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Prevalence of common mental disorders in southern Brazilian women: a comparison of two population-based studies (2003 vs. 2015)

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Abstract

Purpose To investigate the prevalence and associated factors of common mental disorders (CMD) in women, and comparing them in two periods, 2003 and 2015.

Methods A comparative study was conducted between two surveys with representative samples of women aged 20–60 years residing in southern Brazil. The final sample included 988 and 987 women from the 2003 and 2015 surveys, respectively. The presence of CMD was assessed using the Self-Reporting Questionnaire (SRQ-20 $\geq$ 8) in both surveys. Poisson regression analysis was used to evaluate the associations between the outcome (CMD) and variables of interest.

Results The mean age of the participants was 38.5 ± 11.1 years (2003) and 40.3 ± 11.4 years (2015). In 2003, the prevalence of CMD was 33.4% (95%CI: 30.5–36.3) and in 2015, it was 33.7% (95%CI: 30.8–36.7). Over 12 years, no significant differences were observed in the prevalence of CMD, except for a reduction in the prevalence in women of color and physically active. After adjusting, the prevalence ratios of CMD in 2003 and 2015 remained associated with low family income, a higher number of pregnancies, and tobacco use.

Conclusions This study showed a trend toward stability in the high prevalence of CMD among women.

Keywords Mental health disorders · Prevalence · Women's health · Cross-sectional studies · Trends

Introduction

Common mental disorders (CMD) are characterized by a group of non-psychotic mental health disorders such as depressive symptoms, anxiety, irritability, insomnia, fatigue, forgetfulness, difficulty concentrating, feelings of worthlessness, and somatic complaints (Goldberg and Huxley 1992).

These disorders account for the highest burden of disability worldwide, significantly affecting interpersonal relationships and increasing social and economic costs (G. B. D. Mental Disorders Collaborators 2022; Covid- Mental Disorders Collaborators 2021).

Evidence points to a high prevalence of CMD in population-based samples, especially in low- and middle-income

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countries (WHO 2022). Based on global data, it is estimated that 1 in 5 adults (17.6%) met the criteria for CMD during 12 months prior to the assessment and that 29.2% of adults experienced CMD at some point in life (Steel et al. 2014). In Brazil, studies with representative samples showed prevalences between 19.7% and 26.8% (Santos et al. 2019; Nunes et al. 2016). In addition, studies indicate a trend of stability in the prevalence of CMD in the last 30 years (Brunoni et al. 2023; Cebrino and Portero de la Cruz 2020; Baxter et al. 2014).

Women constitute a particularly vulnerable population group for the occurrence of CMD. The global prevalence of CMD in adult women tends to vary between 9.6% and 69.3%, depending on the screening instrument used, cultural and environmental context, as well as the economic conditions of the investigated population (Bezerra et al. 2021). This health condition is more prevalent in women than in men (Steel et al. 2014; Nunes et al. 2016). This vulnerability is potentially explained by social determinants (Bezerra et al. 2021; Bates et al. 2013), sociocultural gender-related inequalities (Pinho and de Araujo 2012), as well as biological determinants such as hormonal fluctuations during the reproductive period (Albert and Newhouse 2019).

Previous studies have also highlighted a series of factors associated with the occurrence of CMD, including socioeconomic and behavioral aspects such as low education and income, unemployment, socially vulnerable conditions, tobacco use, excessive alcohol consumption, and physical inactivity (Ridley et al. 2020; Santos et al. 2019; WHO 2014).

Based on the above and considering the existence of few studies on the trends of CMD in Brazil, particularly in women, the present study aimed to compare the prevalence and factors associated with CMD in women living in Southern Brazil in 2003 and 2015.

Methods

Study design and population

This comparative study used data from two cross-sectional population-based surveys of adult women in the urban area of São Leopoldo, Rio Grande do Sul, Brazil, conducted in 2003 and 2015 with independent representative samples but the same methodology to ensure comparability.

Samples and sampling

In 2003, a prevalence study was conducted using a sample of 1,084 adult women (Teichmann et al. 2006). The diabetes mellitus outcome had the largest sample size, which allowed for identifying a prevalence ratio of 2.0 with a confidence level of 95% and statistical power of 80%, accounting for possible losses/refusals during fieldwork and confounding factors by increasing the sample size by 25%. To locate these women, a systematic sampling process was used to select sectors, blocks, and households (Teichmann et al. 2006). All women aged 20–60 years living in these households were invited to participate, and pregnant women were excluded from the investigation. The study was approved by the Ethics and Research Committee of the School of Medicine of the Federal University of Pelotas, Rio Grande do Sul, and informed consent was obtained during data collection to preserve the ethical aspects.

In 2015, a survey was conducted with a representative sample of adult women using a multiple-outcome approach that included lifestyle habits, nutritional aspects, psychological factors, preventive procedures, contraceptive methods, morbidities, and the use of health services (Lisowski et al. 2019; Cafruni et al. 2019). A sample size was determined to identify a prevalence ratio of 2.0 at 95% confidence, with 80% power, while upholding a 1:2 unexposed-to-exposed ratio. Unexposed participants were those with higher education (≥15 years of schooling), and the outcome that necessitated the largest sample size (1,013 women) was delayed cytological examination—referring to women not following current pap smear or cervical cancer screening protocol. To account for possible losses/refusals and control for confounding factors in the data analysis, the sample size was increased by 25%, totaling 1,281 women. To locate these women, a systematic sampling process was used to select sectors, blocks, and households (Lisowski et al. 2019; Cafruni et al. 2019). All women aged 20–69 years residing in the selected households were invited to participate in the study, except for pregnant women and those with hearing and/or cognitive deficits. To compare the data with the sample obtained in 2003, this study included only women aged 20–60 years. This study was approved by the Research Ethics Committee of the University of Vale do Rio dos Sinos, and all participants signed an informed consent form.

In both surveys (2003 and 2015), the EpiInfo software, a trademark of the Centers for Disease Control and Prevention (CDC), was utilized for determining the sample size.

Data collection and instruments

Data were collected using a standardized, pre-coded, and pre-tested questionnaire in two surveys during two periods: March to December 2003 and February to October 2015. The questionnaire investigated various characteristics such as demographics, socioeconomic factors, reproductive history, and behaviors. Face-to-face interviews were conducted in the participants' homes and the interviewers received training prior to the surveys. A pilot study was conducted in a separate census tract to test the instruments and train

interviewers. To ensure data quality, 10% of the interviews were repeated using a simplified questionnaire with questions not subject to short-term changes. The interviewers codified the information, and the research coordinator supervised the process. Data entry followed a double-entry procedure in the EpiData program (Centers for Disease Control and Prevention, Atlanta, United States), including a comparison of entries and consistency analysis to ensure data accuracy. These procedures demonstrated sufficient inter-rater reliability, with a Kappa coefficient exceeding 0.80.

Common mental disorders (CMD) assessment (outcome)

The presence of CMD was established using the Self-Reporting Questionnaire (SRQ-20), which screens for signs and symptoms of non-psychotic mental disorders (Mari and Williams 1986). The SRQ-20 has 20 yes/no questions, and assesses depressive symptoms, anxiety, insomnia, fatigue, irritability, forgetfulness, difficulty concentrating, and somatic complaints within the past 30 days. The Brazilian Portuguese version of the SRQ-20 was validated with a cut-off score of ≥ 8 out of 20 positive responses to identify CMD in adult women (Mari and Williams 1986). This validation study demonstrated a sensitivity of 86% and specificity of 77%, compared to the criterion of a standardized psychiatric interview within the context of primary care settings in developing countries (Mari and Williams 1986).

Independent variables (associated factors)

This study investigated several independent variables including demographic, socioeconomic, reproductive, and behavioral characteristics. All variables were collected similarly in both surveys (2003 and 2015) except for physical activity. Demographic and socioeconomic characteristics included age (categorized into 10-year groups), self-reported skin color (white or others: black/brown/yellow/indigenous; according to the categories proposed by the Brazilian Institute of Geography and Statistics), marital status (single, married/cohabitating, separated/divorced, or widowed), schooling/years of education (≤ 4, $5 - 7$, $8 - 10$, or ≥ 11 years), economic class (A, B, C, or D–E: classified according to the classification of the Brazilian Association of Research Companies), per capita family income (≤ 0.50, $0.51 - 1$, $1.01 - 3$, or > 3: calculated as the sum of the reported income of each family member in the last month divided by the number of people living in the household and categorized by the regional minimum wage in 2003 [BRL 312.00] and 2015 [BRL 1006.88]), and employment status (working or not working). Reproductive characteristics included the number of pregnancies ($1 - 2$, $3 - 4$, or ≥ 5), referring to the total number of pregnancies during the woman's reproductive life,

including abortions, stillbirths, and live births) and age at menarche ($8 - 11$, $12 - 13$, or ≥ 14 years). Physical activity was evaluated using different instruments in each survey. In 2003, an instrument adapted from the Agita Brazil Program was used (classifying physically inactive women as those who reported not engaging in any physical activity in leisure time or only once a week in light intensity) (Masson et al. 2005), while in 2015, the International Physical Activity Questionnaire short version was used (considering physically inactive women as those who reported engaging in < 150 min per week of moderate or vigorous physical activity in leisure time) (Matsudo et al. 2001). Smoking (non-smoker, former smoker, or smoker) and alcohol consumption (consumption of any alcoholic beverage in the last seven days) were also investigated.

Statistical analysis

Descriptive statistics were used to describe the distribution of the sample characteristics, and the outcome variable (CMD) was presented as absolute and relative frequencies. The Pearson chi-square test for the heterogeneity of proportions was used to compare the distribution of characteristics and the prevalence of CMD between the 2003 and 2015 surveys.

To assess the association between CMD and independent variables, Poisson regression with robust variance was used. Unadjusted and adjusted prevalence ratios, 95% confidence intervals (95% CI), and p-values obtained using the Wald chi-square test were estimated. Variables with a p-value < 0.20 in the unadjusted analysis were included in the adjusted (multivariable) analysis, which followed a conceptual hierarchical model (Victora et al. 1997). The model included Block 1 (demographic and socioeconomic variables), Block 2 (reproductive variables), and Block 3 (behavioral variables), arranged hierarchically to determine the outcome.

All analyses were performed using Stata version 14 (StataCorp LP, College Station, Texas, USA), stratified by survey year (2003 and 2015), with a significance level of 5% ($p < 0.05$).

Results

In 2003, 1,084 women aged $20 - 60$ years were identified, with 58 (5.6%) losses or refusals. Pregnant women ($n = 32$) and those with missing SRQ-20 data ($n = 6$) were excluded. The 2015 survey identified 1,281 women aged $20 - 69$ years, with 152 (11.9%) losses or refusals. The exclusion criteria were age of $61 - 69$ years ($n = 141$) and missing SRQ-20 data ($n = 1$). The final sample comprised of 988 and 987 women in 2003 and 2015, respectively. Mean participant age was 38.5 ± 11.1 years in 2003 and 40.3 ± 11.4 years in 2015.

Table 1 presents the sample characteristics and distributions by year. Compared with 2003, the 2015 sample had a higher proportion of women aged 50-60 years (18.6% vs. 25.4%), women of color (16.9% vs. 25.7%), those with menarche between 8-11 years (19.7% vs. 24.4%), and inactive women (68.2% vs. 85.8%). In terms of education level, the percentage of individuals with more years of study was higher in 2015 (39.2% vs. 44.7%), while those with fewer years of study were lower (20.5% vs. 15.1%). From 2003 to 2015, more women lived on less than one minimum wage (49.4% vs. 59.7%) and fewer had higher wages (15% vs. 7.1%). More women were in socioeconomic classes B-C and fewer were in extreme classes A and D/E (Table 1).

No significant difference was observed in the prevalence of CMD over 12 years, with rates of 33.4% (95% CI: 30.5 – 36.3) in 2003 and 33.7% (95% CI: 30.8 – 36.7) in 2015. The prevalence of CMD was similar across most variables investigated in both studies, except for skin color and physical activity. Women of color had a lower prevalence of CMD (49.9% vs. 37.4%) than those who were physically active (29.0% vs. 17.1%) (Table 1).

Table 2 presents the unadjusted and adjusted prevalence ratios of CMD based on the characteristics of the 2003 and 2015 samples. After adjusting for the multivariate analysis model, the 2003 study showed a higher probability of CMD in women of color, whereas in 2015, CMD was not associated with demographic variables. The 2003 study found associations between CMD and schooling, economic class, and income, whereas in 2015, only low income and unemployment were associated with a higher probability of CMD observed among women with income below half the minimum wage. The occurrence of CMD in both 2003 and 2015 was proportional to the number of pregnancies. Women with five or more previous pregnancies had a probability of >80% for CMD compared to women without any pregnancies. In 2015, insufficiently active women had a 62% higher probability of CMD than physically active women, whereas current tobacco use was significantly associated with a higher occurrence of CMD in both 2003 and 2015 compared to non-smokers.

Discussion

This study aimed to compare the prevalence and associated factors of CMD in women using data from two cross-sectional surveys conducted in 2003 and 2015. The results showed no significant differences in the prevalence of CMD between the two time periods, except for a reduction in the prevalence of CMD in women of color and physically active. After adjusting for multivariate models, low income, history of five or more pregnancies, and tobacco use were consistently associated with a higher prevalence of CMD in both

surveys. Black/brown skin color, low schooling, and lower economic class were associated with CMD only in 2003, whereas unemployment and physical inactivity were associated with CMD only in 2015.

Our findings on the trends in the prevalence of CMD are consistent with those of previous studies. A systematic review of global prevalence data for CMD found no evidence of an increased prevalence in the general population, although the number of cases increased by 36% over the study period (Baxter et al. 2014). A cross-sectional study in Spain analyzed trends in CMD in 48,505 people, with prevalence of 24.5% in 2006, 24.1% in 2011/2012, and 20.1% in 2017 among women, but these differences were not statistically significant (Cebrino and Portero de la Cruz 2020). In Brazil, a longitudinal study comparing pre-COVID-19 pandemic data (three evaluations between 2008 and 2018) and COVID-19 pandemic data (three evaluations in 2020) found no significant change in the prevalence of CMD and depressive disorders over time, ranging from 23.5% to 21.1% and from 3.3% to 2.8%, respectively (Brunoni et al. 2023). In addition, a study comparing population-based data in Chile found no significant change in the prevalence of depression, which was 20.5% in 2003 and 18.4% in 2010 (Markkula et al. 2017). These findings may be explained by the partial attenuation of some risk factors for CMD over time, such as better living conditions related to increased levels of education, the reduction of economic crises, and lower rates of communicable diseases and malnutrition in the population (Baxter et al. 2014).

A possible explanation for the lack of change in CMD prevalence in our study may be related to the characteristics that remained associated with CMD even after 12 years. For example, low income remained associated with a higher occurrence of CMD in 2003 and 2015, which is consistent with previous studies (Santos et al. 2019; Moraes et al. 2017). Higher financial contribution and family income promote access to better living conditions, while lack of money can lead to stress and insecurity, which are trigger mechanisms for CMD (Ridley et al. 2020). There is evidence that CMD are socially determined, and adverse social and economic conditions may have a direct influence on the prevalence and severity of CMD at all stages of life (Lund et al. 2018). The World Health Organization states that situations of violence, poverty, and inequalities in income and schooling are among the main determinants for mental disorders (WHO 2014).

Findings from 2003 revealed an inverse association between socioeconomic conditions and CMD. This is consistent with previous studies that found a higher prevalence of CMD among individuals with low levels of education (Santos et al. 2019; Moraes et al. 2017) and those from less advantaged economic classes (Tiguman et al. 2022). Access to education not only generates cognitive skills and

Table 1 Comparison of sample distribution and prevalence of common mental disorder (CMD) according to demographic, socioeconomic, reproductive, and behavioral characteristics of adult women from São Leopoldo, RS, Brazil. (2003 and 2015)

Characteristics	Samples			CMD (SRQ-20 ≥ 8 points)		
	2003	2015		2003	2015	
	n (%)	n (%)	P-value*	n (%)	n (%)	P-value*
TOTAL	988 (100)	987 (100)		330 (33.4)	333 (33.7)	0.874
Demographic						
Age (years)			0.001			
20 to 29	261 (26.4)	216 (21.9)		92 (35.3)	66 (30.6)	0.278
30 to 39	244 (24.7)	244 (24.7)		87 (35.7)	85 (34.8)	0.850
40 to 49	299 (30.3)	276 (28.0)		97 (32.4)	95 (34.4)	0.615
50 to 60	184 (18.6)	251 (25.4)		54 (29.4)	87 (34.7)	0.242
Skin color			<0.001			
White	830 (84.0)	733 (74.3)		252 (30.4)	238 (32.5)	0.370
Others	158 (16.0)	254 (25.7)		78 (49.4)	95 (37.4)	0.017
Marital status			0.720			
Without partner	356 (36.0)	348 (35.3)		108 (30.3)	118 (33.9)	0.310
With partner	632 (64.0)	639 (64.7)		222 (35.1)	215 (33.7)	0.579
Socioeconomic						
Schooling (years of study)			0.003			
≥ 11	387 (39.2)	441 (44.7)		84 (21.7)	110 (24.9)	0.272
8 to 10	160 (16.2)	181 (18.3)		54 (33.8)	72 (39.8)	0.250
5 to 7	238 (24.1)	216 (21.9)		91 (38.2)	83 (38.4)	0.967
≤ 4	203 (20.5)	149 (15.1)		101 (49.8)	68 (45.6)	0.445
Economic class (ABEP)	N=986	N=984	<0.001			
A (high)	79 (8.0)	40 (4.1)		10 (12.7)	5 (12.5)	0.980
B	260 (26.3)	313 (31.8)		60 (20.1)	78 (24.9)	0.607
C	391 (39.7)	512 (52.0)		129 (33.0)	198 (38.7)	0.078
D/E (low)	256 (26.0)	119 (12.1)		130 (50.8)	52 (43.7)	0.201
Family income (MW)	N=977	N=955	<0.001			
> 3	147 (15.0)	68 (7.1)		26 (17.7)	9 (13.2)	0.411
1,01 to 3	348 (35.6)	317 (33.2)		89 (25.6)	87 (27.4)	0.585
0,51 to 1	287 (29.4)	338 (35.4)		109 (38.0)	119 (35.2)	0.473
≤ 0,50	195 (20.0)	232 (24.3)		104 (53.3)	108 (46.6)	0.163
Employment status			0.103			
Working	568 (57.5)	603 (61.1)		169 (29.8)	172 (28.5)	0.643
Not working	420 (42.5)	384 (38.9)		161 (38.3)	161 (41.9)	0.299
Reproductive						
Number of pregnancies			0.096			
Nulliparous	194 (19.7)	163 (16.5)		44 (22.7)	38 (23.3)	0.887
1 to 2	423 (42.8)	470 (47.6)		126 (29.8)	133 (28.3)	0.624
3 to 4	282 (28.5)	259 (26.3)		112 (39.7)	106 (40.9)	0.774
≥ 5	89 (9.0)	95 (9.6)		48 (53.9)	56 (59.0)	0.493
Age at menarche (years)		N=979	0.009			
≥ 14	349 (35.3)	292 (29.8)		119 (34.1)	110 (37.7)	0.347
12 to 13	444 (45.0)	448 (45.8)		151 (34.0)	135 (30.1)	0.215
8 to 11	195 (19.7)	239 (24.4)		60 (30.8)	86 (36.0)	0.253
Behavioral						
Physical activity			<0.001			
Active	314 (31.8)	140 (14.2)		91 (29.0)	24 (17.1)	0.007
Inactive	674 (68.2)	847 (85.8)		239 (35.5)	309 (36.5)	0.680
Smoking			0.175			
Non-smoker	579 (58.6)	583 (59.0)		166 (28.7)	170 (29.2)	0.854

Table 1 (continued)

Characteristics	Samples			CMD (SRQ-20 ≥ 8 points)		
	2003	2015		2003	2015	
	n (%)	n (%)	P-value*	n (%)	n (%)	P-value*
Former smoker	186 (18.8)	210 (21.3)		67 (36.0)	70 (33.3)	0.575
Smoker	223 (22.6)	194 (19.7)		97 (43.5)	93 (47.9)	0.364
Alcohol consumption			0.838			
No	633 (64.1)	628 (63.6)		235 (37.1)	233 (37.1)	0.993
Yes	355 (35.9)	359 (36.4)		95 (26.8)	100 (27.9)	0.743

CMD: Common Mental Disorders were measured using the Self-Reporting Questionnaire (SRQ-20) and a cutoff point of eight or more positive items was considered; Skin color was self-reported by interviewees as white, black, brown, indigenous, or yellow, and categorized as "white" and "others."; ABEP: Economic classification criteria were based on the Brazilian Association of Research Companies; MW: Per capita family income was measured in terms of the number of regional Minimum Wages (R$ 312.00 in 2003 and R$ 1006.88 in 2015)

*Pearson's chi-square test was used to calculate the p-value for the heterogeneity of proportions between the 2003 and 2015 studies

assertiveness but also influences aspirations, self-esteem, and the acquisition of new knowledge, which can motivate attitudes and behaviors (Bates et al. 2013). Furthermore, higher levels of education can lead to better job opportunities, which provide security, good housing conditions, and personal development, especially for women (Murcia et al. 2015). However, the lack of research on this topic may be due to lower decision-making power, frustrations, insecurity, and the perceived inability to influence the environment, resulting in greater psychological distress (Bezerra et al. 2021). Our 2015 findings are consistent with the scientific literature, which shows a relationship between job loss and CMD symptoms (Perera et al. 2019; van der Noordt et al. 2014). One possible explanation for this is that unemployment is related to a financial tension, self-perception of poor/precarious health, strong stress, and social fragility (van der Noordt et al. 2014).

This study found an association between CMD and a history of five or more pregnancies, which is consistent with previous research (Araújo et al. 2005). This relationship can be attributed to the higher level of stress and domestic workload that women experience with a larger number of children, especially if they lack social support and have unfavorable socioeconomic conditions (Hartmann et al. 2017). However, since the number of pregnancies in the study included stillbirths and interrupted pregnancies, such as spontaneous and/or provoked abortions, it can also be hypothesized that this relationship is influenced by psychological distress resulting from gestational losses. Furthermore, lower sociocultural and economic determinants can affect women's desire for children and their ability to plan their families, which increases their likelihood of experiencing mental distress (di Giacomo et al. 2021). Therefore, it is important to consider these factors when addressing the relationship between reproductive characteristics and CMD.

Behavioral risk factors associated with CMD include tobacco use (Tiguman et al. 2022; Costa et al. 2019; Taylor et al. 2014) and insufficient physical activity (Schuch et al. 2019; Schuch et al. 2018). Our study found a higher prevalence of CMD among female smokers, which is consistent with an American longitudinal study reporting a significantly higher risk of mood and anxiety disorders among smokers, especially among younger adults (Mojtabai and Crum 2013). One possible explanation for this association is the dysregulation of the hypothalamic-pituitary-adrenal system caused by nicotine, which increases cortisol secretion and alters the activity of neurotransmitters responsible for reactions to stress (Badrick et al. 2007). However, a meta-analysis study suggested that it was challenging to infer causality between smoking and CMD in observational studies, and when a causal relationship is assumed, bidirectionality should be taken into account (Taylor et al. 2014). In terms of physical activity, evidence indicates that insufficient activity and/or sedentary behavior are associated with a higher risk of CMD at all ages (Ferreira et al. 2020). Conversely, higher levels of physical activity are linked to a reduced likelihood of developing future depression and anxiety, demonstrating the potential psychological benefits of physical activity for mental health (Schuch et al. 2019; Schuch et al. 2018). Overall, addressing behavioral risk factors such as tobacco use and insufficient physical activity can potentially improve mental health outcomes and reduce the incidence of CMD.

As mentioned previously, the prevalence of CMD did not increase; however, several significant changes occurred in the lives of women between the two periods. In 2015, a higher percentage of women of color was observed compared to 2003, with a significant reduction in the prevalence of CMD within this specific population group between 2003 and 2015 (49.4% vs. 37.4%). One possible hypothesis is that women of color have become more comfortable

Table 2 Unadjusted and adjusted Prevalence Ratios (PR) for common mental disorder (CMD) according to demographic, socioeconomic, reproductive, and behavioral characteristics among adult women from São Leopoldo, RS, Brazil. (2003 and 2015)

Characteristics	CMD (SRQ-20 ≥ 8 points)			
	2003		2015	
	Unadjusted	Adjusted*	Unadjusted	Adjusted*
	PR (95% CI)	PR (95% CI)	PR (95% CI)	PR (95% CI)
BLOCK 1[+]				
Demographic				
Age (years)	P=0.152	P=0.109	P=0.407	--
20 to 29	1.00	1.00	1.00	
30 to 39	1.01 (0.80 ; 1.28)	0.96 (0.75 ; 1.21)	1.14 (0.87 ; 1.49)	
40 to 49	0.92 (0.73 ; 1.16)	0.91 (0.72 ; 1.15)	1.13 (0.87 ; 1.46)	
50 to 60	0.83 (0.63 ; 1.10)	0.80 (0.60 ; 1.07)	1.13 (0.87 ; 1.48)	
Skin color	P<0.001	P=0.006	P=0.145	P=0.698
White	1.00	1.00	1.00	1.00
Others	1.63 (1.35 ; 1.96)	1.31 (1.08 ; 1.59)	1.15 (0.95 ; 1.39)	1.04 (0.86 ; 1.25)
Marital status	P=0.130	P=0.220	P=0.934	--
Without partner	1.00	1.00	1.00	
With partner	1.16 (0.96 ; 1.40)	1.13 (0.94 ; 1.37)	1.00 (0.83 ; 1.19)	
Socioeconomic				
Schooling (years of study)	P<0.001	P=0.011	P<0.001	P=0.087
≥ 11	1.00	1.00	1.00	1.00
8 to 10	1.55 (1.17 ; 2.07)	1.19 (0.86 ; 1.64)	1.59 (1.25 ; 2.03)	1.33 (1.03 ; 1.72)
5 to 7	1.76 (1.37 ; 2.26)	1.22 (0.90 ; 1.66)	1.54 (1.22 ; 1.95)	1.18 (0.92 ; 1.52)
≤ 4	2.29 (1.81 ; 2.90)	1.49 (1.09 ; 2.04)	1.83 (1.44 ; 2.32)	1.34 (1.02 ; 1.75)
Economic class (ABEP)	P<0.001	P=0.008	P<0.001	P=0.106
A (high)	1.00	1.00	1.00	1.00
B	1.82 (0.98 ; 3.39)	1.52 (0.79 ; 2.92)	1.99 (0.86 ; 4.63)	1.40 (0.57 ; 3.44)
C	2.61 (1.44 ; 4.73)	1.76 (0.89 ; 3.45)	3.09 (1.35 ; 7.08)	1.71 (0.69 ; 4.27)
D/E (low)	4.01 (2.22 ; 7.25)	2.17 (1.08 ; 4.35)	3.50 (1.50 ; 8.14)	1.65 (0.64 ; 4.23)
Family income (MW)	P<0.001	P=0.028	P<0.001	P=0.003
> 3	1.00	1.00	1.00	1.00
1,01 to 3	1.46 (0.98 ; 2.14)	1.04 (0.67 ; 1.61)	2.07 (1.10 ; 3.91)	1.68 (0.84 ; 3.36)
0,51 to 1	2.15 (1.47 ; 3.14)	1.22 (0.77 ; 1.96)	2.66 (1.42 ; 4.97)	1.83 (0.90 ; 3.72)
≤ 0,50	3.02 (2.08 ; 4.38)	1.44 (0.88 ; 2.36)	3.52 (1.88 ; 6.57)	2.18 (1.06 ; 4.47)
Employment status	P=0.005	P=0.807	P<0.001	P=0.007
Working	1.00	1.00	1.00	1.00
Not working	1.29 (1.08 ; 1.54)	1.02 (0.85 ; 1.23)	1.47 (1.24 ; 1.75)	1.29 (1.08 ; 1.53)
BLOCK 2[‡]				
Reproductive				
Number of pregnancies	P<0.001	P=0.001	P<0.001	P<0.001
Nulliparous	1.00	1.00	1.00	1.00
1 to 2	1.31 (0.97 ; 1.77)	1.12 (0.81 ; 1.55)	1.21 (0.89 ; 1.66)	1.05 (0.76 ; 1.44)
3 to 4	1.75 (1.30 ; 2.36)	1.38 (0.96 ; 1.97)	1.76 (1.28 ; 2.40)	1.38 (0.99 ; 1.92)
≥ 5	2.38 (1.72 ; 3.29)	1.82 (1.21 ; 2.73)	2.53 (1.83 ; 3.50)	1.87 (1.30 ; 2.69)
Age at menarche (years)	P=0.481	--	P=0.585	--
≥ 14	1.00		1.00	
12 to 13	1.00 (0.82 ; 1.21)		0.80 (0.65 ; 0.98)	
8 to 11	0.90 (0.70 ; 1.17)		0.96 (0.76 ; 1.20)	
BLOCK 3[§]				
Behavioral				
Physical activity	P=0.049	P=0.087	P<0.001	P=0.006
Active	1.00	1.00	1.00	1.00

Table 2 (continued)

Characteristics	CMD (SRQ-20 ≥ 8 points)			
	2003		2015	
	Unadjusted	Adjusted*	Unadjusted	Adjusted*
	PR (95% CI)	PR (95% CI)	PR (95% CI)	PR (95% CI)
Inactive	1.22 (1.00 ; 1.50)	1.18 (0.98 ; 1.42)	2.13 (1.46 ; 3.10)	1.62 (1.12 ; 2.34)
Smoking	P<0.001	P=0.016	P<0.001	P=0.005
Non-smoker	1.00	1.00	1.00	1.00
Former smoker	1.26 (1.00 ; 1.58)	1.18 (0.95 ; 1.48)	1.14 (0.91 ; 1.44)	1.08 (0.86 ; 1.36)
Smoker	1.52 (1.25 ; 1.85)	1.26 (1.04 ; 1.54)	1.64 (1.35 ; 2.00)	1.35 (1.10 ; 1.67)
Alcohol consumption	P=0.001	P=0.142	P=0.004	P=0.098
No	1.00	1.00	1.00	1.00
Yes	0.72 (0.59 ; 0.88)	0.87 (0.71 ; 1.06)	0.75 (0.62 ; 0.91)	0.86 (0.71 ; 1.04)

CMD: Common Mental Disorders were measured using the Self-Reporting Questionnaire (SRQ-20) and a cutoff point of eight or more positive items was considered; Skin color was self-reported by interviewees as white, black, brown, indigenous, or yellow, and categorized as "white" and "others."; ABEP: Economic classification criteria were based on the Brazilian Association of Research Companies; MW: Per capita family income was measured in terms of the number of regional Minimum Wages (R$ 312.00 in 2003 and R$ 1006.88 in 2015)

P-values were calculated using Wald's chi-square test to test for heterogeneity of proportions for categorical variables and linear trend for ordinal variables.

*Variables with P-values > 0.20 in the unadjusted analysis were not included in the adjusted analysis (multivariate model)

[†] Block 1 included demographic and socioeconomic variables adjusted for themselves

[‡] Block 2 included reproductive variables adjusted for each other and the variables in Block 1

[§] Block 3 included behavioral variables adjusted for each other and the variables in Blocks 1 and 2

in self-identifying as black or brown women during this period, possibly due to shifts in social discussions, along with increased awareness and acceptance of diverse identities. This is particularly important because psychological stress and racial discrimination can increase the vulnerability to CMD, especially in lower-income countries (Smolen and Araujo 2017).

To the best of our knowledge, this is one of the first studies to compare the prevalence and factors associated with CMD using data from two cross-sectional studies with representative samples of women. This study has several strengths, including the large sample size of adult women obtained from the two surveys and the use of robust and similar methodological procedures in both surveys, allowing for an adequate analysis of comparability between the data. Additionally, validated instruments were employed to screen for the presence of CMD in Brazilian adults (SRQ-20) (Mari and Williams 1986), and multivariate analyses were performed to control for potential confounding factors using a conceptual hierarchical model, which enhanced the methodological rigor of the study. However, this study has some limitations that must be acknowledged. The cross-sectional design of this study limits the ability to speculate about causal relationships between exposures and outcomes. SRQ-20 measures depressive symptoms, anxiety, and psychosomatic complaints, which are indicative of

probable cases of CMD but do not allow for specific diagnoses of mental health disorders. Moreover, while the samples collected in 2003 and 2015 accurately represent the same investigated population, they are independent of each other and do not reflect individual historical data. Finally, the study's external validity is limited to adult women living in similar socioeconomic contexts or conditions. In summary, although the present study has some limitations, the findings suggest the need for public policies aimed at addressing the social determinants of CMD in women, particularly those related to socioeconomic conditions, reproductive characteristics, and behavioral risk factors, such as tobacco use and physical activity. Further longitudinal studies and studies in different populations are needed to better understand the relationship between these factors and CMD occurrence. Additionally, a CMD prevalence of 33% underscores an exceedingly high rate that is unequivocally unacceptable, compelling the urgent implementation of decisive actions to lower it.

Conclusions

The current study demonstrated that the high prevalence of CMD among women, which accounts for approximately one-third of the female population, remained unchanged

over a period of 12 years, as no significant differences were found in the prevalence of CMD between 2003 and 2015. Moreover, the study revealed that socioeconomic, reproductive, and behavioral characteristics were significantly associated with the occurrence of CMD among women. These findings underscore the need for further research to identify and mitigate the risk factors associated with CMD and devise effective prevention and treatment strategies. Additionally, the data obtained in this study can be used for future comparisons on the prevalence of CMD, particularly in the post-COVID-19 era.

Author's contribution D.G.O. and M.T.A.O. designed the study and contributed to analysis, data interpretation, and preparation of the manuscript; D.G.O. and A.G. analyzed data and drafted the manuscript; C.T.B.S. and J.S.D.C contributed to data interpretation and assisted in the preparation and writing of the manuscript. All authors critically reviewed and approved the final version of the manuscript.

Data availability The data that support the findings of this study are available from the corresponding author upon reasonable request.

Declarations

References

Albert KM, Newhouse PA (2019) Estrogen, stress, and depression: cognitive and biological interactions. Annu Rev Clin Psychol 15:399–423

Araújo TMD, Pinho PDS, Almeida MMGD (2005) Prevalence of psychological disorders among women according to socio demographic and housework characteristics. Rev Bras Saude Mater Infant 5:337–348

Badrick E, Kirschbaum C, Kumari M (2007) The relationship between smoking status and cortisol secretion. J Clin Endocrinol Metab 92:819–24

Bates LM, Berkman LF, Glymour MM (2013) Socioeconomic determinants of women's health: the changing landscape of education, work, and marriage. Women Health (pp 671-683). Elsevier. https://doi.org/10.1016/B978-0-12-384978-6.00044-3

Baxter AJ, Scott KM, Ferrari AJ, Norman RE, Vos T, Whiteford HA (2014) Challenging the myth of an "epidemic" of common mental disorders: trends in the global prevalence of anxiety and depression between 1990 and 2010. Depress Anxiety 31:506–16

Bezerra HS, Alves RM, Nunes ADD, Barbosa IR (2021) Prevalence and associated factors of common mental disorders in women: a systematic review. Public Health Rev 42:1604234

Brunoni AR, Suen PJC, Bacchi PS, Razza LB, Klein I, Dos Santos LA et al. (2023) Prevalence and risk factors of psychiatric symptoms and diagnoses before and during the COVID-19 pandemic: findings from the ELSA-Brasil COVID-19 mental health cohort. Psychol Med 53:446–457

Cafruni CB, Pattussi MP, Backes V, da Costa JD, Olinto MTA, de Bairros FS et al (2019) Neighbourhood environment and transport-related and leisure-time sedentary behaviour amongst women in a city in Southern Brazil: a multilevel analysis. Int J Public Health 64:511–522

Cebrino J, Portero de la Cruz S (2020) Environmental, health and sociodemographic determinants related to common mental disorders in adults: a spanish country-wide population-based study (2006-2017). J Clin Med 9:2199

Collaborators C-MD (2021) Global prevalence and burden of depressive and anxiety disorders in 204 countries and territories in 2020 due to the COVID-19 pandemic. Lancet 398:1700–1712

Collaborators GBDMD (2022) Global, regional, and national burden of 12 mental disorders in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. Lancet Psychiatry 9:137–150

Costa CO, Branco JC, Vieira IS, Souza LDM, Silva RA (2019) Prevalence of anxiety and associated factors in adults. J Bras Psiquiatr 68:92–100

di Giacomo E, Pessina R, Santorelli M, Rucco D, Placenti V, Aliberti F et al (2021) Therapeutic termination of pregnancy and women's mental health: determinants and consequences. World J Psychiatry 11:937–953

Ferreira VR, Jardim TV, Povoa TIR, Viana RB, Sousa ALL, Jardim PCV (2020) Physical inactivity during leisure and school time is associated with the presence of common mental disorders in adolescence. Rev Saude Publica 54:128

Goldberg DP, Huxley P (1992) Common mental disorders: a bio-social model. Tavistock/Routledge

Hartmann JM, Mendoza-Sassi RA, Cesar JA (2017) Postpartum depression: prevalence and associated factors. Cad Saude Publica 33:e00094016

Lisowski JF, Leite HM, Bairros F, Henn RL, Dias-da-Costa JS, Olinto MTA (2019) Prevalence of overweight and obesity and associated factors in women of São Leopoldo/RS - Population-based study. Cad Saude Colet 27:380–389

Lund C, Brooke-Sumner C, Baingana F, Baron EC, Breuer E, Chandra P et al (2018) Social determinants of mental disorders and the Sustainable Development Goals: a systematic review of reviews. Lancet Psychiatry 5:357–369

Mari JJ, Williams P (1986) A validity study of a psychiatric screening questionnaire (SRQ-20) in primary care in the city of Sao Paulo. Br J Psychiatry 148:23–6

Markkula N, Zitko P, Pena S, Margozzini P, Retamal CP (2017) Prevalence, trends, correlates and treatment of depression in Chile in 2003 to 2010. Soc Psychiatry Psychiatr Epidemiol 52:399–409

Masson CR, Dias-da-Costa JS, Olinto MT, Meneghel S, Costa CC, Bairros F et al (2005) Prevalence of physical inactivity in adult women in Sao Leopoldo, Rio Grande do Sul, Brazil. Cad Saude Publica 21:1685–95

Matsudo S, Araújo T, Matsudo V, Andrade D, Andrade E, Oliveira LC et al (2001) International Physical Activity Questionnaire (lPAQ): study of validity and reliability in Brazil. Rev Bras Ativ Fis Saude 6:5–18

Mojtabai R, Crum RM (2013) Cigarette smoking and onset of mood and anxiety disorders. Am J Public Health 103:1656–65

Moraes RSM, Silva DAS, Oliveira WF, Peres MA (2017) Social inequalities in the prevalence of common mental disorders in adults:

a population-based study in Southern Brazil. Rev Bras Epidemiol 20:43–56

Murcia M, Chastang JF, Niedhammer I (2015) Educational inequalities in major depressive and generalized anxiety disorders: results from the French national SIP study. Soc Psychiatry Psychiatr Epidemiol 50:919–28

van der Noordt M, IJzelenberg H, Droomers M, Proper KI (2014) Health effects of employment: a systematic review of prospective studies. Occup Environ Med 71:730-6

Nunes MA, Pinheiro AP, Bessel M, Brunoni AR, Kemp AH, Bensenor IM et al (2016) Common mental disorders and sociodemographic characteristics: baseline findings of the Brazilian Longitudinal Study of Adult Health (ELSA-Brasil). Braz J Psychiatry 38:91–7

Perera G, Di Gessa G, Corna LM, Glaser K, Stewart R (2019) Paid employment and common mental disorders in 50–64-year olds: analysis of three cross-sectional nationally representative survey samples in 1993, 2000 and 2007. Epidemiol Psychiatr Sci 28:88–99

Pinho PS, de Araujo TM (2012) Association between housework overload and common mental disorders in women. Rev Bras Epidemiol 15:560–72

Ridley M, Rao G, Schilbach F, Patel V (2020) Poverty, depression, and anxiety: Causal evidence and mechanisms. Science 370:eaay0214

Santos G, Alves M, Goldbaum M, Cesar CLG, Gianini RJ (2019) Prevalence of common mental disorders and associated factors in urban residents of Sao Paulo, Brazil. Cad Saude Publica 35:e00236318

Schuch FB, Vancampfort D, Firth J, Rosenbaum S, Ward PB, Silva ES et al (2018) Physical activity and incident depression: a meta-analysis of prospective cohort studies. Am J Psychiatry 175:631–648

Schuch FB, Stubbs B, Meyer J, Heissel A, Zech P, Vancampfort D et al (2019) Physical activity protects from incident anxiety: a meta-analysis of prospective cohort studies. Depress Anxiety 36:846–858

Smolen JR, Araujo EM (2017) Race/skin color and mental health disorders in Brazil: a systematic review of the literature. Cien Saude Colet 22:4021–4030

Steel Z, Marnane C, Iranpour C, Chey T, Jackson JW, Patel V et al (2014) The global prevalence of common mental disorders: a systematic review and meta-analysis 1980–2013. Int J Epidemiol 43:476–93

Taylor AE, Fluharty ME, Bjorngaard JH, Gabrielsen ME, Skorpen F, Marioni RE et al (2014) Investigating the possible causal association of smoking with depression and anxiety using Mendelian randomisation meta-analysis: the CARTA consortium. BMJ Open 4:e006141

Teichmann L, Olinto MTA, Dias-da-Costa JS, Ziegler D (2006) Risk factors associated with overweight and obesity in women living in São Leopoldo, RS. Rev Bras Epidemiol 9:360–373

Tiguman GMB, Silva MT, Galvao TF (2022) Prevalence of depressive and anxiety symptoms and their relationship with life-threatening events, tobacco dependence and hazardous alcohol drinking: a population-based study in the Brazilian Amazon. J Affect Disord 298:224–231

Victora CG, Huttly SR, Fuchs SC, Olinto MT (1997) The role of conceptual frameworks in epidemiological analysis: a hierarchical approach. Int J Epidemiol 26:224–7

WHO (2014) Social determinants of mental health. World Health Organization: Geneva, 2014. Available in: <https://www.who.int/publications/i/item/9789241506809> Accessed 19 March 2023

WHO (2022) World mental health report: Transforming mental health for all. World Health Organization: Geneva, 2022. Available in: <https://www.who.int/publications/i/item/9789240049338> Accessed 19 March 2023