Analysis of Social Aspects Associated with Osteoarthritis in the Brazilian Population: A Cross-sectional Study Based on the National Health Survey in Brazil (PNS 2013).

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Abstract

**Background:** Osteoarthritis (OA) is considered the third most prevalent chronic non-communicable disease in the Brazilian population, being responsible for a high rate of physical disability and reduced quality of life. Little has been discussed about the social factors associated with this health condition. This study aimed to analyze the social factors associated with OA in the Brazilian population.

**Methods:** This is a cross-sectional study based on data from the 2013 National Health Survey in Brazil with OA as its main outcome. Gender, age, body weight, usual activities, physical activity, self-perceived health and diagnosis of depression were analyzed as independent variables. Descriptive and inferential statistics were used. Poisson multiple regression was performed, and the prevalence ratio (PR) and confidence interval (CI) of 95% were calculated using a significance level of 5% (p≤0.05).

**Results:** A total of 60,202 individuals of both genders took part in this study and the OA prevalence was 6.4%. The individual factors associated with a higher prevalence of OA were female gender (PR = 2.09; CI = 1.95-2.25), age over 35 years (PR = 2.88; CI = 2.57-3.24) and excess body weight (PR = 1.61; CI = 1.25-2.07). The presence of OA showed an association with lower performance of usual activities (PR = 1.61; CI = 1.50-1.73) and self-perceived health as very poor (PR = 3.96; CI = 3.31-4.72). In addition, it was associated with a higher prevalence of mental illnesses such as depression (PR = 1.77; CI = 1.64-1.90).

**Conclusion:** Social and modifiable factors which are associated with a higher prevalence of osteoarthritis can be controlled through incentive measures such as social participation and physical activity.

**Bullet Points**

Little has been discussed about the social factors associated with osteoarthritis in the Brazilian population.

Osteoarthritis is associated with lower performance of usual activities, poor self-perceived health and greater presence of mental illnesses, such as depression.

Encouraging social participation and physical activity can improve the social and modifiable factors associated with osteoarthritis.

**Background**

Osteoarthritis (OA) is a chronic-degenerative, progressive and multifactorial condition[1]. It commonly occurs in the aging process and affects several joints in the body, being more common in those responsible for weight support such as in the knees and hips[1, 2] as a mechanical and biochemical imbalance, which causes damage to the cartilage of joint surfaces and leads to inflammatory and repairing processes responsible for the appearance of bone deformities and physical disabilities[3]. It is
the most common health condition in the population and the main cause of pain and disability in the world[1]. OA is among the 10 most disabling disease in developed countries, and its prevalence increases with advancing age, affecting about 75% of people over 65 years of age, and also being present in younger ages, especially in women with an average age of 50 years[4].

The consequences of OA go beyond joint pain and impairment, as it has a negative impact on the quality of life of individuals, especially in the social sphere[5]. It represents 65% of the causes of incapacity for work in Brazil, being considered the third cause of absences and sick leave[6] In addition, there is excessive expenditure on medications and varied treatments for this condition[7]. The sum of these factors results in important consequences for the country’s socioeconomic and health system[8, 9].

Most studies on the prevalence and factors associated with chronic non-communicable diseases (NCDs) in the Brazilian population[10–12] touch on OA by only estimating its prevalence, but without analyzing other external factors associated with this chronic condition. Understanding these factors can contribute to elaborating specific public policies and promotion and prevention strategies which aim to reduce the prevalence and disabilities that can arise from the diagnosis and development of the disease. Thus, the objective of this study was to analyze the prevalence and external factors associated with osteoarthritis in the Brazilian population from a population-based health survey.

Method

A cross-sectional, descriptive and analytical study was conducted based on secondary data which were produced from the National Health Survey (PNS Brazil) in 2013, developed by a conglomerate sample selected in three stages with simple random sampling: census sectors, fixed households and residents aged 18 or over. The PNS was approved by the National Research Ethics Commission (CONEP) under registration number 328,159 on June 26, 2013 and met all recommendations of Resolution 466/2012 of the National Health Council (CNS). All individuals were informed, clarified and voluntarily accepted to participate in the research. This study followed the recommendations of the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE)[13].

Data collection took place from an analysis of the database in November 2019, and the final sample consisted of 60,202 individuals interviewed by trained researchers who answered the questions on the form in their home environment[14]. Additional information on the design of the PNS 2013 can be found in the National Health Research Report 2013, published by the Brazilian Institute of Geography and Statistics (IBGE)[15].

The dependent variable of osteoarthritis was assessed through the question (Q079): “Has any doctor already given you a diagnosis of arthritis or rheumatism?”, with two answer options: yes or no. Although the PNS uses the term arthritis or rheumatism, the term osteoarthritis was used in this study in a generalized way, as it is considered the most recommended to describe this condition according to the Brazilian Society of Rheumatology[16].
The independent variables and their respective codes were gender (C006), age (C008), body mass index (BMI) which was calculated from the items weight (P00101) and height (P00401), stop performing usual activities (J002), what is your self-perception of health? (N001), physical activity (P034), and diagnosis of depression (Q092). The age variable was categorized into three ranges: adult individuals (18 to 34 years old), middle-aged (35 to 59 years old) and older adults (60 years old or more), while the BMI was classified as underweight (< 18.5), normal weight (between 18.5 and 24.9), overweight (between 25 and 29.9), and obesity (> 30).

A descriptive analysis of the data was initially performed and then association tests such as the Chi-squared test between the dependent variable and all the independent variables, estimating the prevalence ratios (PR) and their respective 95% confidence intervals (CI) in the unadjusted model. All independent variables which presented p ≤ 0.20 in the association test with the outcome variable were included in the multivariate regression model. The adjusted PR and 95% CI were obtained from the Poisson regression model. The analyzes were conducted using SPSS software version 22.0 and a significance level of 5% (α < 0.05).

**Results**

This study covered the total sample of 60,202 individuals evaluated by the *PNS* in 2013. The prevalence of OA found in this study was 6.4%. Table 1 shows the absolute and relative values for each of the independent variables analyzed in this study.
Table 1
Descriptive analysis of research participants

| Variable                                    | No. of people (%) |
|---------------------------------------------|--------------------|
| **Gender**                                  |                    |
| Male                                        | 25,920 (43.1)      |
| Female                                      | 34,282 (56.9)      |
| **Idade**                                   |                    |
| 18 to 34 years                              | 21,746 (36.1)      |
| 35 to 59 years                              | 27,279 (45.3)      |
| 60 or older                                 | 11,177 (18.6)      |
| **BMI**                                     |                    |
| Low weight                                  | 1,372 (2.3)        |
| Normal weight                               | 23,379 (38.8)      |
| Overweight                                  | 21,305 (35.4)      |
| Obese                                       | 12,358 (20.5)      |
| **Unable to perform habitual activities**   |                    |
| No                                          | 54,935 (91.3)      |
| Yes                                         | 5,267 (8.7)        |
| **Self-perception of health**               |                    |
| Very good                                   | 7,433 (12.3)       |
| Good                                        | 31,708 (52.7)      |
| Regular                                     | 17,197 (28.6)      |
| Bad                                         | 3,099 (5.1)        |
| Very bad                                    | 765 (1.3)          |
| **Practive physical activity**              |                    |
| Yes                                         | 17,896 (29.7)      |
| No                                          | 42,306 (70.3)      |
| **Depression diagnosis**                    |                    |
BMI: Body Mass Index

The associations between OA and the independent variables analyzed are shown in Table 2. All variables included were associated with statistical significance ($p \leq 0.05$).

Among the analyzed independent variables, only not practicing physical activity was associated with a lower prevalence of OA (PR = 0.93, 95% CI = 0.86-0.99). All other factors were associated with higher prevalence of OA.

The most intense associations were represented by the female gender, which is twice as prevalent (PR = 2.09, 95% CI = 1.95-2.25), while being in the middle-age range (35 to 59 years) increased the prevalence by almost 3 times (PR = 2.88, 95% CI = 2.57-3.24). Furthermore, being an older adult (60 years or older) increases the prevalence of the outcome by 6.4 times (PR = 6.39, 95% CI = 5.68-7.19), as well as having a poor perception of their own health (bad or very bad) increased OA prevalence by approximately 4 times (PR = 3.96, 95% CI = 3.31-4.72; and PR = 3.99, 95% CI = 3.24-4.90), respectively.
Table 2
Relationship between the “Osteoarthritis” outcome and the independent variables.

|                       | Osteoarthritis | Non-adjusted | Adjusted |
|-----------------------|----------------|--------------|----------|
|                       | Yes            | No           | p-value  | PR (95%CI) | p-value | PR (95%CI) |
|                       | n (%)          | n (%)        |          |            |         |            |
| Gender                |                |              |         |            |         |            |
| Male                  | 25,007 (96.5)  | 913 (3.5)    | 1        | 2.54 (2.36-2.73) | <0.001  | 2.09 (1.95-2.25) |
| Female                | 31,219 (91.1)  | 3,063 (8.9)  | <0.001   | 2.09 (1.95-2.25) | <0.001  | 2.09 (1.95-2.25) |
| Age                   |                |              |         |            |         |            |
| 18 to 34 years        | 21,398 (98.4)  | 3,488 (1.6)  | 1        | 1          | 1        | 1          |
| 35 to 59 years        | 25,531 (93.6)  | 1,748 (6.4)  | <0.001   | 2.88 (2.57-3.24) | <0.001  | 2.88 (2.57-3.24) |
| 60 or older           | 9,297 (83.2)   | 1,880 (16.8) | <0.001   | 6.39 (5.68-7.19) | <0.001  | 6.39 (5.68-7.19) |
| BMI                   |                |              |         |            |         |            |
| Low weight            | 1,422 (95.8)   | 62 (4.2)     | 0.244    | 1.42 (1.10-1.82) | 0.006   | 1.42 (1.10-1.82) |
| Normal weight         | 22,245 (95.1)  | 1,134 (4.9)  | 0.006    | 1.17 (0.90-1.49) | 0.006   | 1.17 (0.90-1.49) |
| Overweight            | 19,851 (93.2)  | 1,454 (6.8)  | <0.001   | 1.61 (1.25-2.07) | <0.001  | 1.61 (1.25-2.07) |
| Obese                 | 11,366 (89.8)  | 1,285 (10.2) | <0.001   | 1.92 (1.50-2.47) | <0.001  | 1.92 (1.50-2.47) |
| Unable to perform habitual activities |        |              |         |            |         |            |
| No                    | 51,884 (94.4)  | 3,051 (5.6)  | 1        | 1          | 1        | 1          |
| Yes                   | 4,342 (82.4)   | 925 (17.6)   | <0.001   | 1.61 (1.50-1.73) | <0.001  | 1.61 (1.50-1.73) |
| Self-perception of health |              |              |         |            |         |            |
| Very good             | 7,279 (97.9)   | 154 (2.1)    | 1        | 1          | 1        | 1          |
| Good                  | 30,632 (96.6)  | 1,076 (3.4)  | <0.001   | 1.41 (1.20-1.66) | <0.001  | 1.41 (1.20-1.66) |
| Practice physical activity | Yes | No |
|---------------------------|-----|----|
| Regular                   | 16,964 (94.8) | 39,262 (92.8) |
| Bad                       | 932 (5.2) | 3,044 (7.2) |
| Very bad                  | 1 | <0.001 |
|                           | 1 | 0.032 |

| Diagnosis of depression | No | Yes |
|-------------------------|----|-----|
| PR: Prevalence Ratio; CI: Confidence Interval; BMI: Body Mass Index. |

| Diagnosis of depression | No | Yes |
|-------------------------|----|-----|
| PR: Prevalence Ratio; CI: Confidence Interval; BMI: Body Mass Index. |

Discussion

This study aimed to analyze the external factors associated with the prevalence of OA in the Brazilian population with a description of 60,202 individuals as assessed by the PNS in 2013. The results showed that most of the analyzed outcomes showed significant associations with the prevalence of OA, with greater representation in the female gender, in the middle-age range, performing less habitual activities and having poor self-perception of health.

The OA prevalence in this study was similar to that found in the National Household Sample Survey (PNAD)[17] in 2008, in which arthritis or rheumatism ranked third among chronic conditions, second only to arterial hypertension and back diseases[12]. This fact was also confirmed in a recent study[18].

Variables such as gender, age and weight are individual factors which are widely described in the literature[19–21]. Most studies confirm the prevalence of OA with a two-fold increase for women compared to men[22, 23] and at older ages[24], similar to what was found in this study. This fact may be linked to hormonal issues, especially when it occurs in middle age around 50 years, in which women go through the climacteric and menopause process and are more exposed to metabolic and joint disorders due to the decrease in the estrogen hormone[25, 26]. Another aspect which may be associated is the volume of articular cartilage, which is considerably lower in women[27]. Regarding age, it is known that the aging process generates a natural and progressive wear on the structures which compose the joints,
leading to physical and functional consequences of individuals, as in osteoarthritis[24]. Such a progressive effect was confirmed by the gradual increase in the prevalence of OA with increasing age.

It was also observed in this study that OA showed a gradient of increasing prevalence of association with BMI. This finding is supported by a systematic review, which found a positive risk of high BMI for OA in all 36 studies which were part of the review[28]. Among the modifiable factors, it is known that overweight and obesity cause mechanical overload on the joints which support the body, especially the knees and hips, which are normally the most affected regions[29]. However, another study showed that the relationship of obesity in OA is beyond the biomechanical cause, showing that there is a direct influence of metabolic and inflammatory aspects that are present in these cases[30].

Although it was confirmed in this study that OA was strongly associated with the female gender, advanced ages and body weight above the ideal limits (other variables little discussed so far) also presented relevant results. It was observed that failure to perform habitual activities in the internal environment, such as domestic services and external activities such as going to work or shopping are associated with a higher prevalence of OA. This fact may be related to sedentary behavior and the consequent disuse of muscles and joints, which may accelerate the tissue degeneration process due to muscle weakness and immobility. On the other hand, after adjusting the multivariate model, lower practice of physical activity became a factor associated with the decrease in the prevalence of OA; although this decrease is small (around 7%), it is believed that such an attitude is associated with a protective factor assumed by individuals who already have OA and therefore they avoid practicing physical activity for fear of generating more pain and then is the consequence of low adherence of these individuals to regular physical activity programs.

The prevalence of OA was associated with a greater presence of comorbidities. According to a study[18], hypertension, diabetes, kidney problems and depression stood out as the most frequent. The latter was also associated with a higher prevalence of OA in the Brazilian population, suggesting that the multifactorial impact of the disease may influence mental health.

The self-perception of the limitation degree shows a high level of agreement with the individual's clinical condition[31]. In a study which classified the limitation degree as intense or very intense for habitual activities in chronic diseases, OA occupied the third position behind mental illness and stroke sequelae[11]. This fact reveals a general concern for society, as there is a general increase in the limitations of habitual activities in chronic diseases due to the reduced functional capacity and little knowledge about diagnostic and treatment methods. This generates a relevant social and economic impact[32].

The individual's perception of feeling sick is not just a result of physical sensations, but of the social and psychological consequences of the disease[33]. The self-perceived health assessed in this study showed a strong concentration gradient for the categories bad and very bad, corroborating with a study[34] which evaluated the impact of osteoarthritis on the ability to work and activities of daily living, and showed a strong association with worse physical health; it is also related to reports of pain at higher levels.
Among the associated factors, age and gender target groups are at greater risk for developing this chronic condition and therefore need strategic health promotion actions and preventive measures such as screening for early diagnosis of this condition. However, modifiable factors should be considered such as overweight and poor health perception, as these factors can be changed or minimized through specific strategic and political actions, since they are not purely individual or biological factors, but involve a variety of health determinants and conditions. In addition, a sedentary lifestyle and immobility suggest isolation and consequent diagnosis of depression, making supportive measures relevant for greater social participation and physical activity.

In this study we can see that other factors are involved in OA, however the cross-sectional study design limits the analysis because it does not enable for an inference of reverse causality. Another limitation in this study was the diagnostic method adopted in this study following the PNS assessment instrument, in which it does not differentiate the type of arthritis or rheumatism pointed out by the interviewee. In addition, it would be pertinent to investigate other conditions and characteristics of the population with this disease, such as knowledge about the disease and measures used for treatment. Thus, it is suggested that prospective studies be developed to better manage cases and reduce the magnitude of social impacts on the lives of people with OA observed in this study.

**Conclusion**

The social factors which were associated with a higher prevalence of OA in the Brazilian population were less practice of habitual activities, poor self-perception of their own health and diagnosis of depression. These factors could be minimized through incentive measures such as greater social participation and regular physical activity.

**List Of Abbreviations**

OA - Osteoarthritis

PR - Prevalence Ratio

CI - Confidence Interval

NCDS - Chronic Non-Communicable Diseases

PNS - National Health Survey

CONEP - National Research Ethics Commission

CNS - National Health Council

STROBE - Strengthening the Reporting of Observational Studies in Epidemiology
Ethics approval and consent to participate

This study was conducted based on secondary data which were produced from the National Health Survey (PNS) in 2013. The PNS was approved by the National Research Ethics Commission (CONEP) under registration number 328,159 on June 26, 2013 and met all recommendations of Resolution 466/2012 of the National Health Council (CNS). All individuals were informed, clarified and voluntarily accepted to participate in the research.

Consent for publication

Not applicable.

Availability of data and materials

The data that support the findings of this study of the Health National Survey (PNS 2013) can be found in the National Health Research Report 2013, published by the Brazilian Institute of Geography and Statistics (IBGE).

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions
CGS was responsible for the study design and data collection. Performed data analysis and final writing.

MCS reviewed the manuscript and the translation criteria.

HJAS organized the data and methodological aspects for submission of the manuscript.

SJA performed statistical analysis and participated in the writing of the manuscript.

DSD responsible for the orientation of the study and methodological design.

All authors approved this final version of the manuscript.

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