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Multimorbidity and breastfeeding practices: findings from a population-based survey in Peru during 2024

Dayana BARRIGA-RODRIGUEZ[1,2], José A. CHAQUILA[2]

1 Carrera Profesional de Nutrición, Universidad Peruano Cayetano Heredia, Lima, Perú.
2 Departamento de Investigación en Salud Pública, Sociedad Peruana de Nutrición, Lima, Perú.

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ABSTRACT

Objective: To examine the association between multimorbidity and breastfeeding practices among Peruvian women of reproductive age who participated in a national survey.

Materials and Methods: This was a secondary analysis of the 2024 Peruvian Demographic and Family Health Survey. The exposure variable was multimorbidity, constructed from three possible non-communicable chronic diseases (NCDs): obesity, type 2 diabetes mellitus, and hypertension. This variable included three categories: no condition, one condition, and two or more conditions. The outcomes were two breastfeeding practices: exclusive breastfeeding (EBF) and early initiation of breastfeeding (EIB), both categorized dichotomously. Potential confounders were also considered. Bivariate and multivariable analyses were conducted using Poisson regression with robust variance.

Results: A total of 8,163 women were eligible for the analysis. Overall, 65.3% did not practice EBF, and 45.3% had a delayed initiation of breastfeeding. Additionally, 42.1% had one NCD and 4.4% had two or more. A higher number of NCDs was associated with a lower prevalence of optimal breastfeeding practices, showing a dose–response pattern. In the multivariable model, women with two or more NCDs had a 33% lower prevalence of EIB (PR: 0.67; 95% CI: 0.55–0.82). However, multimorbidity was not significantly associated with EBF.

Conclusion: These findings underscore the need for targeted support strategies for women with multiple NCDs to promote optimal breastfeeding practices in the Latin American context.

KEYWORDS

Non-Communicable Diseases; Maternal Health; Exclusive Breastfeeding; Postnatal care; Population Study

INTRODUCTION

In recent decades, despite decreasing mortality rates from non-communicable diseases (NCDs), their incidence has risen considerably[1]. This increase indicates that a growing number of individuals are losing disability-adjusted life years (DALYs), which negatively affects their quality of life. Moreover, in Latin American countries, elevated body mass index (BMI), high serum glucose levels, and elevated blood pressure rank among the three leading causes of DALYs and mortality[2]. As a result, national health programs are continuously structured to prevent NCDs.

In this context, multimorbidity is commonly defined as the coexistence of two or more diseases[3], which deteriorates both physical and mental health by increasing the number of hospitalizations, polypharmacy, and frailty[4]. Additionally, multimorbidity has been shown to affect psychosocial components such as social relationships, quality of life, and emotional well-being[4]. Thus, multiple social programs and support networks have been implemented to assist these patients, who also tend to have a higher incidence of depression[5].

Aligned with this, one behavior that may be affected by multimorbidity is breastfeeding (BF). Optimal BF practices—such as exclusive breastfeeding (EBF) and early initiation of breastfeeding (EIB)—have demonstrated health benefits for both mothers and infants[6]. Women who breastfeed tend to exhibit lower incidence of NCDs such as type 2 diabetes mellitus (T2DM)[7], hy-

Correspondencia:
José A. Chaquila
jachaquila@hotmail.com

pertension[8] and cardiovascular disease[9]. For children, BF contributes to greater immunity, better nutrition, enhanced cognitive development, and lower long-term incidence of NCDs[10-12].

However, evidence shows that women with NCDs often present inadequate BF practices. Women with NCDs are more likely to initiate BF late, discontinue BF, and provide infant formula, compared with women without chronic conditions[13]. Nonetheless, some studies have found no association between NCDs and BF practices[14], underscoring the need for further research. Given the implications that multimorbidity may have on BF practices—a behavior crucial for child development—and the lack of evidence in Latin American countries, particularly Peru, the primary objective of this study was to assess the association between multimorbidity and BF practices among women of reproductive age who participated in a national survey in Peru in 2024. As a secondary objective, this study aimed to characterize BF practices and sociodemographic factors of women according to the number of coexisting diseases. Based on prior evidence, we hypothesized that a higher number of diseases would be associated with poorer BF practices.

METHODS

Study Desing

The proposed objective was addressed through a cross-sectional observational study using secondary data from the 2024 Peruvian Demographic and Family Health Survey (ENDES), the most recent version available at the time of the study (2025)[15]. ENDES is the largest national survey addressing health-related aspects of individuals across different age groups. It collects information from individuals and households across all regions of Peru and, given its representativeness, its data are used for public health decision-making. Additionally, ENDES is part of the international Demographic and Health Surveys (DHS) program, implemented in multiple countries worldwide.

Population and Sample

For this study, we included information from women of reproductive age (15–49 years). Only women who had given birth within the previous five years were included. Women lacking complete information on the variables of interest or presenting implausible BMI values (≤15 kg/m² or ≥50 kg/m²) were excluded[16]. In 2024, more than 36,000 households were surveyed as part of ENDES, selected through a two-stage, independent, probabilistic, and stratified sampling design[15]. The analytic final sample was 8,193 women.

Variables

Exposure variable: Multimorbidity

To determine multimorbidity, three NCDs were considered: obesity, T2DM and hypertension. Obesity was defined as BMI ≥ 30 kg/m²; T2DM was identified through an affirmative response to the question, "Have you ever been diagnosed with diabetes or high blood sugar?" Hypertension was identified using two criteria: (1) an affirmative response to the question, "Have you ever been diagnosed with high blood pressure?" or (2) systolic and diastolic blood pressure ≥140 and ≥90 mmHg, respectively. The multimorbidity variable included three categories: (1) no diseases, (2) one disease, and (3) two or more diseases.

Outcome variables: Breastfeeding practices

Two BF-related practices were evaluated for the woman's most recent child: 1) EBF and 2) initiation of BF. Both variables refer to the practices employed with the woman's last child. EBF was defined as providing only breast milk for six months without offering any other type of liquid. BF initiation refers to the moment when the mother first breastfed the child. EIB was considered when the mother breastfed immediately or within the first hour after birth. Conversely, delayed BF initiation was defined as breastfeeding after the first hour of birth. These classifications were based on World Health Organization guidelines[17].

Covariates

Covariates were selected based on epidemiological criteria, as all were considered potential hypothesized variables. These included the woman's age, highest educational attainment, marital status, ethnicity, number of children, daily consumption of three or more servings of fruits and vegetables, alcohol and tobacco use in the last month, wealth (established in quintiles), and the woman's household region and area of residence. The variable categories are shown in **Table 1**.

Statistical Analysis

All analyses were conducted using STATA version 19.5 SE (StataCorp). Given the complex survey design, sampling weights were applied to all statistical analyses. Descriptive analyses were expressed as absolute and weighted frequencies, including 95% confidence intervals (95% CIs). To determine differences between women's characteristics according to exposure variables, bivariate analyses were conducted using Pearson's chi-square test. Differences were considered statistically significant when the p-value was less than 0.05.

To address the study objective, a Poisson regression model with robust variance was performed, expressing the strength of association through prevalence ratios (PRs) and 95% CIs. Both crude and adjusted models (including all confounding variables) were constructed. This statistical model was chosen over binomial regression due to the number of adjustment variables and the risk of non-convergence in binomial models. Additionally, Poisson regression with robust variance allows for control of overdispersion, providing more reliable confidence intervals. Multicollinearity was assessed using vari-

Table 1. Characteristics of Peruvian women of reproductive age included in the study (n = 8,193)

	n	% (95% CIs) *
Age, years		
15 – 25	1,895	24.4 (22.9 – 25.9)
26 – 35	3,742	38 (36.4 – 39.5)
36 – 45	2,456	35.2 (33.6 – 36.9)
45 or older	100	2.4 (1.7 – 3.4)
Highest educational attainment		
Incomplete secondary education	2,483	25.7 (24.4 – 27.1)
Complete secondary education	2,824	34.4 (32.9 – 36)
Post-secondary education	2,886	39.9 (38.2 – 41.6)
Marital status		
Without partner	1,837	23.1 (21.6 – 24.6)
With partner	6,356	76.9 (75.4 – 78.4)
Ethnicity		
Indigenous	2,982	27.4 (25.9 – 28.9)
Afro-Peruvian	954	11.8 (10.8 – 12.8)
Mestizo	3,697	52.5 (50.7 – 54.2)
Other	560	8.4 (7.4 – 9.5)
Number of children		
1 child	2,409	33.1 (31.4 – 34.8)
2 or more	5,784	66.9 (65.2 – 68.6)
Daily consumption of 3 or more servings of fruits and vegetables		
No	7,927	96.7 (96 – 97.2)
Yes	266	3.3 (2.8 – 4.0)
Alcohol consumption in the last month		
No	5,897	69.1 (67.4 – 70.7)
Yes	2,296	30.9 (29.3 – 32.6)
Tobacco use in the last month		
No	8,021	97.3 (96.6 – 97.9)
Yes	172	2.7 (2.1 – 3.4)
Household wealth		
Poorest	2,526	19.0 (18.0 – 20.1)
Poor	2,356	24.7 (23.2 – 26.2)
Middle	1,600	21.8 (20.4 – 23.4)
Rich	1,112	19.7 (18.2 – 21.3)
Richest	599	14.8 (13.3 – 16.3)
Region		
Metropolitan Lima	834	35.2 (33.4 – 37.0)
Rest of the coast	2,450	26.5 (25.2 – 27.8)
Highlands	2,805	24.4 (23.0 – 25.8)
Jungle	2,104	13.9 (13.1 – 14.9)
Residence		
Rural	2,514	16.5 (15.7 – 17.4)
Urban	5,679	83.5 (82.6 – 84.3)

n: sample; CIs: Confidence intervals.
* The weighted frequencies and CIs considered the survey sampling weights.

ance inflation factors (VIFs) from an auxiliary linear regression model. No evidence of severe multicollinearity was detected, with a mean VIF of 1.77 and all VIFs < 10.

Ethical Consideration

The data provided by ENDES are publicly accessible and available for use by decision-makers and researchers at: https://proyectos.inei.gob.pe/microdatos/. Furthermore, the database does not contain sensitive or identifying information that would permit recognition or localization of survey participants. Additionally, ENDES operates under a Legal Framework approved by the Peruvian government, ensuring participant protection[15]. Therefore, ethical approval was not required for the execution of this study.

RESULTS

Participant characteristics

After applying the exclusion criteria, 8,193 women were eligible for analysis. The sample was predominantly composed of women with post-secondary education, women with two or more children, and women from low-wealth households. Additionally, three out of ten women consumed alcohol in the past 30 days, and eight out of ten resided in urban areas **(Table 1)**.

Additionally, nearly one-third of women practiced EBF, and slightly more than half had EIB **(Table 2).** Regarding health conditions, obesity was the most prevalent condition, whereas T2DM had the lowest prevalence. Overall, 4.4% of women presented two or more diseases.

Characterization of participants according to the number of diseases

When evaluating participant characteristics according to the number of diseases, women who did not practice EBF had a higher proportion of having two or more diseases compared with those who did practice EBF, whereas women with no diseases reported EBF more frequently than their counterparts **(Table 3).** Similarly, women who initiated BF late had twice the prevalence of presenting two or more diseases compared with those who had EIB. Regarding other characteristics, the number of diseases differed statistically according to the woman's age, marital status, number of children, alcohol consumption, household wealth, region, and area of residence. Higher age, greater number of children, and higher household wealth were associated with a greater presence of two or more diseases. Additionally, a lower prevalence of two or more diseases was observed in the rainforest region and among women living in rural households **(Table 3)**.

Multivariate association between multimorbidity and breastfeeding practices

To address our hypothesis—that a higher number of diseases would adversely affect optimal BF practices—multivariate association models were conducted. When evaluating the association between multimorbidity and having provided EBF, a dose–response pattern was observed: mothers with 1 and with ≥2 diseases had 7% and 21% lower prevalence of having provided EBF, respectively, compared with mothers without diseases, in both crude and adjusted models. However, this association was not statistically significant. Conversely, a statistically significant dose–response association was found between multimorbidity and BF initiation. In both crude and adjusted models, a higher number of diseases was associated with a lower prevalence of EIB. Mothers with 1 and ≥2 diseases showed 7% and 33% lower prevalence of EIB, respectively, compared with those without diseases.

Table 2. Breastfeeding practices, chronic diseases, and multimorbidity among Peruvian women of childbearing age included in the study (n = 8,193)

	n	% (95% CIs) *
EBF		
No	4,912	65.3 (63.6 – 66.8)
Yes	3,281	34.7 (33.2 – 36.4)
Initiation of breastfeeding		
Late	3,025	43.5 (41.6 – 45.3)
Early	5,168	56.5 (54.7 – 58.4)
Obesity		
No	4,659	55.8 (54.0 – 57.6)
Yes	3,534	44.2 (42.4 – 46.0)
T2DM		
No	8,106	98.7 (98.1 – 99.1)
Yes	87	1.3 (0.9 – 1.9)
Hypertension		
No	7,761	94.4 (93.6 – 95.2)
Yes	432	5.6 (4.8 – 6.4)
Multimorbidity (number of diseases)		
0	4,484	53.5 (51.7 – 55.3)
1	3,373	42.1 (40.3 – 43.9)
2 or more	336	4.4 (3.7 – 5.3)

n: sample; CIs: Confidence intervals; EBF: exclusive breastfeeding.
* The weighted frequencies and CIs considered the survey sampling weights.

DISCUSSION

Main Findings

Our results indicate that in a sample of more than 8,000 Peruvian women of childbearing age who participated in a national survey in 2024, those with NCDs had a lower prevalence of EIB, with women presenting two or more NCDs showing a 33% lower prevalence of this good BF practice (adjusted PRs: 0.67, 95% CI: 0.55–0.82). Regarding EBF, we also found a lower prevalence as the number of NCDs increased, with a 21% lower prevalence of having provided EBF among women with two or more diseases compared to those without diseases. However, this association (adjusted PR: 0.79, 95%

Table 3. Breastfeeding practices and other characteristics of Peruvian women of childbearing age included in the study according to the number of chronic diseases they presented (n = 8,193)

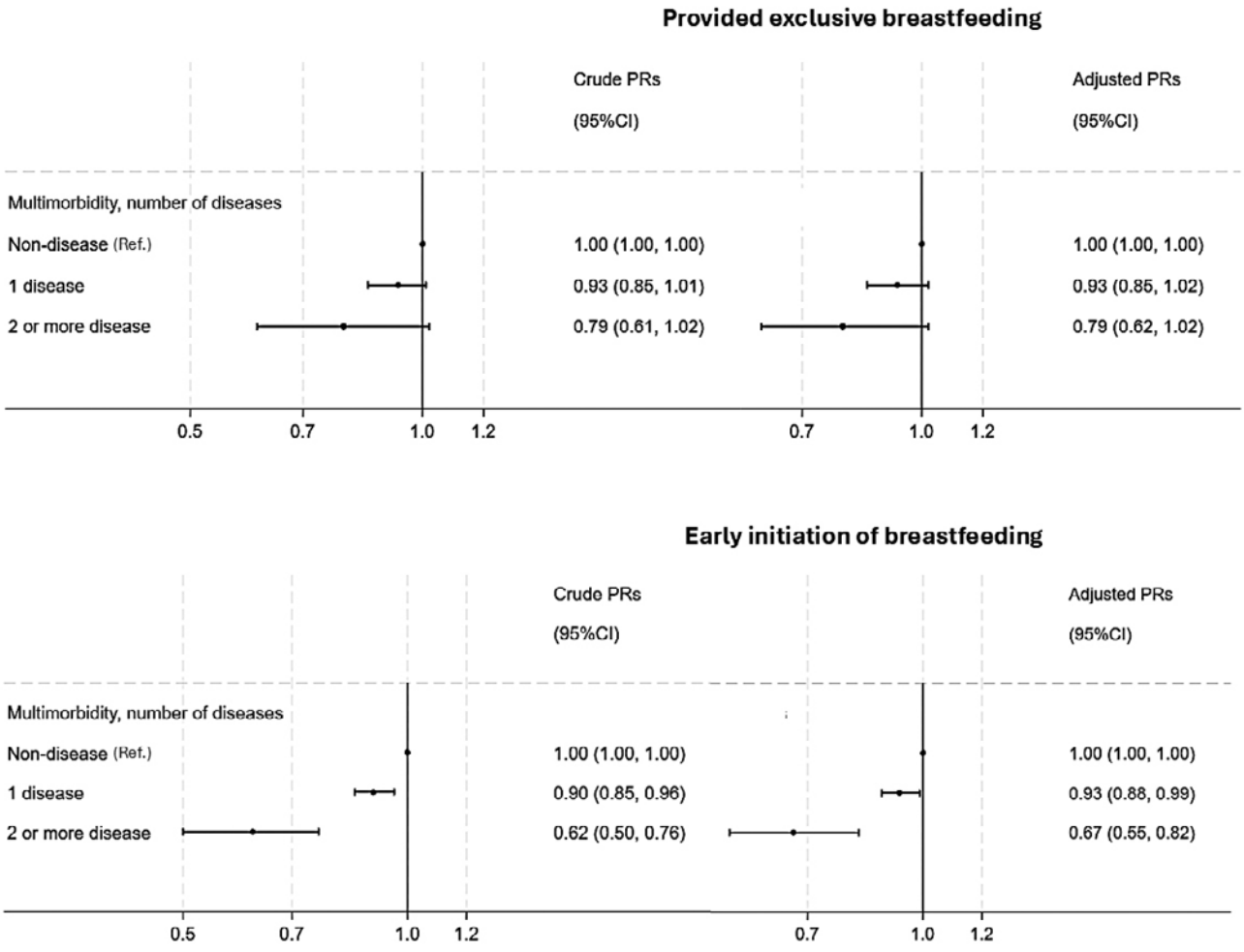
	Multimorbidity, number of diseases						P value
	0		1		2 or more		
	n	%(95% CIs) *	n	%(95% CIs) *	n	%(95% CIs) *	
EBF							
No	2,564	52.4(50.0 – 54.7)	2,120	42.8(40.5 – 45.1)	228	4.9(3.9 – 6.0)	0.077
Yes	1,920	55.6(53.0 – 58.2)	1,253	40.7(38.2 – 43.3)	108	3.7(2.8 – 4.8)	
Inititation of breastfeeding							
Late	1,477	49.3(46.5 – 52.2)	1,374	40.4(38.3 – 42.6)	174	6.4(5.1 – 8.1)	<0.001
Early	3,007	56.7(54.5 – 58.8)	1,999	40.4(38.3 – 42.6)	162	2.9(2.3 – 3.7)	
Age, years							
15 – 25	1,367	71.7(68.2 – 75.0)	514	27.5(24.2 – 31.0)	14	0.8(0.3 – 2.2)	<0.001
26 – 35	1,982	51.4(48.8 – 54.0)	1,625	45.0(42.5 – 47.6)	135	3.6(2.7 – 4.6)	
36 – 45	1,090	44.0(41.0 – 47.1)	1,189	48.8(45.6 – 52.0)	177	7.2(5.9 – 8.8)	
45 or older	45	39.4(22.8 – 58.9)	45	45.5(29.1 – 63.0)	10	15.0(6.4 – 31.5)	
Highest educational attainment							
Incomplete secondary education	1,310	49.8(46.9 – 52.8)	1,062	45.3(42.4 – 48.3)	111	4.8(3.7 – 6.2)	0.077
Complete secondary education	1,579	53.4(50.3 – 56.4)	1,142	42.7(39.9 – 45.5)	103	4.0(2.8 – 5.5)	
Post-secondary education	1,595	55.9(52.9 – 58.9)	1,169	39.5(36.6 – 42.4)	122	4.6(3.5 – 6.1)	
Marital status							
Without partner	1,073	57.9(54.2 – 61.4)	698	38.9(35.3 – 42.5)	66	3.3(2.2 – 4.8)	0.012
With partner	3,411	52.2(50.1 – 54.2)	2,675	43.0(41.0 – 45.1)	270	4.8(4.0 – 5.7)	
Ethnicity							
Indigenous	1,666	53.5(50.6 – 56.4)	1,209	41.8(39.0 – 44.8)	107	4.6(3.5 – 6.2)	0.605
Afro-Peruvian	497	48.5(44.2 – 52.8)	412	46.9(42.7 – 51.3)	45	4.6(3.1 – 6.8)	
Mestizo	2,016	54.5(52.0 – 57.1)	1,519	41.2(38.7 – 43.8)	162	4.3(3.3 – 5.5)	
Other	305	53.7(46.8 – 60.5)	233	41.5(34.9 – 48.4)	22	4.8(2.2 – 9.9)	
Number of children							
1 child	1,582	64.4(61.3 – 67.5)	778	33.7(30.7 – 36.8)	49	1.9(1.1 – 3.2)	<0.001
2 or more	2,902	48.1(45.9 – 50.2)	2,595	46.2(44.1 – 48.4)	287	5.7(4.8 – 6.8)	

n: sample; CI: Confidence intervals; EBI: exclusive breastfeeding.
* The weighted frequencies and CIs considered the survey sampling weights.

Table 3 continuation. Breastfeeding practices and other characteristics of Peruvian women of childbearing age included in the study according to the number of chronic diseases they presented (n = 8,193)

	Multimorbidity, number of diseases						P value
	0		1		2 or more		
	n	%(95% CIs) *	n	%(95% CIs) *	n	%(95% CIs) *	
Daily consumption of 3 or more servings of fruits and vegetables							
No	4,329	53.1(51.4 – 55.1)	3,274	42.4(40.5 – 44.2)	324	4.4(3.7 – 5.2)	0.233
Yes	155	60.5(51.5 – 68.9)	99	34.0(26.2 – 42.9)	12	5.4(2.3 – 12.4)	
Alcohol consumption in the last month							
No	3,365	55.8(53.7 – 57.8)	2,317	40.3(38.2 – 42.3)	215	4.0(3.2 – 5.0)	<0.001
Yes	1,119	48.4(45.1 – 51.7)	1,056	46.1(42.8 – 49.4)	121	5.5(4.2 – 7.1)	
Tobacco use in the last month							
No	4,417	53.8(52.0 – 55.6)	3,279	41.8(40.0 – 43.6)	325	4.4(3.7 – 5.2)	0.142
Yes	67	41.7(39.4 – 55.0)	94	52.1(39.5 – 64.5)	11	6.2(2.6 – 13.9)	
Household wealth							
Poorest	1,600	62.5(59.9 – 65.1)	855	34.4(31.9 – 37.0)	71	3.0(2.3 – 4.1)	<0.001
Poor	1,220	51.8(48.3 – 55.3)	1,038	44.0(40.6 – 47.5)	98	4.2(3.1 – 5.7)	
Middle	780	47.9(44.2 – 51.7)	743	48.0(44.2 – 51.7)	77	4.1(3.0 – 5.6)	
Rich	557	49.0(44.5 – 53.6)	496	45.1(40.8 – 49.4)	59	5.9(4.0 – 8.5)	
Richest	327	58.8(52.9 – 64.5)	241	36.0(30.5 – 41.9)	31	5.2(3.1 – 8.5)	
Region							
Metropolitan Lima	399	51.1(46.8 – 55.4)	395	44.0(39.7 – 48.3)	40	5.0(3.4 – 7.1)	0.004
Rest of the coast	1,194	50.7(48.1 – 53.2)	1,135	45.3(42.8 – 47.8)	121	4.1(3.2 – 5.1)	
Highlands	1,658	56.5(54.2 – 58.8)	1,041	38.6(36.3 – 41.0)	106	4.9(3.8 – 6.2)	
Jungle	1,233	59.6(56.9 – 62.3)	802	37.3(34.6 – 40.1)	69	3.1(2.3 – 4.2)	
Residence							
Rural	1,563	61.4(58.6 – 64.2)	881	35.5(32.8 – 38.4)	70	3.0(2.3 – 4.0)	<0.001
Urban	2,921	51.9(49.8 – 54.0)	2,492	43.4(41.3 – 45.5)	266	4.7(3.9 – 5.7)	

n: sample; CI: Confidence intervals; EBI: exclusive breastfeeding.
* The weighted frequencies and CIs considered the survey sampling weights.



PRs: prevalence ratios. CI: confidence interval. Crude and adjusted models accounted for the survey sampling weights. Models were adjusted for age, education, marital status, ethnicity, number of children, daily consumption of three or more servings of fruits and vegetables, alcohol and tobacco use in the past month, household wealth, region, and area of residence.

Figure 1. Association between multimorbidity and breastfeeding practices among Peruvian women of childbearing age included in the study (n = 8,193).

CIs: 0.62–1.02) did not reach statistical significance, suggesting that multimorbidity did not significantly affect the provision of EBF.

Comparison with other studies and potential explanatory mechanisms

Regarding EIB, our findings show that the presence of NCDs significantly decreased this practice. This aligns with what has been reported in a sample of Egyptian women, where those with NCDs were less likely to initiate BF within the first hour (48%) compared to their healthy counterparts (71%)[13]. These findings may be explained by delayed onset of lactogenesis II, the stage when breast milk production increases substantially[18,19]. Women with obesity have been shown to have a 56% higher probability of delayed lactogenesis II, and this probability is threefold higher among women receiving insulin therapy for diabetes (OR: 3.11)[20].

Another physiological mechanism that may explain our findings is the reduced secretion of prolactin, the hormone responsible for milk production[18]. After childbirth, progesterone levels decrease, allowing sustained prolactin secretion to initiate milk production[19]. In a study of 40 obese mothers, prolactin levels before and after breastfeeding were significantly lower compared to normal-weight women, even up to seven days postpartum[21]. This suggests that excess adiposity, a common risk factor for multiple NCDs such as T2DM and hy-

pertension[22], may contribute to early BF cessation and may underlie our results.

In contrast, unlike other studies, EBF was not significantly associated with the presence of NCDs in our findings. This differs from a Canadian sample, where women with NCDs were more than twice as likely to discontinue EBF (OR: 2.48, 95% CIs: 1.49–4.12)[23] and from Australian data showing that women with obesity had a 40% higher probability of not EBF for six months[14]. Additionally, we found that women with two or more diseases tended to be older and from wealthier households. With increasing age, disease incidence rises due to weaker immune response, loss of muscle mass, and greater cumulative exposure to harmful factors across the life course[24]. Moreover, in low- and middle-income countries, higher socioeconomic status has been linked to poorer health outcomes due to excess malnutrition and sedentary lifestyles[25]. These results underscore the importance of prioritizing specific population groups when designing BF promotion strategies.

Implications of our study

The findings of this study highlight the need for timely interventions targeting women of childbearing age with at least one NCD who plan to become mothers. Educational programs on optimal BF practices and their benefits could help raise awareness and promote appropriate BF behaviors. Furthermore, the characterization of women by number of diseases allows prioritization of specific groups. For example, women aged 36 years and older, partnered women, those with two or more children, wealthier households, residents of urban areas, and those living along the coast will require special attention due to their higher vulnerability to multimorbidity. These findings may support the implementation or restructuring of BF awareness programs.

Limitations and strengths

This study has limitations that should be considered when interpreting its findings. First, there may be measurement bias, particularly in anthropometric data, disease diagnosis, and duration of disease. Unlike hypertension and obesity, T2DM diagnosis was based on self-report rather than clinical measurement; however, self-report questions are commonly used in population studies to estimate national prevalence. Second, in line with the previous limitation, recall bias may be present, potentially affecting the accuracy of self-reported BF practices, T2DM diagnosis, and other covariates. Third, the cross-sectional design prevents the establishment of causal pathways between exposure (multimorbidity) and outcomes (BF practices). Nevertheless, the multivariable regression approach allows estimation of total effects while controlling for potential confounders, providing a more precise approximation of the underlying associations. Fourth, ENDES data allowed estimation of multimorbidity only from obesity, T2DM, and hypertension, limiting exploration of other NCDs that may also be present. Still, elevated BMI, hyperglycemia, and high blood pressure are the main contributors to NCD-related DALYs in Latin America[2]. Despite these limitations, the main strengths of our investigation include the use of a nationally representative survey with a large sample of women of childbearing age. Additionally, standardized measurement protocols and data collection procedures help minimize measurement and recall biases.

CONCLUSIONS

In a sample of more than 8,000 women of childbearing age, our results show a dose–response relationship between multimorbidity and delayed BF initiation, with women experiencing one and two or more NCDs showing 7% and 33% lower prevalence, respectively, of EIB. We also found a trend of lower EBF as the number of diseases increased, although this association was not statistically significant. These findings may contribute to identifying vulnerable groups for targeted awareness strategies promoting optimal breastfeeding practices.

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