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REVIEW ARTICLE

Geriatrics, Gerontology and Aging

A look at vulnerability in the older population in health sciences studies: a systematic review

O olhar sobre a vulnerabilidade na população idosa nos estudos das ciências da saúde: uma revisão sistemática

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Abstract

The objective of this study was to systematically investigate and review studies on the concept of vulnerability associated with the health of the older population. Articles were selected, filtered, and analyzed following the steps recommended by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Screening and data extraction were performed independently by 2 reviewers using templates developed by the authors. Data extracted included specific details about population, interest, and context. Studies were eligible for inclusion if they: 1) were cross-sectional or prospective, 2) involved community-dwellers aged ≥60 years, 3) were published in the last 10 years, and 4) had as a concept vulnerability associated with the health of the older population. A total of 833 studies were identified and screened, 26 of which were included. Most included studies addressed vulnerability in older adults as an individual aspect, whether biological or psychological. The remaining studies reported vulnerability as affecting socio-environmental, health care system, and multifactorial aspects. Therefore, the concept of "vulnerability in older people" was not properly defined in the biomedical scientific community. When we return to the guiding question of this review, we can conclude that the conditions of vulnerability of older people are being treated broadly and diversely, producing different methodological strategies. The systematic review was conducted in the United States National Library of Medicine (PubMed), Latin American and Caribbean Health Sciences Literature (LILACS), and Scientific Electronic Library Online (SciELO) databases between August and December 2020 and updated in September 2022, with registration number CRD42022361649.
Keywords: Health vulnerability, aged, health sciences.

Resumo

O objetivo da pesquisa é investigar e revisar sistematicamente estudos sobre o conceito de vulnerabilidade associado à saúde da população idosa. Os trabalhos foram selecionados, filtrados e analisados seguindo as etapas recomendadas pela *The Preferred Reporting Items for Systematic Reviews and Meta-Analyses* (PRISMA) *guideline*. A triagem e a extração de dados foram realizadas por dois revisores independentes usando modelos desenvolvidos pelos autores. A extração de dados incluiu detalhes específicos da população; interesse; contexto. Consideraram-se artigos que: 1) fossem estudos transversais ou prospectivos, 2) envolvessem idosos da comunidade (≥ 60 anos), 3) fossem dos últimos dez anos; tivessem como conceito a vulnerabilidade associada à saúde da população idosa. O total de 833 estudos foi identificado e triado, e 26 deles foram incluídos. A maioria dos estudos incluídos verificou a vulnerabilidade do idoso no aspecto individual, seja biológico, seja psicológico. Em contrapartida, o restante dos estudos acredita que a vulnerabilidade atinja o aspecto socioambiental, sistema de saúde e multifatorial. Sendo assim, conceito de "vulnerabilidade do idoso" não está devidamente definido na comunidade científica biomédica. Neste caso, retornando à questão norteadora desta revisão, conclui-se que as condições de vulnerabilidade do idoso estão sendo tratadas de maneira ampla e diversa, produzindo diferentes estratégias metodológicas. A revisão sistemática foi realizada nas bases de dados United States National Library of Medicine (PubMed), Literatura Latino-Americana e do Caribe em Ciências da Saúde (Lilacs) e Scientific Electronic Library Online (SciELO), entre agosto e dezembro de 2020, com atualização em setembro de 2022, sob código CRD42022361649.
Palavras-chave: Vulnerabilidade em saúde, idoso, ciências da saúde.

INTRODUCTION

The terms frailty and vulnerability are used interchangeably. However, the general concept of vulnerability has come to have a specific meaning in the context of older people.[1] Vulnerability is a multidimensional construct in which behavioral, sociocultural, economic, and political conditions interact with biological processes throughout life.[2] However, the general level of vulnerability is known to increase during the aging process, with age being a good indicator of health risks in the health care system.[3] In a previous review, Barbosa et al.[3] reported that vulnerability in older people can be the result of different conditions that correlate with each other, highlighting biological, social, and programmatic factors.

Seidl & Zannon[4] systematized the subjectivity of vulnerability in older adults. They highlighted 4 major dimensions that have implications for quality of life: physical, psychological, social relationships, and environmental. These dimensions also need to be considered when analyzing the new demands that arise for maintaining the health of older adults, since their needs, resulting from clinical, functional, social, and family characteristics, may reach a certain depth, requiring different intervention processes.[5]

Some studies highlight that cognitive impairment, decreased senses (smell and hearing), psychological decline and recurrent episodes of falls and frailty are determinants of vulnerability in older people.[6] Regarding frailty, it is characterized by loss of biological reserves, failure of physiological mechanisms, and increased vulnerability to multiple adverse outcomes.[7] While there is evidence supporting a view that old age is associated with increased vulnerability, such as in frailty and decreased quality of life, this view has also been criticized for resulting in negative stereotypical views of old age.[6] A recent systematic review and meta-analysis showed that, among the included studies, 12% of community-dwelling older people were physically frail.[8]

Currently, there are observational (cross-sectional and longitudinal), intervention and applied research studies that have analyzed vulnerability in older persons. However, studies systematically exploring the meaning of vulnerability in this population are scarce. Only one scoping review was published in an attempt to synthesize the definitions and instruments used to measure vulnerability in older adults. This review reported that the Perceived Vulnerability Scale was able to provide a common language and measure in health and social sciences research, policy, and practice.[9] Our review moves toward looking at vulnerability within individual, socio-environmental, and health care system aspects. Given the complexity and multidimensionality of older people's vulnerability, the objective of this study was to systematically investigate and review studies that have addressed the concept of vulnerability associated with individual, socio-environmental, and health care system aspects of the older population.

METHODS

The current systematic review was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.[10] The study protocol was registered with the International Prospective Register of Systematic Reviews (PROSPERO) on October 2, 2022, with registration number CRD42022361649.

Search strategy

An electronic database search was performed to identify relevant studies on vulnerability involving community-dwelling older adults. We searched the United States National Library of Medicine (PubMed)/Medical Literature Analysis and Retrieval System Online (MEDLINE), Latin American and Caribbean Health Sciences Literature (LILACS), and Scientific Electronic Library Online (SciELO) databases for articles published in the last 10 years. The initial search was run in August 2020 and updated in September 2022. The development of the search strategy was based on the PICo approach (P = population; I = interest; Co = context).[11] However, the initial systematic search included the following Medical subject headings (MeSH) terms: "older people" AND "vulnerability." The final search strategy for each database is detailed in Appendix 1. When available in the databases, filters were applied to ensure that only articles published in the selected languages (ie, English, Portuguese, or Spanish) involving human participants were included in the search results.

Eligibility criteria

Studies were eligible for inclusion in the systematic review if they:

1. Were cross-sectional or prospective,
2. Involved community-dwellers aged ≥ 60 years,
3. Were published in the last 10 years,
4. Were published in Portuguese, English, or Spanish.

Studies involving older people with specific diseases and residents of long-term care facilities or hospitals were excluded. Studies were also excluded if they were letters to the editor, editorials, or published in the gray literature.

Study selection

After removal of duplicates, 2 reviewers (AGM and DCD) independently screened titles and abstracts for selection on the basis of our eligibility criteria. If there were any disagreements between reviewers regarding eligibility , a third reviewer (GCC) was consulted. Subsequently, full texts of potential studies for inclusion were retrieved and independently analyzed in detail by the 2 reviewers (AGM and DCD).

Data extraction

For studies meeting eligibility, data were extracted and entered into a spreadsheet (Microsoft Excel® 2011) by one of the reviewers. Extracted data were examined for accuracy by the other reviewer. Any disagreements were resolved by discussion and consensus between reviewers. Data extracted included:

1. Study characteristics (first author, year, study design);
2. Sample characteristics (sample size, sex, mean age); and
3. Methodological details (instruments used, definition of vulnerability, and main results).

Data extraction strategies were tested in 10 studies and refined throughout the process. If necessary, the corresponding author was contacted via email for missing data. When a study was reported in more than one article, we only extracted data from the most comprehensive report, unless the other articles had a different research question or method or reported different outcome or follow-up measures.

Quality assessment

To assess the quality of cross-sectional and longitudinal studies, we used the National Institutes of Health (NIH) quality assessment tool for observational cohort and cross-sectional studies.[12] Questions were answered as "yes," "no," or "cannot determine/not applicable/not reported." Quality was rated as "good," "fair," or "poor." As there are no established cutoff points in the literature for quality rating, the quality assessment score was reported but not used for the selection of studies in the current review. The quality of all studies was assessed twice by 2 independent reviewers. Any disagreements were discussed between the reviewers until consensus was reached. The details of the assessment of study quality are shown in Table 1.[3,13-37]

Data synthesis and analysis

The analysis and synthesis of data in this review sought to examine the approaches used to vulnerability in older people in the included studies and the instruments used to measure this condition of vulnerability. To this end, the included studies were categorized according to the operationalization proposed by Rosero-Bixby & Dow.[13] According to these authors, there is a systematization of the conditions that lead to negative health outcomes for the older population, considering aspects related to socioeconomic status, demographics, health, well-being, lifestyle, biological risks, frailty, and negative health results, such as mortality and disability. In the included studies, 4 categories of vulnerability were identified, which were defined here as follows.

Frailty

We defined frailty as a state of vulnerability, being considered a multidimensional syndrome characterized by decreased reserve and resistance to stressors, which can put older people at an increased risk of adverse health outcomes, such as falls, hospitalization, disability, and premature death.[7]

Biological or psychological aspects

As for the biological or psychological aspects of vulnerability in older people, we analyzed the articles that addressed morphological, functional, biochemical, and psychological changes occurring in the aging process, which can make individuals vulnerable by reducing their ability to adapt to the environment.[38]

Socio-environmental aspect

The socio-environmental aspect of vulnerability results from socioeconomic structures that simultaneously produce precarious living conditions and deteriorated environments, which may also manifest as low resilience, thus leading to vulnerability.[39]

Health care system/care provision

The vulnerability category that encompasses care provision and health care systems includes access to health services, organization of health services, relationship between older service users and health care providers, recommended actions for disease prevention and control, and social resources available in the area covered by the health center.[40]

RESULTS

Study selection

Figure 1 provides an overview of the literature search and study selection process. A total of 833 potentially relevant studies were identified in the literature search. Of these, 298 were duplicates and 405 were excluded after title and abstract

TABLE 1. Characteristics of included studies (n=26).

Author	Country	Study design	Setting	n	Women n (%)	Mean age (SD)	Vulnerability assessment tool	Definition of vulnerability*	Quality rating†
Amaral et al.[14]	Brazil	Cross-sectional	Community	300	202 (67.33)	74.30 (6.90)	- Questionnaire of the Health, Well-Being and Aging (SABE) survey - Minimum Map of Relationships of the Elderly - Frailty Phenotype	Individual aspect	Good
Neri et al.[15]	Brazil	Cross-sectional	Community	3.478	2353 (67.77)	72.90 (6.00)	- Frailty Phenotype	Individual aspect	Good
Fernandes et al.[16]	Brazil	Cross-sectional	Community	128	86 (67.20)	68.90 (7.80)	Edmonton Frail Scale	Individual aspect	Good
Naylor et al.[17]	USA	Longitudinal	Community	470	334 (71.06)	80.80 (8.71)	- Adaptation of the Wilson & Cleary HRQoL conceptual model - Geriatric Depression Scale	Individual, socio-environmental, and health care system aspects	Good
Carneiro et al.[18]	Brazil	Cross-sectional	Community	686	327 (47.67)	74.00 (7.40)	- Edmonton Frail Scale	Individual aspect	Good
Lo et al.[19]	USA	Longitudinal	Community	940	477 (20.80)	75.50 (6.00)	- Index of Objective Neighborhood Disadvantage - Life-space assessment - Panel from the American Geriatrics Society	Socio-environmental aspect	Good
Moraes et al.[20]	Brazil	Cross-sectional	Community	397	Not reported	Not reported	- Clinical-Functional Vulnerability Index-20	Individual aspect	Good
Cruz et al.[21]	Brazil	Cross-sectional	Community	339	207 (61.10)	74.30 (8.20)	- Edmonton Frail Scale - Patient Health Questionnaire-4 - Falls Efficacy Scale – International – Brazil - Lawton and Brody scale	Individual aspect	Good
Naess et al.[22]	Norway	Longitudinal	Community	83	62 (74.70)	87.00 (4.40)	- Sarcopenia: handgrip and walking - Barthel ADL Index	Socio-environmental aspect	Good
Barbosa et al.[3]	Brazil	Cross-sectional	Community	368	253 (68.75)	71.40 (-)	- Vulnerable Elders Survey	Individual aspect	Good
Patanwala et al.[23]	USA	Cross-sectional	Community	283	69.0 (24.40)	Not reported	- Patient Health Questionnaire-15 - Social and Existential Symptoms	Individual and socio-environmental aspects	Fair
Ballesteros & Moreno-Montoya[24]	Colombia	Cross-sectional	Community	23,694	13,582 (57.30)	70.80 (8.20)	- Barthel Index scale - Unsatisfied Basic Needs index	Individual, socio-environmental, and social support aspects	Good
Segura-Cardona et al.[25]	Colombia	Cross-sectional	Community	1514	Not reported	Not reported	- Functional capacity, depression and social support survey	Individual and social support aspects	Good
Masson & Dallacosta[26]	Brazil	Cross-sectional	Community	176	111 (63.10)	68.30 (6.80)	- Vulnerable Elders Survey	Individual aspect	Good

Continue...

TABLE 1. Continuation.

Author	Country	Study design	Setting	n	Women n (%)	Mean age (SD)	Vulnerability assessment tool	Definition of vulnerability*	Quality rating†
Cabral et al.[38]	Brazil	Cross-sectional	Community	377	227 (60.21)	69.60 (7.50)	- Vulnerable Elders Survey - Katz Index and Lawton and Brody scale - Geriatric Depression Scale - Cumulative Illness Rating Scale for Geriatrics - Mini Nutritional Assessment	Individual aspect	Good
Amancio et al.[27]	Brazil	Cross-sectional	Community	956	581 (60.80)	Not reported	- Vulnerable Elders Survey (VES-13)	Individual aspect	Good
Bolina et al.[28]	Brazil	Cross-sectional	Community	701	468 (66.80)	Not reported	- Health Vulnerability Index - Programmatic Vulnerability Index	Individual, socio-environmental, and health care system aspects	Good
Didoné et al.[29]	Brazil	Cross-sectional	Primary health care	302	171 (56.62)	69.60 (7.40)	- Geriatric Depression Scale - Mini Nutritional Assessment in Older People - Short-Form-6D Quality of Life Questionnaire - Medical Outcome Study Scale - Katz and Lawton Scale - Questionnaire on instrumental activities of daily living - International Physical Activity Questionnaire	Individual aspect	Good
Xue et al.[30]	USA	Longitudinal	Community	5362	3113 (58.05)	72.70 (5.50)	- Frailty Phenotype - Frailty Index	Individual aspect	Good
Carneiro et al.[31]	Brazil	Cross-sectional	Community	394	263 (66.80)	Not reported	- Edmonton Frail Scale - Clinical-Functional Vulnerability Index-20	Individual aspect	Good
Sena et al.[32]	Brazil	Cross-sectional	Primary health care	472	306 (64.83)	69.00 (-)	- Clinical-Functional Vulnerability Index-20 - WHOQOL-BREF	Individual aspect	Good
Takatori & Matsumoto[33]	Japan	Cross-sectional	Community	5050	2538 (50.25)	79.40 (3.80)	- Kihon Checklist	Individual and socio-environmental aspects	Fair
Cabral et al.[34]	Brazil	Longitudinal	Primary health care	304	190 (62.50)	71.80 (7.40)	- Vulnerable Elders Survey - Lawton and Brody Scale	Individual aspect	Good
Ribeiro et al.[35]	Brazil	Longitudinal	Primary health care	396	259 (65.40)	71.80 (-)	- Clinical-Functional Vulnerability Index-20 - Edmonton Frail Scale	Individual aspect	Good
Neri et al.[36]	Brazil	Longitudinal	Community	1284	882 (68.69)	72.60 (5.80)	- Frailty Phenotype	Individual aspect	Fair
Perseguino et al.[37]	Brazil	Longitudinal	Community	769	472 (61.37)	71.90 (-)	- Vulnerable Elders Survey-13 - WHOQOL-BREF	Individual and socio-environmental aspects	Good

SD: standard deviation. *Defined according to Rosero-Bixby & Dow[13]; †National Institutes of Health (NIH) quality assessment tool for observational cohort and cross-sectional studies. Quality rating was determined by the authors as follows: if the article had 0 to 1 "no" answers, it would be rated as "good"; if the article had 2 to 6 "no" answers, it would be rated as "fair"; and if the article had more than 6 "no" answers, it would be rated as "poor."

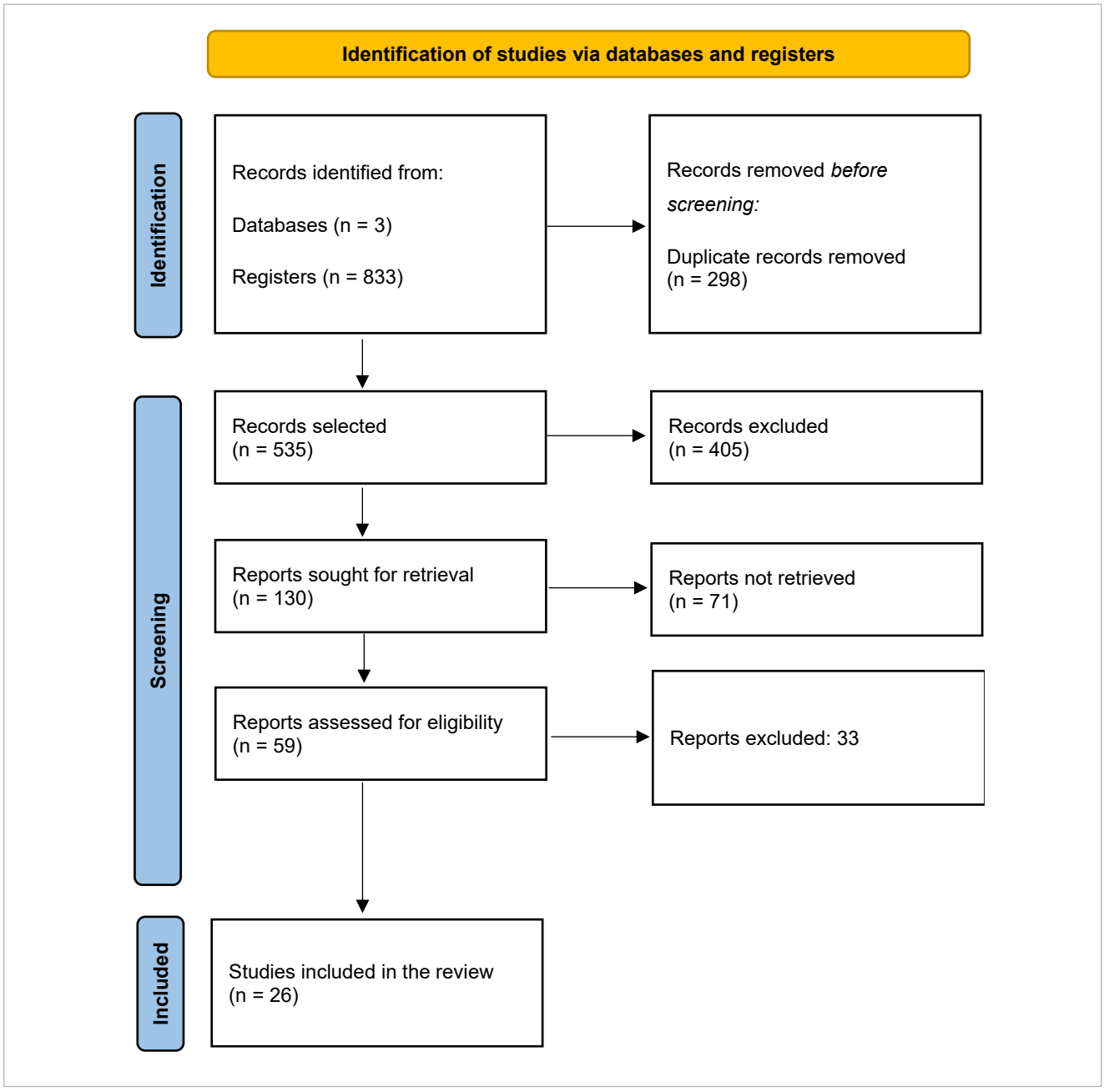

FIGURE 1. Flowchart of the study selection process according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines.

screening. Fifty-nine studies were retrieved for full-text review and assessed for eligibility, 33 of which were excluded for different reasons (wrong population, wrong outcome, or wrong study duration). The methodological quality of the remaining 26 studies was assessed, and all 26 were included in this systematic review.

Characteristics of included studies

The characteristics of the included studies are summarized in Table 1. Of the 26 selected studies, 18 had a cross-sectional design and 8 had a longitudinal design. The included studies were published from 2013 to 2022. Regarding geographic location, 18 studies were conducted in Brazil, 4 in the United States, 2 in Colombia, 1 in Japan, and 1 in Norway.

Focus on vulnerability

Of the 26 selected articles, 17 addressed vulnerability in older adults as an individual aspect, whether biological or psychological. Of the remaining 9, only 2 did not address

the individual or psychological vulnerability category: one focused on the socio-environmental category, and the other focused on the health care system/care provision category. The other 7 articles assessed vulnerability in a multifactorial manner, addressing a combination of categories. It is worth noting that, in these 7 articles, biological or psychological vulnerability was always assessed. All data are shown in Table 1.

Vulnerability defined as synonymous with frailty

The analysis of the included studies showed that 11 articles addressed "vulnerability in the older population" with a focus on the frailty syndrome. All 11 studies presented variations in how the frailty syndrome was conceptualized, either being limited to the physical aspects or extending its meaning to that of a multifactorial condition. In this respect, in studies such as the one by Amaral et al.,[14] the frailty syndrome was seen as a condition associated with an increased risk of adverse clinical outcomes, such as functional decline, falls, hospitalization, institutionalization, and death, that is, as an essentially individual biological phenomenon. Conversely, according to Masson and Dallacosta,[26] frailty is a multifactorial, multifaceted, dynamic, syndromic condition resulting from the arrangement between biological, social, psychological, and environmental aspects, which interact with each other in the course of human life and in the relationships that occur within it. The authors also emphasized that health-related vulnerabilities extend beyond the physical dimension and should not be dissociated from domains such as cognition, mood, and social support.

DISCUSSION

In this systematic review, the identification of the definition of vulnerability in the older population was considered. The database searches resulted in 26 studies, most of which were conducted in Brazil and focused on individual aspects of vulnerability. However, the literature on vulnerability in older people in the field of health sciences is still scarce, according to the articles retrieved during the search period. This issue has been previously raised by Gutiérrez-Robledo & Avila-Funes,[5] but no changes have been identified in this pattern in recent years, according to the current review. When studying social vulnerability for determining frailty, those authors stated that studies do not approach the problem from a non-biological framework in the field of biomedical sciences.[5] Even so, frailty in older adults has been conceived as a clinical condition with multiple causes, characterized by decreased strength, resistance, and physiological function, which can lead to dependence and physical, cognitive, and social decline.[41]

Rosero-Bixby & Dow,[13] for example, sought to determine the factors that could influence the health of older Costa Ricans based on socioeconomic status gradients in different health conditions in the older population. In a longitudinal study, they evaluated 8000 older people using mortality and the prevalence of several health conditions and anthropometric biomarkers, as well as blood and urine samples. The ultimate health indicator revealed that better educated and wealthier individuals are worse off, presenting with metabolic syndrome and risk of death. In contrast, measures related to quality of life, such as functional and cognitive disabilities, physical frailty, and depression, worsen with lower socioeconomic status. However, the relationship between the concepts of vulnerability and fragility was not clear, and the authors only restated that fragility is the result of a series of interconnected conditions, which may be called conditions of vulnerability.

In this direction, the relationship between vulnerability and frailty has not been clearly reported, as observed in the included studies. The current analysis showed that most studies presented these terms as synonymous when addressing participants' physical deficits, but they were also used independently when each one contributed independently to an event that could compromise the quality of life of older people. In addition, the terms were reported in an associated manner when one condition contributed to the outcome of the other.

Bolina et al.[28] defined "vulnerability" as a term used to designate the susceptibilities of people or communities to health problems and damage. Moreover, this concept may be formed in 3 interdependent levels — the individual, the social, and the programmatic: individual vulnerability is characterized by biological, behavioral, and affective aspects that increase an individual's susceptibility to adverse health outcomes; the social component is related to the interference of the socioeconomic and cultural contexts; and the programmatic component refers to the way in which policies, programs, and health services influence the problem in question. Based on this definition, the authors chose to use a combination of questionnaires that assessed the 3 levels of vulnerability. Consequently, the main results of the study were associated with the definition

of the term presented in the introduction and the chosen methodologies.

Supporting the breadth of the concept, Barbosa et al.[3] pointed out that, in the case of aging, there is an increased risk for the development of biological or individual vulnerability of socioeconomic and psychosocial nature due to the biological decline typical of senescence. In this respect, individual vulnerability may be related to other factors, but the study directed its focus to evaluating and measuring "vulnerability" as a biological phenomenon. Thus, the authors chose to use the Vulnerable Elders Survey (VES-13) as the main questionnaire, which assesses self-perceived health, presence of physical limitations, and functional decline in older people, classifying them as vulnerable or non-vulnerable. With the application of this questionnaire, their main results were within a category different from that presented by Bolina et al.[28]

The definitions of "vulnerability in older people" varied within each article individually, including the issue of the frailty syndrome previously discussed, which makes the standardization of results a challenging task. Nevertheless, most studies addressed the concept of vulnerability in the older population as an individual issue, whether biological or psychological, although, in their rationale, many studies approached the term as a multifactorial and plural concept. The inclusion of concepts involving vulnerabilities in studies on the health of older people might provide deeper reflections and increase the production of evidence, which should prompt us to look beyond the individual aspect. It means involving the historical dimension, social relationships, and subjectivity in order to produce new knowledge to face health risks, as well as to support the development of public policies aimed at improving the living and health conditions of the older population.[42]

This review has some limitations to be considered, as it is a systematic review addressing a broad and complex topic. It is a strength that many different articles have been evaluated in different databases. However, although 3 large databases were selected for the literature search, it might have been more useful, considering the analysis and systematization of results, to include 1 or 2 additional databases in the initial search strategy. The absence of these additional databases may be seen as a limitation of this review. In addition, the majority of the included studies were cross-sectional, showing that there were difficulties in analyzing a cause-and-effect relationship between certain vulnerabilities and their possible consequences.

CONCLUSION

In the current systematic review, we observed that the concept of "vulnerability in older people" was not properly defined in the biomedical scientific community. For this reason, the methodologies used in each article and the main results extracted varied widely, allowing multiple approaches. Nevertheless, the majority of the included studies addressed vulnerability in its individual aspect, whether biological or psychological. Therefore, when we return to the guiding question of this review, "How have the conditions of vulnerability of older people been approached in observational studies?", we can rightly conclude that these conditions are being treated broadly and using a wide variety of methodological strategies. Even so, the focus on the individual aspect of vulnerability is clear, denoting a strong limitation in studying older individuals as a whole, in the various contexts within which they are embedded. In light of this review, clinical and research professionals need to look at vulnerability as a complex and multifactorial phenomenon in order to systematize vulnerability in its multiple aspects (individual, socio-environmental, and health care system). This way, the strategies to assess vulnerability in the older population may be both effective and efficient.

Ethical Aspects

Regarding ethical aspects, this study was based on secondary data, being unable to identify the individuals or perform any intervention in humans. The data are freely and unrestrictedly available. Therefore, this project was exempt from research ethics committee approval, as set forth in Resolution 466/2012 of the Brazilian National Health Council.[43]

Conflicts of Interest

The authors have no conflict of interest to declare.

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Author Contributions

AGM: project administration, conceptualization, writing – original draft, investigation, methodology, funding acquisition. GCC: formal analysis, conceptualization, data curation, writing – review & editing, visualization. DCD: methodology, supervision. NCJ: supervision, validation, visualization. VBN: writing – review & editing, funding acquisition, supervision, validation, visualization.

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