

Abstract

Background Despite growing research on multimorbidity (MM), its epidemiology is poorly understood due to the great complexity of underlying patterns of chronicity. **The present review aims to identify the most frequent MM profiles and their social determinants.** **Methods** A systematic review following the PRISMA statement was conducted. The search strategy was performed by combining three sets of keywords (MM, inequalities, and patterns) searched in Pubmed, Scopus, Web of Science, OVID, CINAHL Complete, and PsycINFO. **Results** After the review process, 96 studies were selected from the 46,726 identified. The main methods used to identify MM patterns fell into five categories: latent class analysis (38.54%), cluster techniques (23.96%), factor analysis (19.79%), and machine learning (10.42%), and expert knowledge (7.29%). Latent class analysis was widely used, although, in recent years, the use of techniques based on machine learning has increased. The main patterns were cardiometabolic, cardiovascular, mental, musculoskeletal, complex MM and respiratory diseases. Some MM profiles were more prevalent among lower-SES groups. **Conclusion** Our results suggest that more and better-designed studies are needed to improve clinical practice and health policies with the aim of enhancing the quality of patients with MM and their relationship to health system use and care.

Background

The current healthcare system is inadequate or absent in addressing the coexisting chronic conditions of patients with comorbidity and MM (1). As life expectancy increases, the prevalence of chronic diseases increases. However, young people in Western countries are also at risk of MM, particularly in low- and middle-income countries. According to recent studies, social determinants significantly impact these differences, with populations with fewer socioeconomic resources experiencing an advance of 10-15 years in the age of onset of MM (2). Social inequalities shape the distribution of health inequalities and chronicity (3). The association between MM pattern and their associated social and behavioral determinants is not well defined, even though the impact of social inequalities on health is identified in the specialized literature(1). A few studies analyze other social determinants, such as area of residence or ethnic characteristics. Further research on MM patterns and associated determinants that may characterize different MM profiles is needed to plan future policies and the sustainability of health systems (4). The pathogenesis of chronicity could improve treatment by focusing on the disease set (5). Identifying specific classes could help healthcare professionals predict and control the probability of chronic disease occurrence and improve patients' quality of life. However, these studies do not entirely describe the different patterns and determinants nor consider the aggregation pattern of chronic diseases (1).

Methods

Studies analysing MM patterns related to socioeconomic and sociodemographic determinants were systematically reviewed.

Eligibility criteria for inclusion This study included primary studies of physical and/or mental MM associated with social determinants. Each article defined the condition of MM independently, so a similar concept was not necessary. We excluded systematic reviews and MM studies with communicable and no-chronic diseases, which had to be written in English and Spanish. We also excluded articles that did not relate MM patterns to social determinants.

Search strategy PubMed/MedLine, SciELO, PsycINFO, Web of Science, Scopus, and CINAHL Complete databases were searched on October 18, 2021. The same search was conducted in January 2022 to retrieve all articles published in 2021. We use Boolean language to search for relevant literature by combining three sets of keywords (multimorbidity, social determinants, and patterns and techniques).

Quality assessment In order to assess the quality of the studies, the Axis Tool quality assessment was used, which is a tool designed for systematically assessing the reliability of articles.

Data extraction The titles and abstracts were first reviewed by four reviewers. Experts reviewed full texts of found articles according to selection criteria. Any disagreements during the review process were resolved through discussion among the four reviewers.

Data analysis Different narrative synthesis and summarizing methods were used to identify patterns and associations with different social inequalities. In synthesizing the evidence found, it was necessary to identify which patterns of MM were most common, how pattern extraction methods were performed, and which social determinants were associated with each pattern.

Results and Discussion

A total of 135,635 articles were identified, of which 46,726 remained after duplicate removal. After judging titles and abstracts, we examined the full text of 937 articles. Finally, after reading the full text and checking the methodological quality, 96 articles were selected for review.

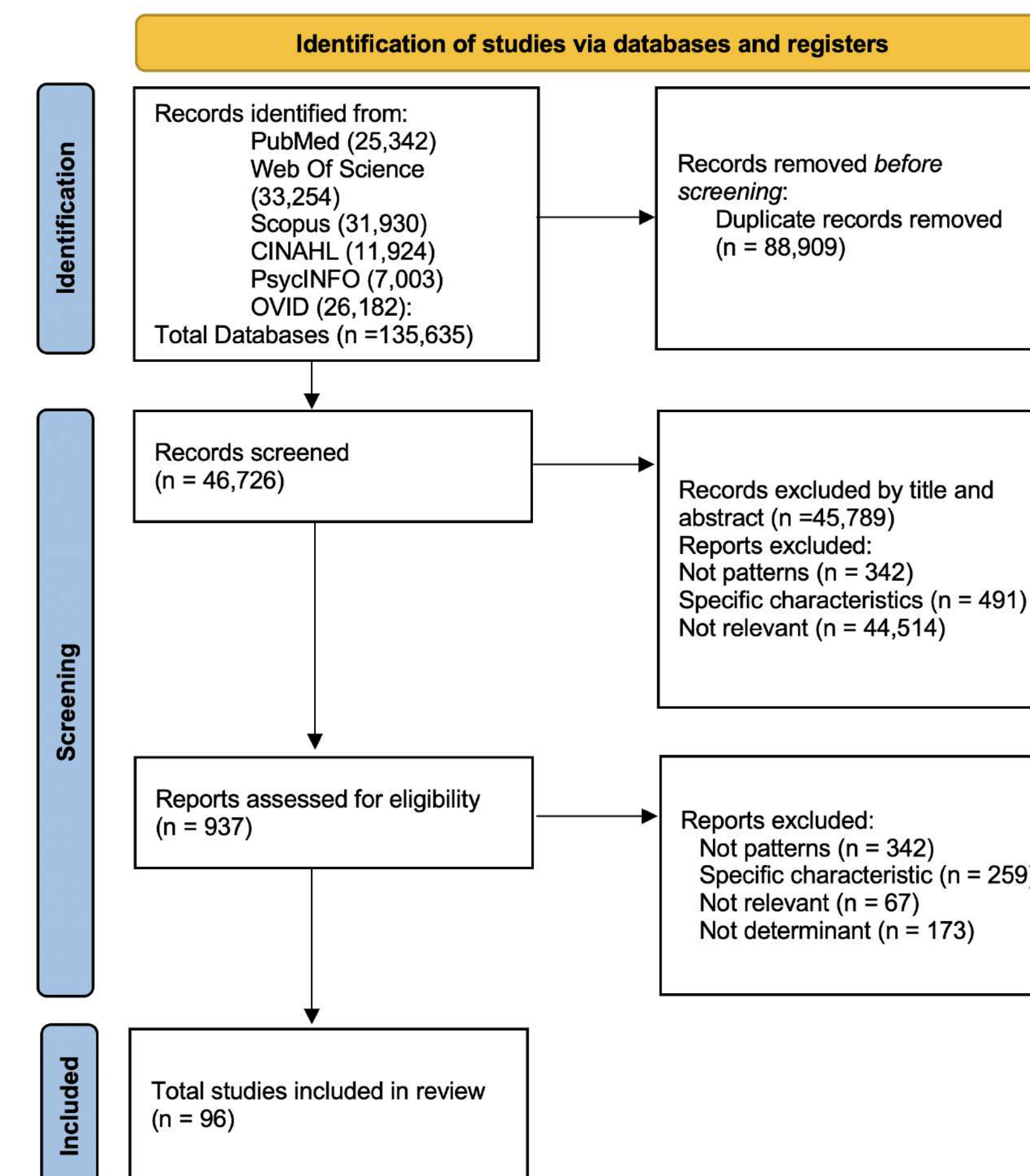


Figure 1. PRISMA Flow diagram

Among the results, several methodologies for extracting MM patterns were found, which were grouped into the latent class analysis(LCA), cluster techniques(CA), factor analysis(FA) Machine learning(ML), and expert knowledge(EK). A total of 38 social determinants were found, including sociodemographic characteristics, socioeconomic status, and lifestyle, social networks, characteristics of the living environment, access to health services (types of health insurance, visits and use). Regarding social determinants, gender and age were most commonly associated with patterns, followed by education. The most common MM patterns are: relatively healthy, cardiovascular, mental, musculoskeletal, metabolic, cardiometabolic, respiratory, complex, cancer, neurological and cardiometabolic/musculoskeletal and mental/musculoskeletal. According to the results described, they appear to be associated with avoidable social inequalities related to social and economic conditions. From a sociodemographic perspective, our review reveals important differences in MM patterns between men and women.

Social determinants	LCA (n=37)	CA(n=22)	FA (n=19)	ML (n=10)	EK (n=8)
Sociodemographic	34	21	17	9	8
Socioeconomic status	34	8	10	2	2
Lifestyle and behavioural	20	6	2	0	2
Living area characteristics	7	2	3	0	1
Health service use	9	2	1	2	0
Social networks and relationships	3	2	1	0	1

Table 1. Social determinants by pattern extraction method

Musculoskeletal and mental patterns are more typical in women, and cardiovascular patterns are more prevalent in men. As for age, the current results show that MM is not just an issue for older people. Certain types of MM are also seen in younger people, such as the MM pattern of psychosis and allergies. This review shows that lower socioeconomic status tends to increase the risk of severe MM (e.g., cardiovascular complex), and low levels of education and living in disadvantaged areas are associated with increased risk of MM. At the same time, healthy behaviours such as physical activity appear to delay the early onset of these MM patterns or at least reduce their impact on patient quality of life. Further study is necessary to address the multimorbidity issue, especially among individuals more socio-economically disadvantaged. Also urgently needed are studies focusing on the effects and determinants of multimorbidity in low- and middle-income countries and additional studies with more varied samples in terms of ethnic groups that may be less apparent to health systems due to accessibility concerns.

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References

- Prados-Torres A, Calderón-Larrañaga A, Hanco-Saavedra J, Poblador-Plou B, van den Akker M. Multimorbidity patterns: a systematic review. *J Clin Epidemiol* 2014;67(3):254–66.
- Hay SI, Abajobir AA, Abate KH, Abbafati C, Abbas KM, Abd-Allah F, et al. Global, regional, and national disability-adjusted life-years (DALYs) for 333 diseases and injuries and healthy life expectancy (HALE) for 195 countries and territories, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016. *The Lancet*. 2017;390(10100):1260–344.
- Vogeli C, Shields AE, Lee TA, Gibson TB, Marder WD, Weiss KB, et al. Multiple Chronic Conditions: Prevalence, Health Consequences, and Implications for Quality, Care Management, and Costs. *J Gen Intern Med*. 2007;22(3):391–5.
- Álvarez-Gálvez J, Rodero-Cosano ML, Salinas-Pérez JA, Gómez-Baya D. Exploring the Complex Associations Among Social Determinants of Health in Andalusia After the 2008 Financial Crisis. *Soc Indic Res*. 2019;141(2):873–93.
- Busija L, Lim K, Szoeko C, Sanders KM, McCabe MP. Do replicable profiles of multimorbidity exist? Systematic review and synthesis. *Eur J Epidemiol* 2019;34(11):1025–53.