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Complete List of Authors:	Behera, Priyamadhaba; AIIMS, Raebareli, Department of Community and Family Medicine Pilania, Manju; RUHS College of Medical Sciences, Department of Community Medicine Yadav, Vikas; Atal Bihari Vajpayee Government Medical College, Department of Community Medicine Bairwa, Mohan; IIHMR University, Jaipur, Public Health & Epidemiology Dabar, Deepti; AIIMS Bhopal Behera, Surama; Regional Medical Research Centre Bhubaneswar Poongothai, S.; Madras Diabetes Research Foundation Mohan, V; Madras Diabetes Research Foundation Gupta, Shiv; IIHMR University
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A systematic review protocol for estimation of the prevalence of depression using diagnostic instruments in the elderly population in India, 2000-2019

Authors

[1]Priyamadhaba Behera, MD, AIIMS, Raebareli, India
Email: priya.madhaba@gmail.com

[2]Manju Pilania, MD, RUHS College of Medical Sciences, Jaipur, India
Email: drmanjupilania@gmail.com

[3]Vikas Yadav, MD, Atal Bihari Vajpayee Government Medical College, Vidisha, India
Email: drvikasyadav@gmail.com

[4]Mohan Bairwa, MD, IIHMR University, Jaipur, India
Email: drmohanbairwa@gmail.com

[5]Deepti Dabar, MD, AIIMS, Bhopal, India
Email ID: deepti.dabar@gmail.com

[6]Surama Manjari Behera, MPH (student), RMRC-ICMR, Bhubaneswar, India
Email: surama.m92@gmail.com

[7]S. Poongothai, PhD, Madras Diabetes Research Foundation, Chennai, India
Email: poongothaisubramani@gmail.com

[8] Viswanathan Mohan, MD, PhD, Madras Diabetes Research Foundation, Chennai, India
Email: drmohans@diabetes.ind.in

[9]Shiv Dutt Gupta, MD, PhD, IIHMR University, Jaipur, India
Email: sdgupta@iihmr.edu.in

Short Title: Estimation of depression prevalence in the elderly population in India

Corresponding Author

Dr. Mohan Bairwa, MD
IIHMR University,
1, Prabhu Dayal Marg, Near Sanganer Airport,
Jaipur, India – 302029
Email ID: drmohanbairwa@gmail.com

Abstract

Introduction: Depression is a common mental disorder in the elderly population which has a significant impact on their quality of life. However, the correct estimate is not available on the magnitude of depression among elderly persons in India. Therefore, we have planned this systematic review and meta-analysis to estimate the depression prevalence using diagnostic instruments in the elderly population.

Methods and analysis: Searches will be performed in PubMed, Scopus, Embase, Web of Science, CINAHL, and PsycINFO. Community-based cross-sectional and cohort studies (2001 – 9/2019) reported the depression prevalence using diagnostic instruments among the elderly population will be included. Studies conducted among chronic patients, in-hospital patients, and other special groups such as with disaster-stricken experiences and the studies reporting the only subcategory of depression will be excluded. Disagreements in study selection and data abstraction will be resolved by consensus and arbitration by a third reviewer. AXIS critical appraisal tool will be used for quality assessment of individual studies. Findings of eligible studies will be pooled using fixed-effects or random-effects meta-analysis whichever appropriate. Heterogeneity between studies will be examined Cochran's Q test and quantified using I^2 statistic. The cumulative meta-analysis will be used to detect temporal trends in the depression prevalence and effect of poor-quality studies on the pooled estimate. Publication bias will be assessed by visual inspection of funnel plots and tested by egger test.

Ethics and dissemination: No ethical approval will be needed because it will be a systematic review. Data from previously published studies will be retrieved and analyzed. Findings will be disseminated through a peer-reviewed publication in a scientific journal and conferences.

PROSPERO registration number CRD42019138453.

Keywords: Prevalence, Depression, India, Elderly, Diagnostic tool, Systematic review

Strengths and limitations of this study

- The first-ever systematic review of depression prevalence in India based on diagnostic instruments only.
- The heterogeneity in methodologies such as diagnostic criteria, study duration, sampling design, and study locations may limit comparison across studies.

- Meta-analytic techniques such as cumulative meta-analysis, leave-one-out (jack-knife estimation) meta-analysis, and meta-regression will enrich the analysis and provide the estimate of prevalence nearer to the population estimate.
- A comprehensive synthesis of all available depression prevalence data in India using a standardized risk of bias tool.
- The protocol adheres to Preferred Reporting Items for Systematic Reviews and Meta-Analyses Protocols guidelines.

Word count: 2186

A systematic review protocol for estimation of the prevalence of depression using diagnostic instruments in the elderly population in India, 2000-2019

Introduction

Mental disorders are chronic in nature and highly prevalent conditions which have a significant impact on the quality of life (1–3). Depression not only affects the quality of life but also increases the risk of all-cause mortality including cardiovascular diseases and stroke (4). The Global Burden of Disease study projected that depression will be the leading cause of Disability Adjusted Life Years by 2020 in developing countries (5). Depression is the most common mental disorder which affects 322 million global population with prevalence ranged 4-13% minor depression and 1-4% major depression (6–8). In the era of population aging, the share of elderly persons will be almost double from 12% to 22%, between 2015 and 2050. This figure is expected to reach 19% by 2050 compared to 8.6% (2011) in India (9,10). This will further worsen the mental health situation of elderly populations in India.

Depression is already both underdiagnosed and undertreated mental disorder in elderly persons and its varied presentation makes the diagnosis more difficult. Elderly persons with depression have poorer functioning compared to their age-matched counterparts without depression and also have increased the cost of health care (8,11). Despite the fact that population is aging rapidly and its share in India is likely to increase from 8.6% (2011) to 19% by 2050 (9,10), little is known about its magnitude at national and regional level. With this background, we attempted to estimate the prevalence of depression in elderly population in India using published studies employed screening tests to identify depression (12). The study provided higher estimate of the depression prevalence in elderly populations, the screening tests might have overestimated the prevalence given higher sensitivity of the screening test albeit low specificity. The screening tests blur the distinctions between low- and high-prevalence population due to false positives(13–15). Moreover, the prevalence studies vary in methodologies including variable sensitivity and specificity of screening of tests, geographical and cultural characteristics, and level of expertise among data collectors (16–18). The studies indicated that prevalence of depression should be estimated using reliable and validated diagnostic tools to identify depression more accurately and to help for planning and health systems management (12,14). A comprehensive clinical interview using a sensitive and specific

diagnostic tool is the gold standard for confirming a diagnosis of depression and plan the appropriate therapy (19). Therefore, we planned this systematic review and meta-analysis to estimate the prevalence of depression including the studies used diagnostic instruments among elderly persons in India.

Methods

This systematic review protocol has been prepared in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-analysis Protocol (PRISMA-P) (20), which provides a standardized guide for performing systematic reviews and meta-analysis (Appendix 1. PRISMA-P checklist). The protocol has been registered on PROSPERO (CRD42019138453)(21).

Eligibility criteria

Elderly population aged 60 years and above in India is the population of interest. This review will include the studies with the following eligibility criteria:

Inclusion criteria:

1) Community-based cross-sectional and cohort studies published during 2001-9/2019
2) Studies reported the prevalence of depression/ depressive symptoms using diagnostic criteria/ instruments for identifying depression

Exclusion criteria

1) Studies among chronic patients, in-hospital patients, and other special groups such as with disaster-stricken experiences;
2) Studies which reported subcategory of depression only

Information sources

Searches will be performed in PubMed, Scopus, Embase, Web of Science, CINAHL, and PsycINFO. To enrich and supplement the literature search, the references of selected articles and relevant reviews will be scanned. Then, we will circulate a list of identified articles to the systematic review team, as well as to the selected experts working in this field to ensure the completeness of search results.

Search strategy

Initially, controlled descriptors (such as MeSH terms, CINAHL headings, PsycINFO thesaurus) will be identified in each database. Following keywords such as “psychiatric”, “depression”, “mental”, “depressive disorders”, “aged”, “geriatric”, “elderly”, “old aged”, “aging”, “prevalence”, “epidemiological studies”, “epidemiology”, and “India” will be used to develop the search strategy. Appropriate Boolean operators will be employed. We will not impose any language limit. The search will be limited to human subjects. Below the search strategy for PubMed is given:

#1. psychiatric OR depressi* OR mental OR "Depression"[Mesh] OR "Depressive Disorder"[Mesh]

#2. "Aged"[Mesh] OR geriatric OR elder* OR "old aged" OR aging

#3. "Prevalence"[Mesh] OR prevalence OR "Epidemiology"[Mesh] OR “epidemiological stud*”

#4. India

#5. #1 AND #2 AND #3 AND #4

#6. Filters: Publication date from 2001/01/01, Humans.

Selection process and data management

Two reviewers (MP and PMB) will conduct searches in all identified databases. All search results will be imported into Rayyan QCRI Software to ensure a systematic and comprehensive search and document the selection process (22). Another reviewer (VY) will manage the Rayyan and identify and remove the duplicate citations and ensure independent review of titles and abstracts by blinding the decisions of both reviewers. MP and PMB will review of titles and abstracts of the shortlisted citations in the Rayyan using a customized inclusion/exclusion checklist (population-based studies; depression prevalence, study duration, and India). Thereafter, VY will identify the discrepancies between the two reviewers in the Rayyan software and inform them for making consensus for the selection of the study. Full-text copies of all studies selected will be obtained to find more details. Both reviewers will review the full-text copies of articles to identify whether diagnostic instruments have been used to identify depression in the study participants.

We will record the reasons for the exclusion of all the studies for which we had obtained full copies. Wherever the studies have been reported in multiple publications/reports, all publications will be obtained. Whilst the study will be included as only one in the review and data will be extracted from all the publications to ensure maximal relevant data is obtained. The full-text copies of all selected articles will be evaluated for quality assessment and data extraction. The study selection process will be presented using PRISMA flow chart describing the reasons for the exclusion for the studies we will explore full texts.

The reference management software Mendeley Desktop for Windows will be used to store, organize, cite and manage all the selected references (23).

Data extraction

PMB and MP will independently perform data extraction on key information including study details (author, year of publication); methods (study design, study location, study setting, sample size, sampling method, non-response, age, sex, screening procedure, screening for dementia, diagnostic instrument); and results (risk factors of depression studied and prevalence data) will be extracted. Any disagreement in the data abstraction will be resolved by consensus and if required, the arbitration will be done by the members of the review team (MB, VM, and SDG). First or corresponding authors will be contacted if additional information will be required in the selected articles.

Risk of bias in individual studies

AXIS critical appraisal tool will be used for quality assessment of individual studies(24). The AXIS tool focuses mainly on the presented methods and results. The AXIS tool contains a 20-point questionnaire with “yes”, “no”, and “don’t know” answer that addresses study quality and reporting. The key areas in the AXIS tool included are study design, sample size justification, target population, sampling frame, sample selection, measurement validity and reliability, overall methods, and conflict of interest and ethical issues.

Strategy for data synthesis

In this systematic review, extracted data will be presented in comprehensive tables and flowcharts. The pooling of prevalence will be done using meta-analysis, in case, the relevant information is not available for meta-analysis, narrative synthesis will be performed. The effect size of interest is the proportion of elderly people with depression. It will be presented

using forest plot including individual prevalence, pooled estimates, and their 95% confidence intervals (CI). All pooled estimates will be calculated using appropriate model (fixed or random-effects model meta-analysis), based on the level of heterogeneity. Heterogeneity between studies will be examined using Cochran's Q test and quantified using I^2 statistic. A rough estimate of the heterogeneity will be as as follows: I^2 0% to 40% - might not be important; I^2 30% to 60% - may represent moderate heterogeneity; I^2 50% to 90% - may represent substantial heterogeneity; I^2 75% to 100% - considerable heterogeneity. The importance of the observed value of I^2 will depend on (i) magnitude and direction of effects and (ii) strength of evidence for heterogeneity. Sensitivity and subgroup analyses will be used to identify the causes of heterogeneity. If required, meta-regression will be employed to determine the sources of heterogeneity (25).

A cumulative meta-analysis will be done to detect temporal trends in the depression prevalence over the years and the effect of quality of studies. In the cumulative meta-analysis, studies are added one at a time in a specified order (e.g. according to date of publication or quality) and the results are summarised as each new study is added. In a graph of a cumulative meta-analysis each horizontal line represents the summary of the results as each study is added, rather than the results of a single study (26,27). All analysis will be done using updated versions of STATA(28) and R software (with meta and metafor packages) (29,30).

Assessment of publication bias

Publication bias will be assessed by visual inspection of funnel plots and testing using Egger's weighted regression, with $p<0.1$ considered indicative of statistically significant publication bias (31).

Sensitivity analysis

Sensitivity analysis (32) will be done to remove the influence of low-quality studies. We will also explore the effect of small studies (fewer than 100 participants), and studies not fulfilling age criteria fully such as participants aged 65 years or more. In particular, the Leave-One-Out method (also known as Jackknife estimation) in which we recalculate the results of our meta-analysis $K-1$ times (where K is a total number of studies), each time leaving out one study. We will then compare the new pooled prevalence with that of the original pooled prevalence of depression. If the new pooled prevalence will lie outside of the 95% CI of the original

pooled prevalence, we will conclude that the excluded study has a significant effect on the pooled estimate and should be excluded from the final analysis (33,34). Some other issues may also be identified for sensitivity analysis during the systematic review process.

Analysis of subgroups or subsets

In order to reduce the random variations between the estimates of the primary studies, we will perform subgroup analysis wherever feasible: study setting, geographical region (states), states by GDP per capita, type of diagnostic instrument, dementia screening, sampling design, and study period.

Patient and Public Involvement

No patients were directly involved in the design of this study. The data for this systematic review will be collected from previously published studies.

Discussion

Screening tools are simple to administer, take less time and are highly useful in primary care settings to screen the people for depression (35). However, confirming a diagnosis of depression by a diagnostic tool provides the true picture of the magnitude of depression. The estimated prevalence of depression was significantly higher when self-reporting instruments or screening tools were used to assess the depression (12,18). The estimation based on screening tools varied widely with the type of study tools, geographic region, sample size, sampling methods, and prevalent socio-cultural differences in the country. These may be responsible for different levels of mental health disorders in India. Hence, we will address this issue by using different meta-analytic techniques such as subgroup and sensitivity analyses such as jackknife estimation, meta-regression, and cumulative meta-analyses.

In India, National Mental Health Survey (NMHS) reported a lower prevalence of lifetime depression (3.14%) and during the previous 12-month period (1.7%) (36) compared to pooled data from 18 countries (n= 89,037) which estimated the average lifetime and 12-month prevalence estimates of DSM-IV MDE to be 14.6% and 5.5% in 10 high-income countries and 11.1% and 5.9% in 8 low- to middle-income countries, respectively (37). This study will provide the unique opportunity to compare the magnitude of depression estimated using

screening tools and findings of NHMS with the pooled estimate of various research studies which have used diagnostic instruments for identification of depression among elderly persons in India.

In India, mental health services receive a minor fraction of the overall health budget, which is grossly inadequate in proportion to the rising burden of mental disorders. In addition, there is a lack of robust and reliable data to address the need for community based mental health services planning and management. The findings of this study, i.e., the estimated magnitude of depression among elderly persons using diagnostic instruments, distribution among subgroups, and regions will help to plan and manage geriatric mental health program in a better way and will provide further directions to future research in the depression epidemiology and its burden in the elderly population. It will also strengthen the provision of comprehensive mental health services, consequently, comprehensive primary health care among geriatric population in India, which is a pressing need for elderly populations given their rising share in the total population.

Ethics and dissemination: No ethical approval will be needed because it will be a systematic review. Data from previously published studies will be retrieved and analyzed. Findings will be disseminated through a peer-reviewed publication in a scientific journal and conferences.

Abbreviations

GBD – Global Burden of Disease
GDP – Gross Domestic Product
NMHS – National Mental Health Survey

Supplementary data

Not applicable.

Availability of data and materials

Will be available once collected.

Author Contributions

Conceived the idea: PMB, MB, VY, MP, and SDG. Designed the protocol and wrote the paper: MB, VY, MP, PMB, DD, SMB, VM, SDG, and SP. Critical revision to the manuscript: MB, VY, MP, PMB, DD, SP, VM, and SDG. All authors have read and approved the manuscript. PMB and MB are the guarantors of the paper.

Conflicts of Interest: None declared.

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Data sharing statement: No additional data are available.

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Appendix 1

Reporting checklist for protocol of a systematic review.

Based on the PRISMA-P guidelines.

Instructions to authors

Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

Your article may not currently address all the items on the checklist. Please modify your text to include the missing information. If you are certain that an item does not apply, please write "n/a" and provide a short explanation.

Upload your completed checklist as an extra file when you submit to a journal.

In your methods section, say that you used the PRISMA-Preporting guidelines, and cite them as:

Moher D, Shamseer L, Clarke M, Ghersi D, Liberati A, Petticrew M, Shekelle P, Stewart LA. Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols (PRISMA-P) 2015 statement. Syst Rev. 2015;4(1):1.

		Reporting Item	Page Number
Title			
Identification	#1a	Identify the report as a protocol of a systematic review	1,3
Update	#1b	If the protocol is for an update of a previous systematic review, identify as such	N/A
Registration			
	#2	If registered, provide the name of the registry (such as PROSPERO) and registration number	2,4
Authors			
Contact	#3a	Provide name, institutional affiliation, e-mail address of all protocol authors; provide physical mailing address of corresponding author	1

Contribution	#3b	Describe contributions of protocol authors and identify the guarantor of the review		9
Amendments				
	#4	If the protocol represents an amendment of a previously completed or published protocol, identify as such and list changes; otherwise, state plan for documenting important protocol amendments	N/A; not a significant amendment is planned in the protocol.	
Support				
Sources	#5a	Indicate sources of financial or other support for the review		9
Sponsor	#5b	Provide name for the review funder and / or sponsor		N/A
Role of sponsor or funder	#5c	Describe roles of funder(s), sponsor(s), and / or institution(s), if any, in developing the protocol		N/A
Introduction				
Rationale	#6	Describe the rationale for the review in the context of what is already known		3
Objectives	#7	Provide an explicit statement of the question(s) the review will address with reference to participants, interventions, comparators, and outcomes (PICO)		4
Methods				
Eligibility criteria	#8	Specify the study characteristics (such as PICO, study design, setting, time frame) and report characteristics (such as years considered, language, publication status) to be used as criteria for eligibility for the review		4
Information sources	#9	Describe all intended information sources (such as electronic databases, contact with study authors, trial registers or other grey literature sources) with planned dates of coverage		4

Search strategy	#10	Present draft of search strategy to be used for at least one electronic database, including planned limits, such that it could be repeated	4-5
Study records - data management	#11a	Describe the mechanism(s) that will be used to manage records and data throughout the review	5
Study records - selection process	#11b	State the process that will be used for selecting studies (such as two independent reviewers) through each phase of the review (that is, screening, eligibility and inclusion in meta-analysis)	5-6
Study records - data collection process	#11c	Describe planned method of extracting data from reports (such as piloting forms, done independently, in duplicate), any processes for obtaining and confirming data from investigators	6
Data items	#12	List and define all variables for which data will be sought (such as PICO items, funding sources), any pre-planned data assumptions and simplifications	6
Outcomes and prioritization	#13	List and define all outcomes for which data will be sought, including prioritization of main and additional outcomes, with rationale	6
Risk of bias in individual studies	#14	Describe anticipated methods for assessing risk of bias of individual studies, including whether this will be done at the outcome or study level, or both; state how this information will be used in data synthesis	6
Data synthesis	#15a	Describe criteria under which study data will be quantitatively synthesised	6-8
Data synthesis	#15b	If data are appropriate for quantitative synthesis, describe planned summary measures, methods of handling data and methods of combining data from studies, including any planned exploration of consistency (such as I2, Kendall's τ)	7-8

Data synthesis	#15c	Describe any proposed additional analyses (such as sensitivity or subgroup analyses, meta-regression)		7-8
Data synthesis	#15d	If quantitative synthesis is not appropriate, describe the type of summary planned		6
Meta-bias(es)	#16	Specify any planned assessment of meta-bias(es) (such as publication bias across studies, selective reporting within studies)		7
Confidence in cumulative evidence	#17	Describe how the strength of the body of evidence will be assessed (such as GRADE)	N/A; almost all studies will be cross-sectional studies, hence, the use of GRADE is not required, however, heterogeneity will be assessed using subgroup and sensitivity analyses.	

Notes:

- 4: N/A; not a significant amendment is planned in the protocol.
- 17: N/A; almost all studies will be cross-sectional studies, hence, the use GRADE is not required, however, heterogeneity will be assessed using subgroup and sensitivity analyses.
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A systematic review protocol for estimation of the prevalence of depression using diagnostic instruments in the elderly population in India, 2000-2019

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A systematic review protocol for estimation of the prevalence of depression using diagnostic instruments in the elderly population in India, 2000-2019

Authors

[1]Priyamadhaba Behera, M.D., AIIMS, Raebareli, India
Email: priya.madhaba@gmail.com

[2]Manju Pilania, M.D., RUHS College of Medical Sciences, Jaipur, India
Email: drmanjupilania@gmail.com

[3]Vikas Yadav, M.D., Atal Bihari Vajpayee Government Medical College, Vidisha, India
Email: drvikasyadav@gmail.com

[4]Mohan Bairwa, M.D., AIIMS, New Delhi, India
Email: drmohanbairwa@gmail.com

[5]Deepti Dabar, M.D., AIIMS, Bhopal, India
Email ID: deepti.dabar@gmail.com

[6]Surama Manjari Behera, MPH (student), RMRC-ICMR, Bhubaneswar, India
Email: surama.m92@gmail.com

[7]S. Poongothai, Ph.D., Madras Diabetes Research Foundation, Chennai, India
Email: poongothaisubramani@gmail.com

[8] Viswanathan Mohan, M.D., Ph.D., Madras Diabetes Research Foundation, Chennai, India
Email: drmohans@diabetes.ind.in

[9]Shiv Dutt Gupta, M.D., Ph.D., IIHMR University, Jaipur, India
Email: sdgupta@iihmr.edu.in

Short Title: Estimation of depression prevalence in the elderly population in India

Corresponding Author

Dr. Mohan Bairwa, MD
Centre for Community Medicine,
All India Institute of Medical Sciences,
Ansari Nagar, New Delhi, India – 302029
Email ID: drmohanbairwa@gmail.com

Abstract

Introduction: Depression is a common mental disorder in the elderly population, which significantly impacts their quality of life. However, correct estimates of its magnitude are not available in the elderly in India. The present systematic review and meta-analysis would attempt to estimate the prevalence of depression using diagnostic instruments among elderly persons aged 60 years and above.

Methods and analysis: Searches will be performed in PubMed, Scopus, Embase, Web of Science, CINAHL, and PsycINFO. Community-based cross-sectional and cohort studies (2001 – 9/2019) reporting the prevalence of depression in the elderly; using diagnostic instruments will be included. Studies conducted among chronic disease patients, in-hospital patients, and special groups such as with disaster-stricken populations, and studies reporting the only 1 or 2 subcategories of depression, will be excluded. Disagreements in study selection and data abstraction will be resolved by consensus and arbitration by a third reviewer. AXIS critical appraisal tool will be used for quality assessment of individual studies. Findings of eligible studies will be pooled using fixed-effects or random-effects meta-analysis whichever is appropriate. Heterogeneity between studies will be examined by Cochran's Q test and quantified by I^2 statistic. A cumulative meta-analysis will be used to detect temporal trends in the prevalence of depression and the effect of poor-quality studies on the pooled estimate. Publication bias will be assessed by visual inspection of funnel plots and the Egger test.

Ethics and dissemination: No ethical approval will be needed because it will be a systematic review. Data from previously published studies will be retrieved and analyzed. Findings will be disseminated through a peer-reviewed publication in a scientific journal and conferences.

PROSPERO registration number CRD42019138453.

Keywords: Prevalence, Depression, India, Elderly, Diagnostic tool, Systematic review

Strengths and limitations of this study

- It is a first-ever systematic review of depression prevalence in India based on diagnostic instruments only.
- Meta-analytic techniques such as cumulative meta-analysis, leave-one-out (jack-knife estimation) meta-analysis, and meta-regression will enrich the analysis and provide the estimate of prevalence nearer to the population estimate.
- A comprehensive synthesis of all available depression prevalence data in India using a standardized risk of bias tool.
- The protocol adheres to Preferred Reporting Items for Systematic Reviews and Meta-Analyses Protocols guidelines.
- Heterogeneity in methodologies, such as diagnostic criteria, study duration, sampling design, and study locations may limit comparison across studies.

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A systematic review protocol for estimation of the prevalence of depression using diagnostic instruments in the elderly population in India, 2000-2019

Introduction

Mental disorders have emerged as one of the major health problems in India and globally. Being chronic in nature, they significantly impact the quality of life (1–3). Depression is the most common mental disorder affecting 322 million people globally, with a prevalence ranging from 4 to 13% for minor depression and 1 to 4% for major depression (4–6). Depression affects not only the quality of life but also increases the risk of all-cause mortality, including cardiovascular diseases and stroke (7). The Global Burden of Disease study projected that depression will be the leading cause of Disability-Adjusted Life Years (DALY) in developing countries by 2020 (8). Depression has emerged out as a significant risk factor for suicidality and suicide deaths in India (9). With the rapid population aging, the proportion of elderly persons is estimated to increase from 12% to 22% between 2015 and 2050 in the world. In India, the figure will rise from the current 8.6% in 2011 to 19% by 2050 (10,11). This underscores the significant health burden depression will place on elderly people in India in the years to come. In India, "elderly persons" are those who have attained the age of 60 years and above (12,13).

Depression is both an underdiagnosed and undertreated mental disorder in elderly persons, and its varied presentation makes its diagnosis difficult. Elderly persons with depression have poorer functioning as compared to people in a similar age group without depression and have increased health care costs (6,14). Even though India's population is rapidly aging, little is known about the magnitude of depression at the national and regional levels. The estimated prevalence of depression among elderly persons from rural community-based studies of India varied highly from 12.7% to 53.7% (15). With this background, we attempted to estimate the prevalence of depression in the elderly population in India, using published studies that employed standardized screening tests to identify depression (16). That study could have provided a higher estimate of the depression prevalence in elderly people as the screening tests might have overestimated the prevalence, given the higher sensitivity of the screening tests, albeit their low specificity. Indeed, the screening tests blur the distinctions between low and high prevalence populations due to false positives (17–19).

Moreover, the prevalence studies vary in methodologies, including variable sensitivity and specificity of screening of tests, geographical and cultural characteristics, and level of expertise among the investigators (20–22). Nevertheless, these studies indicated that the prevalence of depression should be estimated using reliable and validated diagnostic tools to identify depression more accurately and to help with planning and health systems management (16,19). A comprehensive clinical interview using a sensitive and specific diagnostic tool is the gold standard for confirming a diagnosis of depression, which also helps plan the appropriate therapy (23). Therefore, we designed this systematic review and meta-analysis to estimate the prevalence of depression by including the studies that have used diagnostic instruments among elderly persons in India.

Methods

The protocol has been prepared following the Preferred Reporting Items for Systematic Reviews and Meta-analysis Protocol (PRISMA-P) (24), which provides a standardized guide for performing systematic reviews and meta-analysis (Appendix 1. PRISMA-P checklist). The protocol has been registered on PROSPERO (CRD42019138453) (25).

Eligibility criteria

The elderly population aged 60 years and above in India is the population of interest. This review will include the studies with the following eligibility criteria:

Inclusion criteria:

1) Community-based cross-sectional and cohort studies published during 01/2001 – 9/2019
2) Studies that reported the prevalence of depression/ depressive symptoms using diagnostic instruments for identifying depression. “Diagnostic instruments” are tools that diagnose depression by the International Classification of Diseases criteria and/or Diagnostic and Statistical Manual of Mental Disorders criteria (26).

Exclusion criteria

1) Studies among elderly patients with chronic diseases such as diabetes, HIV/AIDS, etc, in-hospital patients, and other special groups such as with disaster-stricken experiences.

2) Studies which reported either 1 or 2 subcategories of depression (mild, moderate and severe) only
3) Studies in which unstructured clinician-defined diagnosis

Information sources

Searches will be performed in PubMed, Scopus, Embase, Web of Science, CINAHL, and PsycINFO. To enrich and supplement the literature search, the references of selected articles and relevant reviews will be scanned. Then, we will circulate a list of identified articles to the systematic review team, as well as to the selected experts working in this field to ensure the completeness of search results.

Search strategy

Initially, controlled descriptors (such as MeSH terms, CINAHL headings, PsycINFO thesaurus) will be identified in each database. Following keywords such as “psychiatric”, “depression”, “mental”, “depressive disorders”, “aged”, “geriatric”, “elderly”, “old aged”, “aging”, “prevalence”, “epidemiological studies”, “epidemiology”, and “India” will be used to develop the search strategy. Appropriate Boolean operators will be employed. We will not impose any language filter. The search will be limited to human subjects. The search strategy for PubMed is given below:

#1. psychiatric OR depressi* OR mental OR "Depression"[Mesh] OR "Depressive Disorder"[Mesh]

#2. "Aged"[Mesh] OR geriatric OR elder* OR "old aged" OR aging

#3. "Prevalence"[Mesh] OR prevalence OR "Epidemiology"[Mesh] OR “epidemiological stud*”

#4. India

#5. #1 AND #2 AND #3 AND #4

#6. Filters: Publication date from 2001/01/01, Humans.

Selection process and data management

Two reviewers (MP and PMB) will conduct searches in all identified databases. All search results will be imported into Rayyan QCRI Software to ensure a systematic and

comprehensive search and document the selection process (27). Another reviewer (VY) will manage the Rayyan and identify and remove the duplicate citations and ensure an independent review of titles and abstracts by blinding the decisions of both reviewers. MP and PMB will review of titles and abstracts of the shortlisted citations in the Rayyan using a customized inclusion/exclusion checklist (population-based studies; depression prevalence, study duration, and India). After that, VY will identify the discrepancies between the two reviewers in the Rayyan software and inform them of making a consensus for the selection of the study. Full-text copies of all studies selected will be obtained to find more details. Both reviewers will review the full-text copies of articles to identify whether diagnostic instruments have been used to identify depression in the study participants.

We will record the reasons for the exclusion of all the studies for which we had obtained full copies. Wherever the studies have been reported in multiple publications/reports, all papers will be obtained. While the studies will be included as only one in the review, the data will be extracted from all the publications to ensure the maximal relevant data is retrieved. The full-text copies of all selected articles will be evaluated for quality assessment and data extraction. The study selection process will be presented using the PRISMA flow chart describing the reasons for the exclusion for the studies we will explore full texts.

The reference management software Mendeley Desktop for Windows will be used to store, organize, cite, and manage all the selected references (28).

Data extraction

PMB and MP will independently perform data extraction on the key variables including study details (author, year of publication); methods (study design, study location, study setting, sample size, sampling method, non-response, age, sex, screening procedure, screening for dementia, diagnostic instrument); and results (risk factors of depression studied and prevalence data) will be extracted. Any disagreement in the data abstraction will be resolved by consensus, and if required, the arbitration will be done by the members of the review team (MB, VM, and SDG). First or corresponding authors will be contacted if additional information is required in the selected articles.

Risk of bias in individual studies

AXIS critical appraisal tool will be used for quality assessment of the individual studies (29). The AXIS tool would emphasize mainly on the presented methods and results. The AXIS tool contains a 20-point questionnaire with "yes", "no", and "don't know" answer that addresses study quality and reporting. The critical areas in the AXIS tool included are study design, sample size justification, target population, sampling frame, sample selection, measurement validity and reliability, overall methods, and conflict of interest and ethical issues.

Strategy for data synthesis

In this systematic review, extracted data will be presented in comprehensive tables and flowcharts. The pooling of prevalence will be done using meta-analysis. In case the relevant information is not available for meta-analysis, a narrative synthesis will be performed. The effect size of interest is the proportion of elderly people with depression. Data will be presented using a forest plot, including individual prevalence, pooled estimates, and 95% confidence intervals (CI). All pooled estimates will be calculated using an appropriate model (fixed or random-effects model meta-analysis), based on the level of heterogeneity. Heterogeneity between studies will be examined using Cochran's Q test and quantified using the I^2 statistic. A rough estimate of the heterogeneity will be as follows: I^2 0% to 40% - might not be important; I^2 30% to 60% - may represent moderate heterogeneity; I^2 50% to 90% - may represent substantial heterogeneity; and I^2 75% to 100% - considerable heterogeneity. The importance of the observed I^2 value will depend on (if) magnitude and direction of effects and (ii) strength of evidence for heterogeneity. Sensitivity and subgroup analyses will be used to identify the causes of heterogeneity. If required, meta-regression will be employed to determine the sources of heterogeneity (30).

A cumulative meta-analysis will be done to detect temporal trends in the depression prevalence over the years and the effect of quality of studies. In the cumulative meta-analysis, the studies are added one at a time in a specified order (e.g., according to date of publication), and the results are summarised as each new study is added. In a forest plot of a cumulative meta-analysis, each horizontal line represents the summary of the results as each study is added, rather than the results of a single study (31,32). All analyses will be done using updated versions of STATA (33) and R software (with meta and metafor packages) (34,35).

Assessment of publication bias

We will assess the publication bias by visual inspection of funnel plots and testing using Egger's weighted regression, with $p<0.1$ considered indicative of statistically significant publication bias (36).

Sensitivity analysis

Sensitivity analysis (37) will be done to remove the influence of low-quality studies. We will also explore the effect of small studies (fewer than 100 participants) and the studies not fulfilling age criteria adequately, such as participants aged 65 years or more. In particular, the Leave-One-Out method (also known as Jackknife estimation) in which we recalculate the results of our meta-analysis K−1 times (where K is a total number of studies), each time leaving out one study. We will then compare the new pooled prevalence with that of the original pooled prevalence of depression. If the new pooled prevalence lies outside of the 95% CI of the original pooled prevalence, we will conclude that the excluded study has a significant effect on the pooled estimate and should be excluded from the final analysis (38,39). Some other issues may also be identified for sensitivity analysis during the systematic review process.

Analysis of subgroups or subsets

To reduce the random variations between the estimates of primary studies, we will perform subgroup analysis wherever feasible according to study setting, geographical region (states), states by GDP per capita, type of diagnostic instrument, dementia screening, sampling design, and study period.

Patient and Public Involvement

No patients are directly involved in this study. The data for systematic review will be collected from previously published studies.

Discussion

Screening tools are simple to administer, take less time, and are highly useful in primary care settings to screen the people for depression (40). However, confirming a diagnosis of

depression by a diagnostic tool provides a more accurate picture of the magnitude of depression. Based on earlier literature, the estimated prevalence of depression was significantly higher when self-reporting instruments or screening tools were used to assess depression (25,41). The estimation based on screening tools varied widely with the type of study tools, geographic region, sample size, sampling methods, and prevalent socio-cultural differences in the country. These may be responsible for different levels of mental health disorders in India. Hence, we will address this issue by using different meta-analytic techniques such as subgroup and sensitivity analyses such as jackknife estimation, meta-regression, and cumulative meta-analyses.

In India, the National Mental Health Survey (NMHS) reported a lower prevalence of lifetime depression (3.14%) and during the previous 12-month period (1.7%) (42) compared to pooled data from 18 countries (n= 89,037) which estimated the average lifetime and 12-month prevalence estimates of DSM-IV MDE to be 14.6% and 5.5% in 10 high-income countries, and 11.1% and 5.9% in 8 low- to middle-income countries, respectively (43). This study will provide the unique opportunity to compare the magnitude of depression estimated using screening tools and findings of NHMS with the pooled estimate of various research studies that have used diagnostic instruments for the identification of depression among elderly persons in India.

In India, mental health services receive a minor fraction of the overall health budget, which is grossly inadequate in proportion to the rising burden of mental disorders. Also, there is a lack of robust and reliable data to address the need for community based mental health services planning and management. The findings of this study, i.e., the estimated magnitude of depression among elderly persons using diagnostic instruments, distribution among subgroups, and regions will help to plan and manage geriatric mental health program in a better way and will provide further directions to future research in the depression epidemiology and its burden in the elderly population. It will also strengthen the provision of comprehensive mental health services in primary health care settings, especially, among the geriatric population in India.

Ethics and dissemination: Ethical approval is not required as it will be a systematic review. Data from previously published studies will be retrieved and analyzed. Findings will be disseminated through a peer-reviewed publication in a scientific journal and conferences.

Abbreviations

GDP – Gross Domestic Product

Supplementary data

Not applicable.

Availability of data and materials

Will be available once collected.

Author Contributions

Conceived the idea: PMB, MB, VY, MP, and SDG. Designed the protocol and wrote the paper: MB, VY, MP, PMB, DD, SMB, VM, SDG, and SP. Critical revision to the manuscript: MB, VY, MP, PMB, DD, SP, VM, and SDG. All authors have read and approved the manuscript. PMB and MB are the guarantors of the paper.

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Appendix 1

Reporting checklist for protocol of a systematic review.

Based on the PRISMA-P guidelines.

Instructions to authors

Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

Your article may not currently address all the items on the checklist. Please modify your text to include the missing information. If you are certain that an item does not apply, please write "n/a" and provide a short explanation.

Upload your completed checklist as an extra file when you submit to a journal.

In your methods section, say that you used the PRISMA-Preporting guidelines, and cite them as:

Moher D, Shamseer L, Clarke M, Ghersi D, Liberati A, Petticrew M, Shekelle P, Stewart LA. Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols (PRISMA-P) 2015 statement. Syst Rev. 2015;4(1):1.

		Reporting Item	Page Number
Title			
Identification	#1a	Identify the report as a protocol of a systematic review	1,3
Update	#1b	If the protocol is for an update of a previous systematic review, identify as such	N/A
Registration			
	#2	If registered, provide the name of the registry (such as PROSPERO) and registration number	2,4
Authors			
Contact	#3a	Provide name, institutional affiliation, e-mail address of all protocol authors; provide physical mailing address of corresponding author	1

Contribution	#3b	Describe contributions of protocol authors and identify the guarantor of the review	9
Amendments			
	#4	If the protocol represents an amendment of a previously completed or published protocol, identify as such and list changes; otherwise, state plan for documenting important protocol amendments	N/A; not a significant amendment is planned in the protocol.
Support			
Sources	#5a	Indicate sources of financial or other support for the review	9
Sponsor	#5b	Provide name for the review funder and / or sponsor	N/A
Role of sponsor or funder	#5c	Describe roles of funder(s), sponsor(s), and / or institution(s), if any, in developing the protocol	N/A
Introduction			
Rationale	#6	Describe the rationale for the review in the context of what is already known	3
Objectives	#7	Provide an explicit statement of the question(s) the review will address with reference to participants, interventions, comparators, and outcomes (PICO)	4
Methods			
Eligibility criteria	#8	Specify the study characteristics (such as PICO, study design, setting, time frame) and report characteristics (such as years considered, language, publication status) to be used as criteria for eligibility for the review	4
Information sources	#9	Describe all intended information sources (such as electronic databases, contact with study authors, trial registers or other grey literature sources) with planned dates of coverage	4

Search strategy	#10	Present draft of search strategy to be used for at least one electronic database, including planned limits, such that it could be repeated	4-5
Study records - data management	#11a	Describe the mechanism(s) that will be used to manage records and data throughout the review	5
Study records - selection process	#11b	State the process that will be used for selecting studies (such as two independent reviewers) through each phase of the review (that is, screening, eligibility and inclusion in meta-analysis)	5-6
Study records - data collection process	#11c	Describe planned method of extracting data from reports (such as piloting forms, done independently, in duplicate), any processes for obtaining and confirming data from investigators	6
Data items	#12	List and define all variables for which data will be sought (such as PICO items, funding sources), any pre-planned data assumptions and simplifications	6
Outcomes and prioritization	#13	List and define all outcomes for which data will be sought, including prioritization of main and additional outcomes, with rationale	6
Risk of bias in individual studies	#14	Describe anticipated methods for assessing risk of bias of individual studies, including whether this will be done at the outcome or study level, or both; state how this information will be used in data synthesis	6
Data synthesis	#15a	Describe criteria under which study data will be quantitatively synthesised	6-8
Data synthesis	#15b	If data are appropriate for quantitative synthesis, describe planned summary measures, methods of handling data and methods of combining data from studies, including any planned exploration of consistency (such as I2, Kendall's τ)	7-8

Data synthesis	#15c	Describe any proposed additional analyses (such as sensitivity or subgroup analyses, meta-regression)		7-8
Data synthesis	#15d	If quantitative synthesis is not appropriate, describe the type of summary planned		6
Meta-bias(es)	#16	Specify any planned assessment of meta-bias(es) (such as publication bias across studies, selective reporting within studies)		7
Confidence in cumulative evidence	#17	Describe how the strength of the body of evidence will be assessed (such as GRADE)	N/A; almost all studies will be cross-sectional studies, hence, the use of GRADE is not required, however, heterogeneity will be assessed using subgroup and sensitivity analyses.	

Notes:

- 4: N/A; not a significant amendment is planned in the protocol.
- 17: N/A; almost all studies will be cross-sectional studies, hence, the use GRADE is not required, however, heterogeneity will be assessed using subgroup and sensitivity analyses.
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