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Review Article

Multimorbidity and Its Impact on Workers: A Review of Longitudinal Studies

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ABSTRACT

Objective: This study investigates the impact of multimorbidity on work through a literature review of longitudinal studies.
Methods: A systematic review was carried out in the databases Lilacs, SciELO, PAHO, PubMed/Medline, Scopus, Web of Science, and Cochrane. There were no restrictions regarding the year of publication or language to maximize the identification of relevant literature. The quality of studies was assessed by the protocol STrengthening the Reporting of OBservational studies in Epidemiology (STROBE).
Results: An initial database search identified 7522 registries, and at the end of the analysis, 7 manuscripts were included in the review. Several studies have demonstrated direct and indirect impacts of multimorbidity on the health of workers. For this, the number of missed days due to health-related issues was evaluated, as well as the reduction in work productivity of the unhealthy worker, vulnerability of the worker with multimorbidity regarding higher indices of dismissal and recruitment difficulties, and incidence of early retirement and/or receipt of benefits due to disabilities.
Conclusions: Multimorbidity has a negative impact on work, with damages to quality of life and work productivity, worsening the absenteeism/presenteeism indices, enhancing the chances of temporary or permanent leaves, and lowering employability and admission of individuals with multimorbidity.

1. Introduction

The epidemiological transition has changed morbidity profiles around the world, where predominance shifted from infectious diseases to those classified as nontransmissible, such as cardiovascular diseases, diabetes, asthma, neoplasms, mental disorders, and musculoskeletal disorders, among others [1]. Several factors have contributed to this transition: better lifestyle of the population, better access to health care, improvement in early detection techniques, development of adequate living conditions, and investments in the prevention of infecto-contagious diseases, which have provided higher longevity to the population [2,3].

Given this scenario, the accumulation of chronic conditions in the same individual is progressively more prevalent. Multimorbidity is defined as the cooccurrence of two or more chronic conditions, given that none of these are the primary cause [1,3–8]. Its epidemiology and risk factors have been studied by several authors, demonstrating that some countries present multimorbidity prevalence indices of up to 80–90% for the population older than 65 years [4,9]. Therefore, there has been increasing interest in investigating multimorbidity due to the aging process of the world population [7,10]. This phenomenon results in a loss of functional reserve, proinflammatory chronic state, and multiple hormone deregulation and culminates in high susceptibility to

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diseases [4]. Consequently, there is a significant increase in the rates of hospitalization, mortality, and transitory or permanent work disability [4,6,9].

It is estimated that 3.3% of the health system users that suffer from multimorbidity are responsible for 47% of its costs [4]. This highlights the importance of changing the current disease-oriented health model to a patient-oriented system, taking into account all of his/her needs, integrally, in an attempt toward better structuring of care, optimization of resources, and reduction of costs [1,6,8,10]. However, this demand is somewhat challenging for the health systems and the clinical practice of health-care professionals [1,6], requiring shared responsibility among the different specialties [3]. This information only reflects a share of the direct costs associated with multimorbidity—there is also a range of indirect costs associated with multimorbidity [2,6,10,11].

Despite the existence of several studies that attempt to evaluate the impact of multimorbidity in older populations, few studies have focused on the health of the working population [6]. There is currently a trend of progressively younger individuals affected by multimorbidity. Some of the risk factors include obesity, consumption of tobacco, sedentarism, urbanization, socioeconomic status, and low education levels [4,8,10,12].

One of the ways to measure the impact of multimorbidity on work is absenteeism [2,11,13–17], which can represent a loss of 3–6% in the overall working time and, when considered along with permanent work disability, can represent approximately 3–5% of the gross domestic product of some OECD[1] countries [6].

Among other diseases, mental disorders (especially depression) are the most significant causes of disability in the world, and a substantial reason for permanent work leave, predominantly when associated with multimorbidity [15,18]. There is a strong association between depression and other chronic conditions (physical and mental). Besides, multimorbidity seems to favor the recurrence of depression, generating positive feedback and increasing the chances of work leaves, either temporary or permanent [5,15,18]. Studies have demonstrated that indirectly associated costs, absenteeism, and loss of work performance can represent annual losses of US$24 billion [2].

Different studies have analyzed the influence of different unique conditions (e.g., depression) in return to work and disability, but there is a lack of systematic reviews on the impact of several chronic conditions (i.e., multimorbidity) on work [19]. In light of this, it is essential to analyze how multimorbidity can influence the work capacity and quality of life of workers. The objective of this study is to investigate the impact of multimorbidity on work, through a literature review of longitudinal studies.

2. Methodology

2.1. Study type

A systematic review is presented herein, based on the protocol Preferred Reporting Items for Systematic Reviews and Meta-Analyses. The objective is to identify the impact of multimorbidity on the health of the worker.

The International Prospective Register of Systematic Reviews (PROSPERO) registry of the Centre for Reviews and Dissemination at York University (United Kingdom) was consulted to confirm the unprecedentedness of the work proposed herein. The PROSPERO is an international database for the registry of systematic reviews on health and social assistance, which contains a detailed list of the reviews that have been carried out to the moment. This initiative aims at preventing the unplanned duplication of studies and enables the comparison of reported review methods. After enrollment in the PROSPERO, this study was registered under number 75869.

2.2. Data sources

After confirmation of the viability of this review and relevance of the subject, the following databases were selected: 1. Latin American and Caribbean Health Sciences Literature (LILACS), 2. SciELO, 3. Pan American Health Organization (PAHO), 4. PubMed/Medline, 5. Scopus, 6. Web of Science, and 7. Cochrane. These databases were consulted to ensure that all the studies published on the subject could be found, which besides fulfilling inclusion criteria, also presented high methodological quality. Studies published until February 28, 2018, were included.

Different combination of keywords and descriptors was used to guarantee efficient search strategies within the characteristics of each database. For databases Cochrane, LILACS, SciELO, PAHO, PubMed/MEDLINE, and Web of Science, the search terms used were as follows: (working full-time OR working part-time OR number of hours working OR early retirement OR work retention OR return to work OR employment OR unemployment OR absenteeism OR presenteeism or workforce or work productivity) and (multimorbidity or comorbidity or polymorbidity or multimorbidity). However, the SCOPUS database required adaptations for the correct recovery of data, and therefore, the following strategy was used: ((working AND full-time) OR (working AND part-time) OR (number AND of AND hours AND working) OR (early AND retirement) OR (work AND retention) OR (return AND to AND work) OR employment OR unemployment OR absenteeism OR presenteeism OR workforce OR (work AND productivity)) AND ((multimorbidity OR comorbidity OR polymorbidity OR multimorbidity)).

2.3. Eligibility criteria

The review included only original longitudinal studies indexed in the aforementioned databases and those that focused on the subject of multimorbidity and its impact on work. Multimorbidity was defined as the presence of two or more chronic diseases in the same individual [8]. There were no restrictions regarding the year of publication or its language to maximize the identification of relevant literature. Results derived from books, proceedings, conference abstracts, and other forms of information disclosure were excluded from the analysis.

2.4. Selection of studies

The bibliographical search was initially carried out by two independent researchers (A.C.D. and G.G.C.), and in the case of doubts or disagreements, a third researcher was consulted (D.L.B.S.). These researchers were previously trained on the inclusion and exclusion criteria to guarantee standardized methodology and adequate selection of studies.

The first phase encompassed the reading of titles and abstracts of all studies identified in the searches (manual and in databases), selecting only those that focused on the subject and type of study.

Duplicated studies were removed, and the studies were integrally read (second phase), with the extraction of relevant data such as the location of study, main chronic diseases and target public, impact on productivity, and information on absenteeism and presenteeism. A manual search was also carried out by reading the scientific references listed in the studies, for possible inclusion of additional studies that were not identified earlier in the electronic search.

[1] Convention on the Organization for Economic Co-operation and Development.

2.5. Quality analysis of studies

The Newcastle–Ottawa Scale (NOS), a quality assessment scale, for case–control and cohort studies was used. The NOS, recommended by the Cochrane Collaboration, contains eight items, categorized into three dimensions: selection, comparability, and outcome or exposure for cohort studies or case–control studies [20]. Meetings occurred for the calibration of those involved in the study, with discussions on the research instruments and on the interpretation of each NOS item. Each study was analyzed by two researchers, independently and blindly, establishing for each item the value "0" (in the case the item was not contemplated) or "1" (if the item was contemplated); a maximum score of 2 could be given for the item "comparability." Then, the scores for each study were compared, and in the case of divergences, a third researcher was consulted for final consensus.

3. Results

The initial database search recovered 7522 registries (Fig. 1), divided as follows: 2155 registries in PubMed, 6 in LILACS, 170 in Cochrane, 4052 in SCOPUS, 1139 in the Web of Science, and 10 from other sources. Despite the several search attempts, using the descriptors and keywords associated with the Boolean operators, no registries were recovered from the SciELO and PAHO databases.

After the first screening stage, 142 studies were selected from the different aforementioned digital repositories. Duplicated studies were excluded. Seventy-five studies were then integrally read to evaluate the pertinence and relevance of each study in an attempt to elucidate the motivating inquiries. Studies with low relevance and those with no direct relationship with the subject were excluded. Finally, during the third phase of the review, only seven studies fulfilled completely the inclusion criteria. The NOS was then applied to score and classify the quality of these studies, and the results are displayed in Table 1. The minimum and maximum scores were, respectively, 4 and 9. Three studies achieved the maximum score of 9 [6,15,18]. The items with lower

Table 1
Bias analysis for the included studies, according to the Newcastle-Ottawa quality assessment scale

Study	Selection				Comparability	Outcome/ Exposure			Total score
	1	2	3	4	1	1	2	3	
Ubalde-Lopez et al., 2017 [5]	0	1	0	0	2	0	1	0	**4**
Ubalde-Lopez et al., 2017 [6]	1	1	1	1	2	1	1	1	**9**
Sundstrup et al., 2017 [9]	1	1	1	1	1	1	1	0	**7**
Ervasti et al., 2015 [18]	1	1	1	1	2	1	1	1	**9**
Ervasti et al., 2014 [15]	1	1	1	1	2	1	1	1	**9**
Fouad et al., 2017 [11] *	1	1	1	1	1	1	1	1	**8**
Kivimäki et al., 2007 [21]	1	1	1	0	1	1	1	0	**6**

Selection: 1, Representativeness of the exposed cohort; 2, Selection of the nonexposed cohort; 3, Ascertainment of exposure; 4, Demonstration that outcome of interest was not present at the start of the study. Comparability: 1, Comparability of cohorts on the basis of the design or analysis. Outcome: 1, Assessment of outcome; 2, Follow-up long enough for outcomes to occur; 3, Adequacy of follow-up of cohorts.

* This study was assessed through the items for case–control studies.

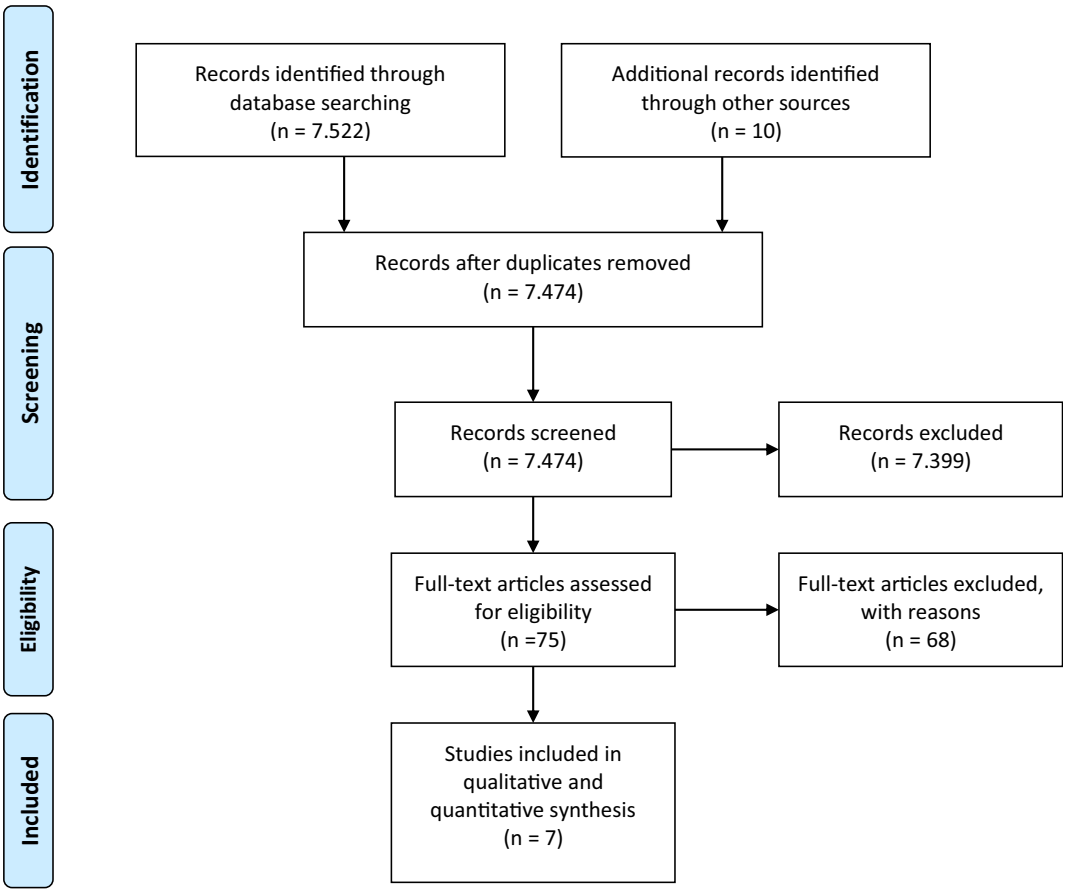

Fig. 1. Flowchart for study selection in the review. PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses. Natal, 2018. (Adapted from PRISMA).

proportion of compliance were adequacy of follow-up of cohorts (related to potential bias due to follow-up rates), comparability of cohorts based on the design or analysis, and demonstration that outcome was not present at the start of the study.

Data on the main results obtained are shown in Table 2. Regarding the locations where the included studies were carried out, the following countries were identified: Finland [15,18,20], Netherlands [5,19], Denmark [9,19], Spain [6,19], Sweden [19], Belgium [19], Germany [19], Austria [19], Switzerland [19], France [19], Italy [19], Greece [19], and Egypt [11]. All works were cohort (prospective) studies, except for one, which carried out a retrospective analysis and can be considered a case–control study [11]. The follow-up duration of studies varied between four weeks and seven years, of which one presented four weeks [11], two presented one year [5,20], two presented two years [6,9], one presented six years [19], and two presented seven years [15,18]. Among the studied populations, the smallest sample was constituted of 156 participants, while the largest encompassed 372,370 [6].

Regarding the number of chronic conditions, this aspect was highly variable, ranging from 2 [22] to 16 [21] chronic conditions. Several outcomes related to impact on work were assessed: incidence and duration of absenteeism [6,11,21]; risk of long-term absenteeism (six or more consecutive weeks) [9]; return to work after a depression-related absence episode exceeding nine days [18]; occurrence of recurrent secondary disability to depressive disorder [15]; benefits due to disability, unemployment, and early retirement [22]; presenteeism and critical incidents [11].

4. Discussion

This literature review verified that several studies demonstrated direct and indirect secondary damages as responses to the impacts of multimorbidity on work. For such, the number of health-related work leaves (missed days) was evaluated, along with the reduction in work productivity, vulnerability of the worker with multimorbidity regarding higher indices of dismissal and recruitment difficulties, and incidence of early retirement and/or receipt of benefits due to disabilities, among others.

Most data on multimorbidity originate from cross-sectional studies that consider a sample of different populations in different contexts; however, some studies point to the necessity of more longitudinal studies that encompass younger patients, aimed at understanding how the accumulation of chronic conditions evolves throughout life [10], until senescence [7]. Such an effort is paramount because the impacts of this clinical condition affect the quality of life of the individual and also entails costs to the health-care and productive systems [8], either directly or indirectly. Considering different populations in different contexts is essential for the planning of strategies in three joint domains: in the adequacy of the health-care system, in the promotion of public health policies, and in the control of environmental factors related to work, which could influence the occurrence of multimorbidity and impair the quality of work.

Nevertheless, when considering the definition of multimorbidity as the coexistence of two or more chronic conditions in an individual (as long as there is not one primary condition, with all the others being secondary to this one) [1,3–6], it is difficult to compare the different studies included herein. This occurs due to the wide variability in the size of samples, the chronic conditions considered in each study, the type of work considered by each study, and the diversity of metrics applied to measure impacts: quantification of absenteeism, presenteeism, employability, and benefits due to disability. There is an evident lack of standardization in the definitions, which hinders the development of research directed to this subject [10]. In addition, it is obvious that there is no established pattern for specific diseases that must be included in multimorbidity studies. The variations found in the studies can either underestimate or overestimate the identified associations, due to the differences in the number of included diseases and the different studied outcomes to measure the impact of multimorbidity at work. There is no consensus on which diseases should be included to consider multimorbidity, and this should be established by an expert committee to facilitate comparison between studies [1].

The main diseases correlated with the impact of multimorbidity on work were musculoskeletal diseases [5,6,9–11,15,18,22], depression/psychiatric disorders, cardiovascular diseases [9,10,12,15,21,22], and diabetes mellitus type 2 [9,12,15,21,22].

Although one study affirmed that there was no significant association between multimorbidity and the duration of absenteeism episodes (except in women with mental disorders) [5], other studies verified that there was an association between the number of chronic diseases and the risk of prolonged absenteeism [9,11] (six or more weeks), which was stronger in employees with worse work capacity. The estimated risk of this event was higher than with healthy employees, depending on the work capacity level presented by the multimorbidity holders (with at least three chronic conditions) [9]. This divergence could have been a consequence of the size of the analyzed samples and the follow-up time, as the first study considered only 156 individuals during 18 months [5], while the second study included 10,427 individuals, monitored during 60 months [9]. Another study, developed with workers affected by diabetes, verified that those who presented three or more non-cardiovascular comorbidities presented an HR of 2.68 for absenteeism. However, employees who did not suffer from diabetes but presented three or more cardiovascular conditions presented an HR of 2.14 for absenteeism. Employees that presented three or more chronic conditions, excluding diabetes and cardiovascular conditions, presented an HR of 2.73 [21]. Another study reported a relative risk (RR) of 7.41 (95% CI: 5.47–10.05) for absenteeism when two or more chronic conditions were considered [11]. The result corroborates with the findings of other authors who demonstrated that work capacity is increasingly affected with higher multimorbidity scores [5], reporting that the incidence of absenteeism in men with multimorbidity was 11%, while men without multimorbidity presented 7%. This represents an incidence 60% higher in the first group than in the second (RR = 1.60; 95% CI: 1.57–1.68), with similar results obtained when women were evaluated [6].

Studies that evaluated the impact of multimorbidity on the return to work after a disease-related absence episode, especially depression, showed that there is an increased risk (approximately 20–50%) in terms of delayed return to work when, besides the cause of the work leave, other illnesses were associated (two or more of the following: cardiovascular disease, hypertension, other psychiatric disorders, asthma, musculoskeletal disorders) [18]. Another study by the same author reported that individuals who previously requested work leaves due to depression presented higher chances of recurrent work leaves when depression was associated with other psychiatric conditions, cardiovascular diseases, and systemic arterial hypertension [15].

The association between cardiovascular diseases or diabetes and mental disorders (especially moderate to severe depression) demonstrated to be a specific combination with high chances of resulting in early retirement [odds ratio (OR): 1.34; 95% CI: 1.05–1.74], unemployment (OR: 2.50; 95% CI: 1.69–3.70), and receipt of benefits due to disability (OR: 1.10; 95% CI: 0.71–1.71); the latter is more probable in individuals who suffered cerebral vascular accidents [21,22].

Regarding presenteeism, which is the issue of workers who are not operating at maximum capacity due to health-related

Table 2
Data collected from the studies included in the review

Study	Country	Design	Sample size, percentage (%) of women, age range, and mean [years old]	Chronic diseases included	Outcomes evaluated	Main results, measures of association, and confidence interval (CI)
Ubalde-Lopez et al., 2017 [5]	The Netherlands	Cohort, prospective study (one year follow-up)	n = 156, 58.6%, 18-63 (42)	Injuries, musculoskeletal, mental, cardiovascular, respiratory, neurological, digestive, urogenital, skin, endocrine/ metabolism, blood and congenital diseases and tumors	Work functioning scores using the Work Role Functioning Questionnaire (WRFQ), by latent class growth analysis (LCGA). LCGA identifies differentiated subpopulations (latent classes), each with its own specific longitudinal trend.	Multimorbidity did not predict membership in any trajectory. The increasing score trajectory levels of work functioning were lower among those with high baseline multimorbidity score. As for the effect of multimorbidity as a modifier of trajectories over time, the LCGA showed that within the increasing work functioning scores trajectory, work functioning decreased over time with higher baseline multimorbidity. Each unit increase in baseline multimorbidity implied a reduction of 1.4 points (p value < 0.001) of the work functioning score over time.
Ubalde-Lopez et al., 2017 [6]	Spain	Cohort, prospective study (two years follow-up)	n = 372 370 (for sickness absence incidence), 27%, NS n = 24 351 (for sickness absence duration), 29.9%, NS	Musculoskeletal disorders (MSDs), mental health disorders (MHDs), and cardiovascular diseases (CVDs)	Incidence and duration of sickness absence	Among men with multimorbidity, overall sickness absence (SA) incidence was 11%, 60% higher [relative risk (RR) = 1.60; 95% CI: 1.57−1.68] than among men without multimorbidity (7%). This was similar in women (RR = 1.54; 95% CI: 1.36−1.74). No significant associations between multimorbidity and duration of SA episodes, regardless of the presence or absence of prior SA episodes, except for women with MHD who had no prior SA episodes and high sex-specific multidimensional multimorbidity score (HR = 3.43; 95% CI: 1.00−11.76)
Sundstrup et al., 2017 [9]	Denmark	Cohort, prospective study (two years follow-up)	n = 10 427, 54.3%, NS (43.5)	Depression, asthma, diabetes, cardiovascular disease, cancer, impaired hearing, eczema, back disorders, or other conditions	Risk of long-term sickness absence (LTSA), it was defined as the registry of $\geq$ six consecutive weeks	There was an association between the number of chronic diseases and risk of LTSA. This association was stronger among employees with poor work ability (either physical or mental). Compared with employees with no diseases and good physical work ability, the risk estimate for LTSA was 1.95 (95% CI: 1.50−2.52) for employees with $\geq$3 chronic diseases and good physical work ability, whereas it was 3.60 (95% CI: 2.50−5.19) for those with $\geq$ three chronic diseases and poor physical work ability.
Ervasti et al., 2015 [18]	Finland	Cohort, retrospective study (seven-year follow-up)	n = 9908, NS, 18-65 (NS)	Other psychiatric disorders, cardiovascular disease, hypertension, diabetes, asthma, and cancer	Return to work after a depression-related absence episode exceeding nine days	A present or recent other condition was associated with a 19% to 52% increased risk of slower return to work. After adjustments for sex, age, occupational position, and employment contract, cancer (HR = 0.66, 95% CI = 0.47−0.92), diabetes (HR = 0.73, 95% CI = 0.62 −0.86), hypertension (HR = 0.76, 95% CI = 0.67−0.85), cardiovascular disease (HR = 0.78, 95% CI = 0.62 −0.99), other psychiatric disorders (HR = 0.78, 95% CI = 0.74−0.83), musculoskeletal disorders (HR = 0.82, 95% CI = 0.77−0.87), and asthma (HR = 0.84, 95% CI = 0.75−0.94). Two or more other chronic conditions in addition to depression were associated with delayed return to work when compared with absences with depression only (HR = 0.76, 95% CI = 0.72−0.81).

(*continued on next page*)

Table 2 (*continued*)

Study	Country	Design	Sample size, percentage (%) of women, age range, and mean [years old]	Chronic diseases included	Outcomes evaluated	Main results, measures of association, and confidence interval (CI)
Ervasti et al., 2014 [15]	Finland	Cohort, retrospective study (seven-year follow-up)	n = 9946, 84.3%, 18-65 (45.7)	Other psychiatric disorders, cardiovascular disease, hypertension, diabetes and musculoskeletal disorders	The occurrence of a recurrent disability episode due to a depressive disorder (new disability episode due to depressive disorder after the end of the preceding disability episode; no new disability episodes due to depression, disability pension with other diagnosis, old-age pension, death, or end of follow-up.	The risk of a recurrent disability episode due to other psychiatric disorder (HR = 1.82, 95% CI: 1.68−1.97), cardiovascular disease (HR = 1.39, 95% CI: 1.04−1.87), hypertension (HR = 1.44, 95% CI: 1.17−1.78), diabetes (HR = 1.43, 95% CI: 1.11−1.85), and musculoskeletal disorders (HR = 1.17, 95% CI: 1.06−1.28); the model was adjusted for sex, age, socioeconomic status, and employment contract.
Fouad et al., 2017 [11]	Egypt	Case−control study	n = 516, NS, ≤60 (NS)	Cardiovascular diseases, respiratory diseases, liver and digestive disorders, genitourinary and kidney disorders, musculoskeletal disorders, neurological (CNS and peripheral), diabetes mellitus, mental disorders, and others	Work productivity was measured in three domains: absenteeism, presenteeism, and critical incidents in the past four weeks.	Absenteeism RR 7.41 (95% CI: 5.47−10.05), presenteeism RR 3.77 (95% CI: 3.12−4.56), and excess negative incidents RR 30.10 (95% CI: 3.96−229.06).
Kivimäki et al., 2007 [21]	Finland	Cohort, prospective study (one-year follow-up)	n = 33 148,80.2%, 17 −65 (NS)	Diabetes, cardiovascular diseases (hypertension and established macrovascular disease: angina, myocardial infarction, and stroke or transient ischemic attack), and noncardiovascular comorbidity (asthma, bronchitis, prolapsed intervertebral disc, osteoarthritis, rheumatoid arthritis, peptic ulcer, fibromyalgia, migraine, depression, other psychiatric disorder)	Sickness absence episodes (>three days)	Among employees with diabetes, the presence of three or more noncardiovascular comorbid chronic conditions was associated with a HR = 2.68 (95% CI: 1.97−3.65) times increased risk of sickness absence after controlling for age, sex, and the number of risk factors and cardiovascular diseases. Among nondiabetic employees, the presence of three or more cardiovascular chronic conditions was associated with a 2.14-fold (95% CI: 1.51−3.03) increased risk of sickness absence, and the presence of three or more noncardiovascular chronic conditions was associated with a 2.73-fold (95% CI: 2.59−2.89) increased risk of sickness absence.

NS: not stated.

conditions, only one study evaluated this criterion specifically and reported an RR of 3.77 (95% CI: 3.12–4.56) for workers with multimorbidity [11].

After analysis of the studies included in the review presented herein, it was verified that the subject of multimorbidity and its relationship with work-related issues is still very recent. There is a lack of adequate standardization for a more systematic and accurate analysis, in the sense of detecting whether the number of chronic diseases or a specific combination of conditions in the same individual represents a more significant work disability.

Nevertheless, it is possible to infer that somatic chronic conditions favor the emergence of psychiatric diseases, especially depression, and the presence of these psychiatric conditions seems to worsen even more the clinical condition of the individual. Therefore, there is a type of positive feedback that broadens, even more, the incidence of absenteeism, the levels of presenteeism, and the chances of unemployment and early retirement.

As limitations of this review, publication bias and the wide variability of information contained in the multimorbidity studies can be cited, due to the absence of standardization of the analyzed diseases and of the impact metrics, which prevents comparison across studies. Given this, studies with different outcomes were included because of the scarcity of longitudinal studies directed to the multimorbidity subject. There is a pressing need to develop more primary studies, with adequate methodological standardization, for the proper measure of relevant parameters that result in a broader comprehension of multimorbidity and its global impact. As a strength of the research presented herein, it must be highlighted that this is the first review that combines longitudinal studies and analyzes the impact of multimorbidity on workers.

The causes involved in multimorbidity are being studied as well as the synergy between the different diseases. Some authors indicate that there may be an etiological relationship with obesity and unhealthy living habits [4,23,24]. These relationships need to be better studied through longitudinal studies that investigate the etiology of multimorbidity.

It can be concluded that multimorbidity is a clinical condition with increasing incidence in different populations, of different age groups. It can also be inferred that health systems are not wholly prepared to assist the affected individuals adequately. Governmental institutions lack data on the epidemiology of multimorbidity, which hinders the adequate planning of strategies to support workers and prevent its occurrence. Finally, the impact of multimorbidity on work must be stressed, because of its damages to quality of life and work productivity, worsening of the absenteeism/presenteeism indices, higher chances of temporary or permanent leaves, lower employability rates, and decreased admission of multimorbidity holders.

Conflicts of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the manuscript.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.shaw.2019.08.004.

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