Association of social and economic conditions with the incidence of sleep disorders during the COVID-19 pandemic

Associação das condições sociais e econômicas com a incidência dos problemas com o sono durante a pandemia de COVID-19

Asociación de las condiciones sociales y económicas con la incidencia de problemas con el sueño durante la pandemia de COVID-19

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Abstract

Sleep is a fundamental aspect for maintaining physical and emotional health, as well as one's well-being. Few studies have assessed the effect of socioeconomic conditions on sleep in the COVID-19 pandemic. Our objective was to analyze the increase or incidence of sleep disorders according to demographic and economic conditions, prior to the pandemic, and according to changes in financial, occupational, and household conditions during the pandemic. This study was conducted via web access, using data from April 24 to May 24, with 45,160 Brazilians (aged 18 or older), with a sample weighted by Brazilian National Household Sample Survey (PNAD) data. Change in sleep quality (outcome), monthly income, effect on family income, occupation/work, gender, age group, marital status, and change in domestic work (exposures) were reported. The percentages of onset or increase of sleep disorders and adjusted odds ratio were estimated. The chance of exacerbation of sleep disorders was 34%, 71%, and twice as high in people with income less than one minimum wage before the pandemic, in those who lost their job and in those who had a great decrease in their income/were without income, respectively. The chance of worsening sleep disorders was 82% higher in women; three times higher (OR = 3.14) in the population aged from 18 to 29, compared to the older adults; and higher with the increase in the amount of housework (OR = 2.21). Financial and occupational factors were determinants in the worsening of self-reported sleep quality, requiring rapid actions on these conditions in order to minimize this effect. Gender, age group, and household routines also deserve attention regarding sleep quality.

Sleep; Social Class; Coronavirus Infections

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Introduction

After seven months of the pandemic of the new coronavirus disease (COVID-19), started in China in December 2019, the number of cases, in Brazil, reached 1,603,055 on July 7, 2020, and 64,867 people have died so far [1].

Social distancing measures have been put in place worldwide in order to try to slow the rapid spread of the virus, preventing collapses in the health system, until pharmacological interventions are safely available. These measures include social distancing, household isolation, closure of schools and universities, suspension and flexibilization of commerce, restriction of transport and cancellation of social gatherings [2,3]. Social distancing measures, in several regions of Brazil, were implemented from *Ordinance n. 356*, March 11 [4], issued by the Brazilian Ministry of Health.

Social distancing strategies can affect several dimensions of life, such as work, family income, and social relationships [5,6,7,8]. Facing these conditions, along with the fear of contracting the infection and exposure to some news vehicles [9,10] emotional health [8,11,12] and its related aspects, such as sleep quality, tend to deteriorate.

Good quality sleep has a strong relationship with emotional issues, physical health, and well-being [13,14,15] acting on the immune, metabolic, and endocrine systems, as well as inflammatory processes [16]. Some authors warn that bad sleep may be related to susceptibility to COVID-19 infection [17,18]. Studies in different countries have found high prevalence of bad sleep quality during the pandemic, reaching rates of 57%, in Italy [12].

Research conducted to investigate the factors associated with sleep quality during the pandemic, in the general population, brings information about the strong relationship with emotional issues and stress [10,12,19,20,21,22]. Furthermore, few studies evaluated social issues [8,12,22], especially economic conditions, affecting sleep quality in this period, and, according to our review, the effect of loss of family income on the incidence of sleep disorders was not assessed. In this sense, this study analyzes the report of increase or incidence of sleep disorders in the Brazilian adult population according to demographic and socioeconomic conditions, prior to the pandemic, and according to changes in financial, occupational conditions, and housework during the pandemic.

Methods

Data from *ConVid – Behavior Survey* were used, conducted in Brazil by the Oswaldo Cruz Foundation (Fiocruz), in partnership with the University of Campinas (Unicamp) and the Federal University of Minas Gerais (UFMG), from April 24 to May 24. The project was approved by the Brazilian National Research Ethics Committee under process n. 3,980,277. The survey was conducted with a self-filled questionnaire, via internet, in order to evaluate changes in living conditions, daily routine, health and access to health services, lifestyle, and emotional aspects of the population living in Brazil during the new coronavirus pandemic. The questionnaire was developed using the application REDCap (Research Electronic Data Capture – https://www.redcapbrasil.com.br/), that is composed of a digital platform for collection, management, and dissemination of data. Data were stored on Fiocruz servers.

The sample was obtained by chain sampling procedure. In the first stage, the study researchers invited 20 other researchers in different regions of Brazil, called influencers, who sent the research link to at least 12 people from their social networks, obeying a stratification by sex, age range (18-39; 40-59; 60+), and schooling level (incomplete high school or less; complete high school or more). These people were asked to invite three other people from their social networks and so on. The sample totaled 45,161 individuals and it was calibrated according to data from the *Brazilian National Household Sample Survey* (PNAD 2019), in order to obtain the same distribution by Federation unit, sex, age group, skin color, and schooling level of the Brazilian population. Details on the method and sampling procedure have been published in another article [23].

The outcome studied was the report of increased sleep disorders among individuals who already complained of these conditions or the report of the onset of sleep disorders. The variable started from the following question: "Did the pandemic affect the quality of your sleep?" with the following response categories: (1) "It affected nothing, I continue to have a good sleep"; (2) "With the pandemic I

started having issues with my sleep"; (3) "I already had sleep disorders and they continued the same"; (4) "I already had sleep disorders and they got much worse"; (5) "I already had sleep problems, but they decreased". Categories 1, 3, and 5 were aggregated, composing the group (1) of those who had no increase or onset of sleep disorders, and categories 2 and 4 were aggregated, composing the group (2) of individuals who reported onset or increase of sleep disorders.

The exposure variables were: sex, age group (people aged from 18-29 , 30-49, 50-59, and 60+), and the number of residents in the household (1 to 3, 4, 5, or more), living with a spouse or partner, schooling level (complete Elementary Education or less, complete High School, complete Higher Education or more), family monthly income per capita in minimum wages (< 1, 1 < 2, 2 < 4, 4 or more), the effect on household income in the period of study (did not decrease, decreased a little, decreased a lot, or the family has run out of income, the effect on employment in the period of study (not because you lost your job, lost a job or out of work), change in the amount or kind of housework (did not rise, it has increased a little, it has increased a lot).

The analyses consisted of estimates of prevalence and 95% confidence intervals (95% CI) of the worsening or onset of sleep disorders during the pandemic according to the exposure variables. Odds ratios (OR) and 95%CI were also estimated by multiple logistic regression model. All analyses were adjusted for gender and age. In the analysis with the number of residents per household, the variable monthly income per capita was added to the adjustments.

The analyses were conducted using statistical software Stata 15.0 (https://www.stata.com), and the sample weight of post-stratification was considered.

Results

We studied 45,160 individuals aged 18 years or older. During the pandemic, family income greatly decreased or reduced to zero to 31.8% of the population, and 26.6% of people were without work or lost their jobs. Among the people who reported an extreme decrease in income, 39.8% had a lower previous monthly income than one minimum wage, whereas 19.8% had an income of four minimum wages or more. The percentage of loss of occupation was 29% in the lowest income participants. The great increase in housework was reported by 20.2% of the population, with a percentage twice as high in females (p < 0.001) (data not shown in table).

In the bivariate analysis, considering social and economic factors prior to the pandemic, the increase or incidence of sleep disorders was reported, in a higher percentage, by women, by the youngest, by those who live with more people at home, those who do not live with a spouse or partner and with lower monthly income per capita (Table 1).

The worsening or incidence of sleep disorders was also higher in people whom income greatly decreased or who were without income during the pandemic, in those who lost their job or were out of work and among those who reported little (47.4%) or much (58.1%) increase in the amount of housework (Table 2). The association of sleep disorders with the addition of housework due to the pandemic had no interaction with gender, that is, it was associated, in a similar way, in the male and female population (data not shown in table).

In the multivariate analysis, the results according to financial and occupational conditions show that the chance of exacerbation of sleep disorders was, respectively, 34% and 71% higher in people with monthly per capita income less than one minimum wage before the pandemic and in those who lost their jobs. In individuals who had greatly decreased income or were without income, the chance of sleep disorders was twice as high (OR = 2.08). In women, the chance of the incidence of sleep disorders was 82%; it increased with gradient, as age decreased, with the OR increasing from 1.72 among people aged from 50-59 years, to 3.14, in the 18-29 years old subgroup, in relation to the older adults. The increase of housework augmented in 52% the chance of increasing or starting sleep disorders, but the greatest increase in housework doubled the chance (OR = 2.21) (Table 3).

Table 1

Factors prior to the COVID-19 pandemic, predictors of the incidence or increase in sleep disorders during the pandemic.

	n	Increase or incidence of sleep disorders		
		%	95%CI	p-value
Schooling level				0.2995
Complete Elementary School or less	5,024	42.4	37.3-47.6	
Complete High School	32,701	45.4	43.6-47.3	
Complete Higher Education or above	7,436	44.2	43.5-44.9	
Monthly per capita family income prior to the pandemic (minimum wage)				< 0.001
< 1	20,996	50.4	48.2-52.7	
1 < 2	10,409	42.0	39.0-45.1	
2 < 4	7,282	39.8	36.8-42.8	
4 or more	3,697	36.5	33.4-39.7	
Sex				< 0.001
Male	20,975	37.7	35.3-40.2	
Female	24,186	51.1	49.5-52.7	
Age group (years)				< 0.001
18-29	9,173	55.0	52.3-57.6	
30-49	7,190	48.2	45.8-52.7	
50-59	17,656	41.1	38.0-44.2	
60 or older	11,142	29.2	26.2-32.4	
Number of residents in the household				0.0001
1-3	28,972	42.3	40.6-44.1	
4	9,638	48.5	45.5-51.4	
5 or more	6,465	51.3	46.7-55.8	
Lives with a spouse				< 0.001
No	20,989	49.1	47.1-51.1	
Yes	24,084	41.2	39.2-43.3	

95%CI: 95% confidence interval.

Table 2

Incidence of sleep disorders according to economic, occupational, and housework changes, which occurred during the COVID-19 pandemic.

Social conditions	n	Increase or incidence of sleep disorders		
		%	95%CI	p-value
Effect on family per capita income				< 0.001
Did not decreased	17,044	37.3	35.4-39.4	
Decreased a little	13,667	42.7	40.6-45.3	
Decreased a lot or ran out of income	14,333	56.1	53.3-58.9	
Effect on occupation/work				< 0.001
Did not lose their job	34,098	42.2	40.6-43.8	
Lost their job	10,546	54.7	51.5-57.8	
Change in the amount and type of housework				< 0.001
Did not increase	17,208	35.6	33.4-37.9	
Increased a little	18,652	47.4	45.2-49.6	
It increased a lot	9,069	58.1	55.1-61.0	

95%CI: 95% confidence interval.

Table 3

Association of preconditions to the COVID-19 pandemic and social and economic changes associated with the incidence and increase of sleep disorders during the pandemic.

Variables	Adjusted OR (95% CI)
Schooling level	
Complete Elementary School or less	1.00
Complete High School	0.95 (0.74-1.20)
Complete Higher Education or above	0.85 (0.68-1.07)
Monthly per capita family income prior to the pandemic (minimum wage)	
< 1	**1.00**
1 < 2	1.06 (0.88-1.28)
2 < 4	1.10 (0.91-1.32)
4 or more	**1.34 (1.13-1.59)**
Effect on family per capita income (minimum wage)	
Did not decreased	1.00
Decreased a little	1.12 (0.97-1.29)
Decreased a lot or ran out of income	**2.08 (1.80-2.40)**
Effect on occupation/work	
Did not lose their job	1.00
Lost their job	**1.71 (1.48-1.98)**
Sex	
Male	1.00
Female	**1.82 (1.61-2.07)**
Age group (years)	
18-29	**3.14 (2.60-3.80)**
30-49	**2.35 (1.96-2.82)**
50-59	**1.72 (1.41-2.11)**
60 or older	1.00
Number of residents in the household	
1-3	1.00
4	1.01 (0.87-1.17)
5 or more	1.21 (0.97-1.50)
Lives with a spouse	
No	1.13 (1.00-1.29)
Yes	1.00
Change in the amount and type of housework	
Did not increase	1.00
Increased a little	**1.52 (1.33-1.74)**
It increased a lot	**2.21 (1.87-2.61)**

95%CI: 95% confidence interval; OR: odds ratio.

Notes: the analyzes were adjusted by sex and age group; the income variable was added to adjust for the association with number of residents; Values in bold represent $p < 0.05$.

Discussion

To our knowledge, this is the first study in Brazil and Latin America that evaluated the report of sleep issues during the COVID-19 pandemic, according to social and economic conditions. It is noteworthy that sleep research in this period is more frequent in China [8,19,20,24] and in developed countries [6,10,12,21,22], with gaps in research representative of other countries affected by the pandemic, especially those of low- or middle-income. We found that financial and occupational factors were determinants in the deterioration of self-reported sleep quality.

Income prior to the pandemic was a predictor of increased issues with sleep. The chance of these sleep disorders was higher in the stratum of individuals with lower income than one minimum wage, compared to those with four wages or more. In studies prior to COVID-19, authors have identified the effect of socioeconomic status on sleep [25], but, according to population-based surveys conducted with adults in a Brazilian municipality [15,26], monthly income was neither associated with sleep quality nor its duration. Low income may not interfere with sleep duration in the period assessed, but it may predict a worsening of sleep quality in adverse situations and, especially, in this period of pandemic and uncertainty. In addition to the prior income, having incomes decreased or being without income, in this period, increased the chance of having sleep disorders by 69%. It is worth noting that the loss of income during the pandemic was twice as high among the poorest participants. The loss of work was also one of the determinant factors of the increase in issues with sleep quality and it was also higher among individuals located in the stratum of lower monthly income. These results alert to the problem of socioeconomic inequalities in Brazil, hampering the equitable cope with the pandemic.

The Economic Commission for Latin America and the Caribbean (ECLAC), in a recent study comparing the period 2008/2014 with 2014/2018, indicates to Brazil, among the countries of its region, in worse conditions regarding poverty, inequality, and unemployment [27]. Since 2014, the unemployment rate has been increasing in Brazil, rising from 6.8% in 2014 to 12.8% in 2017. In 2019, unemployment stood at 11.9%. This scenario affected, mostly, the poorest part of the population, who also suffered from the variation in income during this period [28,29]. Probably, from 2017, due to changes in labor legislation, the class of informal and self-employed workers has grown considerably, with an estimated 38 million workers in these sectors [26]. Women, the least educated, informal workers, and the poorest seem to be linked to more vulnerable occupations during the pandemic, that is, jobs that can be directly affected in this period by having direct interaction with the client [30]. Social inequality, financial crisis, and labor conditions indicate that the Brazilian people was not in a position to face the socioeconomic crisis caused by COVID-19.

The strategy of paying emergency aid of BRL 600.00, which represents about 58% of the monthly minimum wage, for informal and self-employed workers, was implemented on April 9 and it can contribute to improve the situation among the poorest. However, this aid took time to reach the population and it was difficult to access, especially among the less favored population. Also, people eligible to receive the aid may have encountered a feeling of anguish over the uncertainties of receipt in the coming months.

Economic crises and unemployment are factors that directly affect the mental health of the population [31,32], which can influence on sleep disorders, especially insomnia disorder [33]. Measures to minimize the financial problems of the poorest population become important in this period to avoid or to lessen the possible effects on sleep-related disorders.

Being a woman and a young adult increased the chance of exacerbation of sleep disorders during the pandemic. These results are in accordance with a study conducted in Italy and Spain, that presented a higher risk of developing sleep disorder in these subgroups of the population [12,22]. In a study conducted in China, even in the crude analysis, these associations were observed, possibly because the stratification by age group considered only people under and over 35 years [8]. A plausible explanation for this issue would be the altered daily routine in younger adults, changing bedtime and getting up schedules [34]. It is also noteworthy to consider the issue of emotional stress of social isolation in the phase of great aspirations in life, such as studies, early career, marriage. Social gatherings, which are more frequent at this stage, were also compromised. At the stage of old age, loneliness, social distancing, and sleep disorders are structural, which accompany the complexity of aging [35]. Although the

declaration of worsening in sleep in older adults is less intense during the pandemic – comparing it with young people reports, the consequences of the effects can be fatal [36].

Sleep medicine experts, from the Brazilian Society for Sleep Behavior Medicine (ABSM), have set up a task force to develop tips on how to better deal with sleep in the face of challenges of the COVID-19 pandemic. Among them, avoid activities in the room or avoid stay in bed when you are not sleeping; wake up and get out of bed, regardless of daily obligations; create bedtime routines for children and adolescents [34].

Women tend to report worse emotional health conditions [37], even in the pandemic period [38], which may be associated to the report of worse sleep quality. It is also noteworthy the double working day, which may be common in this period, especially in relation to housework, leading to issues of tiredness, nervousness, worry and even occupying more daytime, limiting or worsening the quality of sleep in women. In our study, we found that the excessive increase in housework was twice as higher in women as in men.

The high volume of household routine in this study was strongly associated with sleep disorders. The chance of initiating or aggravating sleep disorders was twice higher with increasing housework. The execution of household tasks tends to be associated with outcomes of worse emotional health [39], and some authors have found associations of these activities with back pains [40,41] that can contribute to worsening sleep quality. It is also possible that increased housework increases the execution time for daily tasks, depriving people of sleep time. Furthermore, the increased housework load and the execution of tasks that were not previously performed, such as cooking, caring for the older adults, sanitizing purchases, may have generated worries and stress in everyday life.

When considering the results of this study, it is necessary to evaluate some aspects. The period analyzed corresponds to the beginning of social isolation strategies and it is possible that the effect will be different in another phase. The question used to analyze sleep change is unique and it does not refer to a scale previous used. However, it is an account of the change in sleep. In a Brazilian study using a single question to detect factors associated with sleep quality, the authors observed that sleep self-assessment presented strong associations with sleep complaints [26]. Other authors have used unique, self-reported questions to analyze sleep quality [42], and it is difficult to insert standardized instruments in web-based surveys, increasing response time and decreasing adherence to participation. It is also necessary to consider that the question of sleep uses a comparison, of the own subject, based on the period before the pandemic to after, which can insert a memory bias, although the time limit for remembering is short. Moreover, due to the very design of the research, it is possible that population groups are underrepresented, as people without internet access. The strengths of the study refer to the information it provides regarding the impact of socioeconomic conditions on the increase in problems with sleep during the COVID-19 pandemic, considering that research on this topic is scarce. The sample was composed of 45,161 individuals and it was calibrated with weights based on the PNAD.

The results of this study revealed that the poorest and those who lost income and work during the pandemic, women, the youngest, individuals who do not live with a spouse or partner and who had their housework increased presented a greater chance of incidence or exacerbation of sleep disorders. These determinant factor should be considered in strategies to minimize the effects of the pandemic and, above all, social isolation, on the population's health, considering the significance of sleep for maintaining health and well-being.

Contributors

M. G. Lima contributed to the design of the article, analysis and interpretation of data and writing of the article. M. B. A. Barros, C. L. Szwarcwald, D. C. Malta and D. E. Romero contributed to the interpretation of data, writing and critical review of the manuscript. A. O. Werneck and P. R. B. Souza Júnior contributed to the writing and critical review of the manuscript.

Additional informations

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Resumo

O sono é importante para a manutenção da saúde física, emocional e para o bem-estar. Poucos estudos avaliaram o efeito das condições socioeconômicas no sono no período da COVID-19. O objetivo foi analisar o aumento ou a incidência dos problemas do sono segundo condições demográficas e econômicas, prévias à pandemia, e segundo mudanças nas condições financeiras, ocupacionais e tarefas domésticas durante a pandemia. Estudo realizado via web, usando dados de 24 de abril a 24 de maio, com 45.160 brasileiros (18 ou mais), com amostra ponderada pelos dados da Pesquisa Nacional por Amostra de Domicílios *(PNAD). Mudança na qualidade do sono (desfecho), renda mensal, efeito na renda familiar, na ocupação/trabalho, sexo, faixa etária, situação conjugal e alteração no trabalho doméstico (exposições) foram reportados. Estimamos os percentuais de início ou aumento dos problemas com o sono e os OR ajustados. A chance de exacerbação dos problemas com o sono foi de 34%, 71% e duas vezes maior nas pessoas com renda inferior a um salário mínimo antes da pandemia, nas que perderam o emprego e naquelas que tiveram a renda muito diminuída/ ficaram sem renda, respectivamente. A chance de piorar os problemas do sono foi 82% maior nas mulheres; três vezes maior (OR = 3,14) na população com 18 a 29 anos, em relação aos idosos; e maior com o incremento da quantidade de tarefas domésticas (OR = 2,21). Fatores financeiros e ocupacionais foram determinantes na deterioração da qualidade do sono autorreferida, demandando ações rápidas sobre essas condições a fim de minimizar esse impacto. Gênero, faixa etária e rotinas domésticas também merecem atenção em relação à qualidade do sono.*

Sono; Classe Social; Infecções por Coronavírus

Resumen

El sueño es importante para mantener la salud física, emocional y bienestar. Pocos estudios evaluaron el efecto de las condiciones socioeconómicas en el sueño durante el período de la COVID-19. El objetivo fue analizar el aumento o incidencia de los problemas del sueño, según condiciones demográficas y económicas, previas a la pandemia, y según cambios en las condiciones financieras, ocupacionales y tareas domésticas durante la pandemia. Estudio realizado vía web, usando datos del 24 de abril al 24 de mayo, con 45 160 brasileños (18 o más), con una muestra ponderada por los datos de la Encuesta Nacional por Muestreo de Hogares *(PNAD). Se informó de cambio en la calidad de sueño (desenlace), renta mensual, efecto en la renta familiar, en la ocupación/trabajo, sexo, franja etaria, situación conyugal y alteración en el trabajo doméstico (exposiciones). Estimamos los porcentajes de inicio o aumento de los problemas con el sueño y los OR ajustados. La oportunidad de exacerbación de los problemas con el sueño fue un 34%, 71% y 2 veces mayor en las personas con renta inferior a 1 salarios mínimos antes de la pandemia, en las que perdieron el empleo y en aquellas que tuvieron la renta muy disminuida/se quedaron sin renta, respectivamente. La oportunidad de empeorar los problemas de sueño fue un 82% mayor en las mujeres; tres veces mayor (OR = 3,14) en la población con 18 a 29 años, en relación con los ancianos; y mayor con el incremento de la cantidad de tareas domésticas (OR = 2,21). Los factores financieros y ocupacionales fueron determinantes en el deterioro de la calidad del sueño autoinformada, demandando acciones rápidas sobre estas condiciones, a fin de minimizar este impacto. Género, franja de edad y rutinas domésticas también merecen atención en relación con la calidad del sueño.*

Sueño; Clase Social; Infecciones por Coronavirus