

Socioeconomic Variation of Multimorbidity in Colombian Older Adults

Silvia Marcela Ballesteros (✉ smballesteros@gmail.com)

Fundacion Santa Fe de Bogotá: Fundacion Santa Fe de Bogota <https://orcid.org/0000-0003-1382-6859>

José Moreno-Montoya

Fundacion Santa Fe de Bogotá: Fundacion Santa Fe de Bogota

Wilhelmus Johannes Andreas Grooten

Karolinska Institutet

Pedro Barrera-López

Fundacion Santa Fe de Bogotá: Fundacion Santa Fe de Bogota

José A. De la Hoz-Valle

Fundacion Santa Fe de Bogotá: Fundacion Santa Fe de Bogota

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Abstract

Background

Multimorbidity prevalence in the elderly is increasing worldwide. Variations regarding the socioeconomic characteristics of the individuals and their context have been described, mostly in high-income scenarios. This study aims to assess the magnitude and the socioeconomic factors associated with variations on multimorbidity in Colombia.

Methods

A cross-sectional multilevel study with a nationally representative sample of 23 694 Colombian adults aged 60 years and older was conducted. Individual socioeconomic, demographic, childhood and health related characteristics, as well as group level variables (multidimensional poverty index and infectious diseases mortality rate) were analyzed. A two-level stepwise structural equation model was used to simultaneously adjust the individual and contextual effects.

Results

Multimorbidity prevalence was 62.3% (95% CI 61.7–62.9). In the multilevel adjusted models, age, female sex, having functional limitations, non-white ethnicity, high body mass index, higher income, physical inactivity, poverty during childhood and living in urban areas were associated with multimorbidity. The mediation analysis showed that living in rural areas was significantly associated with infectious disease mortality rate and other individual associations with multimorbidity were mediated by the multidimensional poverty variable.

Conclusions

This paper demonstrates a strong association between multimorbidity and poverty in a low-middle income country. Differences in the factors involved in the etiology of multimorbidity are expected among wealthy and poor countries regarding availability and prioritization of health services.

Background

Multimorbidity (MM), considered as the co-existence of two or more chronic conditions (1, 2), is a growing worldwide public health issue that has been estimated to affect approximately one third of adults in Latin American countries (3). The prevalence of MM increases as the population ages (4), estimates report figures rising from 11% in adults aged 25–44 years to 65% for those aged 65–84 years, and up to 82% in those 85 years and older (5). Moreover, MM has been widely associated with poor health outcomes including low quality of life (6), functional decline (6-8) and mortality (9, 10), which therefore results in high economic costs of care due to increased hospitalization rates (11) and polypharmacy (12). In the United States, about 65% of healthcare expenditures are related with the treatment of multimorbid patients (13).

Variations in the prevalence of MM have also been reported regarding demographic and socioeconomic characteristics, being higher in women, in the most aged, in persons of lower socioeconomic levels and in those living in disadvantage settings (1, 6, 14). Evidence supports a positive association between low-educational status (14, 15), childhood adversity, which is related with low educational attainment (16), and reduced lifetime earnings with the development of MM in late life (17). Furthermore, disadvantaged socioeconomic contexts have been associated with inadequate access to health care, unhealthy behaviors and unfavorable living conditions (18), all of which are related with the development of multiple chronic diseases (19, 20). Using context deprivation indices, former research have indicated that MM rates are higher among population groups with greater difficulties on access to drinking-water and energy for lighting sources (20), as well as in areas with higher rates of unemployment and household overcrowding (21, 22). In particular, the prevalence of MM, specifically of physical and mental disorders, has reported to be almost twice in areas of high socioeconomic deprivation (11.0%, 95% CI 10.9 –11.2), compared to more affluent areas (5.9%, 5.8 - 6.0) (21).

Likewise, deficient sanitation services and higher infectious diseases mortality rates, particularly in endemic areas and less prosperous settings, also impact on MM figures in late life (23, 24). However, scarce evidence is available regarding to MM in these contexts. The aim of this study was to assess the magnitude and the socioeconomic factors associated with variations on MM in Colombia.

Methods

Study design. A cross-sectional multilevel study was developed using secondary data from the Colombian population-based survey Health, Wellbeing and Aging (Salud, Bienestar y Envejecimiento (SABE)), carried out in 2015. The SABE study included 23 694 individuals aged over 60 years living in urban and rural areas of the 32 Colombian departments (i.e., states). Participants were selected by a probabilistic, multistage and stratified sampling design. Detailed information about the SABE study and the sampling method can be found elsewhere(25).

Variables. The dependent variable of interest was “Multimorbidity”, defined as the coexistence of two or more non-communicable diseases: diabetes, hypertension, cancer, lung disease (chronic obstructive pulmonary disease, asthma, bronchitis or emphysema), heart disease, stroke, joint diseases (arthritis, rheumatism or osteoarthritis), osteoporosis, depressive symptoms and other mental illnesses (mental or psychiatric problem). Except for depression, which was assessed with the Yesavage Geriatric Depression Scale (26), all morbidities were self-reported.

The independent variables of interest were both at individual and at group level. At individual level, the following dichotomous and continues sociodemographic characteristics were used: Sex (female / male(ref)), Age (continues), Marital status (single, widowed or divorced / others(ref)), Ethnicity (non-white / white(ref)), Income (mean income less than \$7.83/day / income of \$7.83/day / more than \$7.83/day(ref)), Educational level (secondary or lower level / higher level(ref)), Victim of armed displacement, defined as ever been displaced by armed conflict or violence (yes / no(ref)), Area of residence (rural / urban(ref)). Health and lifestyle-related variables included were Functional limitation defined as having a Barthel score of <100 (27) (yes / no(ref)), Body Mass Index (BMI) (low (<22) / overweight/obesity (>27) / normal weight (22–27) (ref))(28), Physical inactivity or a low level score of physical activity in the short-form International Physical Activity Questionnaire - IPAQ-SF (29) (yes / no(ref)) and Smoking (current or former smoker / nonsmoker(ref)). Childhood-related factors were also included as Self-perceived childhood economic situation (regular / poor / good(ref)) and Self-perceived childhood health status (poor or regular / good(ref)).

At group level, deprivation was addressed with official reports of the multidimensional poverty index (MPI) (30) in 2018 (31) and infectious diseases mortality rate in 2016 (32) of each department. The MPI includes 5 dimensions with 15 indicators of education, childhood and youth conditions (school attendance, childcare services), employment (informality, long-term unemployment), health (access, insurance), access to public utilities (water source, sewer system) and housing conditions (floors and walls material, overcrowding) (30). Group deprivation characteristics were analyzed as continues variables.

Statistical analysis. Descriptive analysis of the individual characteristics was based on the absolute and relative frequencies with 95% confidence intervals (95%CI) for categorical variables, and measures of central tendency and dispersion (mean and standard deviation (SD)) for quantitative variables. To identify differences between baseline characteristics, independent X^2 test and t -test analyses were developed for qualitative and quantitative variables respectively. Variables with p-values below 20% were considered for the adjusted models. A first one-level logistic model was used to evaluate the associations between the individual variables with MM, and significant variables ($p < 0.05$) were included in a multilevel stepwise backward model. To evaluate the variability of MM prevalence across states, the median OR (MOR) (33) was calculated. Correlation was evaluated between MM and state deprivation variables using Pearson correlation coefficients. A two-level stepwise structural equation model (SEM) was used to simultaneously adjust the individual and contextual effects.

Results

The overall prevalence of MM in the Colombian aged over 60 years was 62.3% (95% CI 61.7–62.9), varying between 42.6% (36.6–48.9) and 74.1% (69.2–78.5) across the country. The average age was 70.8 (SD=8.2) years and 57.3% (56.7–58.0) were women. Main diseases in the population were depression, 56.9% (56.2–57.6), hypertension, 53.9% (53.2–54.6), and joint disease, 26.0% (25.3–26.6). Hypertension and depression were the main comorbid conditions (25.5%), followed by hypertension and joint disease (16.3%), and hypertension and diabetes (12.5%) (Table 1).

A mean of 28.2 in the prevalence of multidimensional poverty was obtained for the whole country (SD=2.6); poorer zones coincide to them where less health facilities are available. Correlation between MM prevalence and poverty across the states in the country was of -0.80. A standardized mortality rate from communicable diseases of 34.48/100 000 was reported for 2016, with a correlation of -0.40 with MM. A non-significant association was found between infectious disease figures and poverty index ($p=0.288$). All individual factors showed a significant association with MM except for education level and smoking in the crude analyses (Table 2).

Adjusted analyses indicated a significant inter-state variability. The MOR for MPI was of 1.29 (1.14–1.44; $p=0.019$) and for infectious diseases was of 1.34 (1.23-1.45; $p=0.014$). Individual variables associated were age, female sex, having functional limitations, high body mass index (BMI), income, physical inactivity, poverty during childhood and living in urban areas (Table 3).

The mediation analysis showed that living in rural areas was significantly associated with infectious disease mortality rate; other individual associations were mediated by the MPI variable (Figure 1).

Discussion

This study found a 63% prevalence of multimorbidity in Colombian elderly population when considering a list of 10 chronic conditions and a cut-off point of 2 or more concurrent morbidities for its definition, including mental and physical disorders. Compared to other authors findings, this corresponds to earlier studies in which the prevalence of MM has been reported between 55 and 98% (6). Around 30% of the multimorbid population had poor functional status, which reinforces the need for preventive, coordinated and non-fragmented care (21).

In this study MM prevalence increases with age, is higher in women and is associated with childhood adversity, as reported before (4, 17). In contrast to previous studies our results indicate lower levels of MM in people living in middle/high income or less deprived settings. Barnett et al. (2012) and Salisbury et al. (2011), in a Scottish and English population, respectively, found that people living in more deprived settings were more likely to be multimorbid. These dissimilarities could derive from methodological matters including the use of clinical records and a more specific list of morbidities for the definition of MM in these studies (21, 22). Also, a better opportunity to be diagnosed or have a medical evaluation in more affluent settings could partly explain them; in fact, in less prosperous contexts, limited availability of resources is associated with lacks in diagnosis of non-communicable diseases (34-36). Likewise, in deprived contexts, where infectious diseases are more prevalent, decision makers are compelled to assign significant portions of resources to the attention and diagnosis of these diseases displacing the care of chronic conditions, in particular MM (37).

Furthermore, the use of self-assessments instead of using medical records, could have led to a difficulty to recall diagnosed chronic diseases. In addition, ongoing treatment might be higher in more affluent populations with better access to medical care which can improve the diagnosis self-reports (34).

Living in a rural residence, being non-white ethnicity and low household income, all of which have been related with deprivation, were also associated with lower risk of reporting multiple chronic conditions. Similar findings have been found by previous research (34, 38), and are also related with the accessibility to public and private services. Therefore, our results might reflect an under-reported prevalence of MM in poor regions and populations due to difficulties in the access to health services and limited resource availability for adequate diagnosis.

Our findings contrast mainly with studies developed in high-income countries. However, comparisons among national-level figures must consider differences among health-assurance, services coverages and deprivation level among the poor, which might not be the same between countries. Moreover, an under-diagnosis or the lag in diagnosis also affects prevalence estimations.

Limitations in our study need to be considered. The self-reported measures of conditions (except depressive symptoms) can underestimate the prevalence. Also, as secondary data was used, care needs or the severity of the diseases could not be included for the analyses. Unequal weights regarding the type and severity of the conditions are warranted to assess the impact of multimorbidity in the population (34).

Conclusion

Considering the above, this paper demonstrates a strong association between MM and poverty in a low-middle income scenario. Further research is needed to better understand the role of deprivation due the scarce number of publications coming from developing world. Wide differences in the factors involved in the etiology of MM are expected among wealthy and poor countries regarding availability and prioritization of health services.

Abbreviations

BMI = Body Mass Index

MM = Multimorbidity

MOR = Median Odds Ratio

MPI = Multidimensional Poverty Index

SABE = Salud, Bienestar y Envejecimiento (Health, Wellbeing and Aging) survey

SEM = Structural Equation Model

Declarations

Ethics approval and consent to participate

Ethics approval was granted by the Institutional Committee of Human Ethics of the Fundación Santa Fe de Bogotá Hospital. The approval ID is CCEI-11861-2020. As secondary data was used, no consent to participate was required.

Consent for publication

Not applicable

Availability of data and materials

The data that support the findings of this study are available from the Colombian Ministry of Health and Social Protection but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of the Ministry of Health and Social Protection.

The datasets regarding group level variables generated during and/or analysed during the current study are available in the National Administrative Department of Statistics repository, <https://www.dane.gov.co/index.php/estadisticas-por-tema/pobreza-y-condiciones-de-vida/pobreza-y-desigualdad/pobreza-monetaria-y-multidimensional-en-colombia-2018#pobreza-por-departamentos-2018>.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

SMB and JMM conceived the study and analyzed the data. SMB wrote the first and successive drafts of the manuscript, JMM and WJAG contributed to the writing of the manuscript. All authors critically revised the manuscript for important intellectual content and contributed to the interpretation of results. All authors have given final approval of the version to be published.

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Tables

Table 1. Population proportion in every comorbidities combination

	Diabetes	Cancer	Lung disease	Heart disease	Stroke	Joint disease	Mental illness	Depression	Osteoporosis	Total (95%CI)
Hypertension	12.4	2.7	6.4	10.8	3.5	16.3	5.6	25.5	7.2	53.9 (53.2-54.6)
Diabetes		0.8	2.1	3.5	1.1	5.1	1.9	7.8	2.4	16.4 (15.9-17.0)
Cancer			0.8	0.9	0.3	1.5	0.5	2.2	0.8	4.4 (4.1-4.7)
Lung disease				2.8	0.7	3.8	1.5	5.0	2.1	10.2 (9.8-10.6)
Heart disease					1.5	4.7	2.1	6.4	2.5	13.6 (13.1-14.1)
Stroke						1.3	0.8	2.4	0.6	4.6 (4.3-4.9)
Joint disease							3.5	12.4	6.9	26.0 (25.3-26.6)
Mental illness								4.1	1.7	8.5 (8.1-8.9)
Depression									5.8	56.9 (56.2-57.6)
Osteoporosis										11.5 (11.1-12.0)

Table 2. Multimorbidity and individual characteristics

Variable	Total (n=22996)		With Multimorbidity (n=14296)		Without Multimorbidity (n=8700)		P
	N	%	N	%	N	%	
Sex							<0.001
Female	13207	57.4	9263	64.8	3944	45.4	
Male	9789	42.6	5033	35.2	4756	54.7	
Marital status							<0.001
Single. Widowed. Divorced	10812	47.0	7072	49.5	3740	43.0	
Other	12174	53.0	7217	50.5	4957	57.0	
Ethnicity							<0.001
Non-white	12492	71.1	7307	68.8	5185	74.5	
White	5079	28.9	3308	31.2	1771	25.5	
Income*							0.038
Less than \$7.83/day	13064	68.7	7980	68.0	5084	69.6	
\$7.83/day	3074	16.2	1911	16.3	1163	15.9	
More than \$7.83/day	2892	15.2	1838	15.7	1054	14.4	
Education level							0.792
Secondary or lower	21492	93.8	13356	93.9	8136	93.8	
Upper than secondary	1416	6.2	875	6.1	541	6.2	
Physical inactivity							<0.001
Yes (Low IPAQ-SF score)	10997	47.9	7764	54.4	3233	37.2	
No (Moderate to High IPAQ-SF score)	11975	52.1	6515	45.6	5460	62.8	
Victim of armed displacement							<0.001
Yes	4259	18.5	2507	17.5	1752	20.1	
No	18732	81.5	11787	82.5	6945	79.9	
Perceived childhood economic situation							<0.001
Poor	3058	16.7	1989	17.9	1069	14.8	
Regular	7753	42.3	4754	42.9	2999	41.4	
Good	7516	41.0	4343	39.2	3173	43.8	
Functional Limitation							<0.001
Yes (Barthel score <100)	5152	22.4	4268	29.8	884	10.2	
No (Barthel score of 100)	17844	77.6	10028	70.2	7816	89.8	
Smoking							0.823
Former or current smoker	11930	51.9	7408	51.8	4522	52.0	
Nonsmoker	11059	48.1	6883	48.2	4176	48.0	
Area of residence (1=Yes; 0=No)							<0.001
Rural	6267	27.3	3456	24.2	2811	32.3	

Urban	16729	72.7	10840	75.8	5889	67.7	
Body Mass Index							<0.001
Low BMI (≤ 22 kg/m ²)	3053	17.7	1539	14.6	1514	22.5	
High BMI (≥ 27 kg/m ²)	7358	42.6	5064	48.1	2294	34.1	
Normal BMI (22 - 27 kg/m ²)	6847	39.7	3918	37.3	2929	43.5	
Self-perceived childhood health status							<0.001
Poor or regular	1925	10.5	1274	11.5	651	9.0	
Good	16453	89.5	9846	88.5	6607	91.0	
Age (Mean (SD))	70.8 (8.2)		71.8 (8.4)		69.2 (7.7)		<0.001

* Dollar values for year 2015; BMI = Body Mass Index

Table 3. Associations between individual variables and MM. using a multiple logistic stepwise model.

	OR	95%CI	p-value
Age (years)	1.04	1.03 - 1.05	<0.001
Female Sex	2.09	1.91 - 2.27	<0.001
Functional Limitation	3.00	2.60 - 3.47	<0.001
Single, widowed and divorced status	0.92	0.84 - 1.00	0.046
Physical inactivity	1.22	1.12 - 1.33	<0.001
Regular perceived childhood economic situation	1.20	1.10 - 1.31	0.002
Poor perceived childhood economic situation	1.37	1.22 - 1.54	<0.001
Income of less than \$7.83 per day*	0.74	0.66 - 0.82	<0.001
Income of \$7.83 per day*	0.88	0.77 - 1.00	0.056
Rural residence	0.81	0.73 - 0.89	<0.001
Non-white ethnicity	0.79	0.72 - 0.86	<0.001
Low BMI (≤ 22 kg/m ²)	0.78	0.69 - 0.88	<0.001
High BMI (≥ 27 kg/m ²)	1.48	1.36 - 1.62	<0.001

* Dollar values for year 2015; BMI = Body Mass Index.

Figures

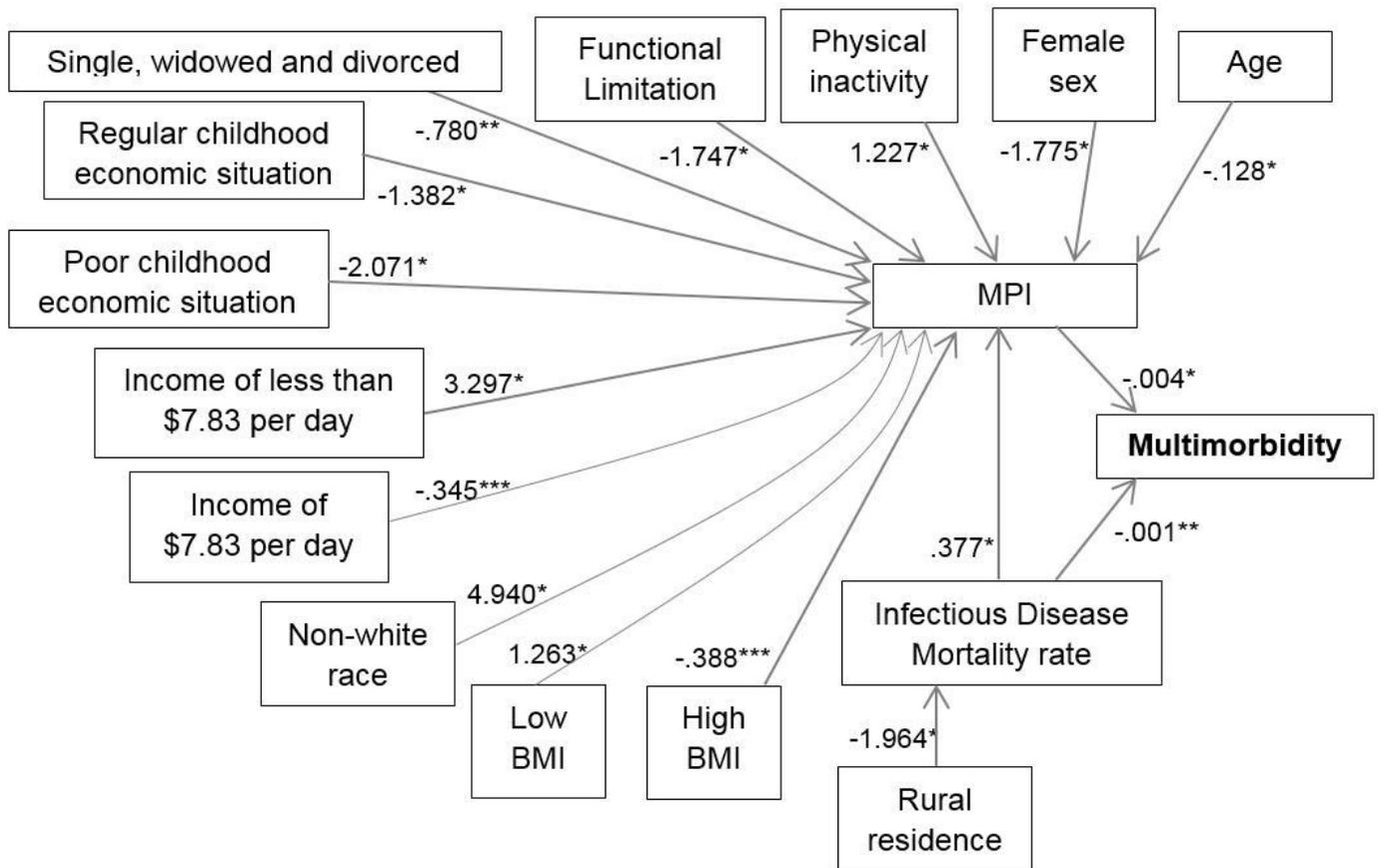


Figure 1

Final Structural Equation Model (SEM). Regression coefficients and p-values. * $p < 0.001$; ** $p < 0.05$; *** $p > 0.05$