aged population in South Asia: World health survey. BMC Geriatr 17:100. https://doi.org/10.1186/s12877-017-0489-1
57. Wang Z, Liu J, Shuai H et al (2021) Mapping global prevalence of depression among postpartum women. Transl Psychiatry 111(11):1–13. https://doi.org/10.1038/s41398-021-01663-6
58. Shamsuddin K, Fadzil F, Ismail WSW et al (2013) Correlates of depression, anxiety and stress among Malaysian university students. Asian J Psychiatr 6:318–323. https://doi.org/10.1016/J.AJP.2013.01.014
59. Ahmed K, Bhugra D (2007) Depression across ethnic minority cultures: diagnostic issues. World Cult Psychiatr Res Rev 2(2/3):47–56
60. Lara-Cinisomo S, Akinbode TD, Wood J (2020) A systematic review of somatic symptoms in women with depression or depressive symptoms: do race or ethnicity matter? J Women's Heal 29:1273–1282. https://doi.org/10.1089/JWH.2019.7975
61. Somasundaram D (2007) Collective trauma in northern Sri Lanka: a qualitative psychosocial-ecological study. Int J Ment Health Syst. https://doi.org/10.1186/1752-4458-1-5
62. Bulloch AGM, Williams JVA, Lavorato DH, Patten SB (2017) The depression and marital status relationship is modified by both age

and gender. J Affect Disord 223:65–68. https://doi.org/10.1016/J.JAD.2017.06.007
63. Amiri S (2021) Unemployment associated with major depression disorder and depressive symptoms: a systematic review and meta-analysis. Int J Occup Saf Ergon 28(4):2080–2092
64. Pourmotabbed A, Moradi S, Babaei A et al (2020) Food insecurity and mental health: a systematic review and meta-analysis. Public Health Nutr 23:1778–1790. https://doi.org/10.1017/S136898001900435X
65. Arenas DJ, Thomas A, Wang JC, DeLisser HM (2019) A systematic review and meta-analysis of depression, anxiety, and sleep disorders in US adults with food insecurity. J Gen Intern Med 34:2874–2882. https://doi.org/10.1007/S11606-019-05202-4
66. Matthias AT, Jayasinghe S (2022) Worsening economic crisis in Sri Lanka: impacts on health. Lancet Glob Heal 10:e959. https://doi.org/10.1016/S2214-109X(22)00234-0
67. Shoib S, Chandradasa M, Rathnayake L et al (2022) Children, adolescent, and youth mental health in Sri Lanka in the context of recent violence, COVID-19, and economic crisis: a call for action. Lancet Reg Health Southeast Asia 2:100021
68. Huang CQ, Dong BR, Lu ZC et al (2010) Chronic diseases and risk for depression in old age: a meta-analysis of published literature. Ageing Res Rev 9:131–141. https://doi.org/10.1016/J.ARR.2009.05.005
69. Hunt GE, Malhi GS, Lai HMX, Cleary M (2020) Prevalence of comorbid substance use in major depressive disorder in community and clinical settings, 1990–2019: systematic review and meta-analysis. J Affect Disord 266:288–304. https://doi.org/10.1016/J.JAD.2020.01.141
70. Alsheikh AM, Elemam MO, El-bahnasawi M (2020) Treatment of depression with alcohol and substance dependence: a systematic review. Cureus. https://doi.org/10.7759/CUREUS.11168
71. Tsakiridis I, Bousi V, Dagklis T et al (2019) Epidemiology of antenatal depression among women with high-risk pregnancies due to obstetric complications: a scoping review. Arch Gynecol Obstet 300:849–859. https://doi.org/10.1007/S00404-019-05270-1
72. Beydoun HA, Beydoun MA, Kaufman JS et al (2012) Intimate partner violence against adult women and its association with major depressive disorder, depressive symptoms and postpartum depression: a systematic review and meta-analysis. Soc Sci Med 75:959–975. https://doi.org/10.1016/J.SOCSCIMED.2012.04.025
73. Levis B, Yan XW, He C et al (2019) Comparison of depression prevalence estimates in meta-analyses based on screening tools and rating scales versus diagnostic interviews: a meta-research review. BMC Med 17:1–10
74. Thombs BD, Kwakkenbos L, Levis AW, Benedetti A (2018) Addressing overestimation of the prevalence of depression based on self-report screening questionnaires. CMAJ 190:E44–E49
75. Sterne JAC, Sutton AJ, Ioannidis JPA et al (2011) Recommendations for examining and interpreting funnel plot asymmetry in meta-analyses of randomised controlled trials. BMJ. https://doi.org/10.1136/bmj.d4002
76. Agampodi T, Katumuluwa S, Pattiyakumbura T et al (2019) Feasibility of incorporating mindfulness based mental health promotion to the pregnancy care program in Sri Lanka: a pilot study. F1000Research 7:1850. https://doi.org/10.12688/F1000RESEARCH.17049.2