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Escola de Educação Física, Fisioterapia e Terapia Ocupacional
Programa de Pós-Graduação em Ciências da Reabilitação

Érica de Matos Reis Ferreira

INVESTIGAÇÕES SOBRE DOR CRÔNICA NA COLUNA E DOENÇAS CRÔNICAS
NÃO TRANSMISSÍVEIS

Belo Horizonte

2025

Érica de Matos Reis Ferreira

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NÃO TRANSMISSÍVEIS**

Tese apresentada ao Programa de Pós-Graduação em Ciências da Reabilitação da Escola de Educação Física, Fisioterapia e Terapia Ocupacional da Universidade Federal de Minas Gerais, como requisito parcial à obtenção do título de Doutora em Ciências da Reabilitação.

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A Comissão considerou a tese:

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UNIVERSIDADE FEDERAL DE MINAS GERAIS
PROGRAMA DE PÓS-GRADUAÇÃO EM CIÊNCIAS DA REABILITAÇÃO



FOLHA DE APROVAÇÃO

INVESTIGAÇÕES SOBRE DOR CRÔNICA NA COLUNA E DOENÇAS CRÔNICAS NÃO TRANSMISSÍVEIS

ÉRICA DE MATOS REIS FERREIRA

Tese submetida à Banca Examinadora designada pelo Colegiado do Programa de Pós-Graduação em CIÊNCIAS DA REABILITAÇÃO, como requisito para obtenção do grau de Doutor em CIÊNCIAS DA REABILITAÇÃO, área de concentração DESEMPENHO FUNCIONAL HUMANO.

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Belo Horizonte, 26 de novembro de 2025.

*Aos meus filhos João Pedro, André e
Luísa por participarem não só da
construção desta tese, mas da construção
da minha história*

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RESUMO

A dor crônica na coluna (DCC) é um problema de saúde pública mundial. Evidências apontam para a coexistência da DCC e outras doenças crônicas não transmissíveis (DCNT), configurando um quadro de multimorbidade. No entanto, não está claro o papel da multimorbidade em adultos com DCC. Esta tese é composta por 5 capítulos, contendo um capítulo de introdução, 3 capítulos reportando resultados relacionados a 3 estudos e um capítulo final com as considerações finais e conclusão da tese. Os estudos reportados no segundo e terceiro capítulos são estudos transversais que utilizaram dados da Pesquisa Nacional de Saúde 2019. No estudo apresentado no capítulo dois, investigamos a prevalência das DCNT em indivíduos com e sem DCC e a associação entre a presença das DCNT e a limitação de atividade nos indivíduos com DCC. As DCNT investigadas por meio do autorrelato foram hipertensão, doenças do coração, Acidente Vascular Cerebral, artrite ou reumatismo, diabetes, depressão, asma, câncer, outras doenças pulmonares, outras doenças mentais. A limitação de atividade foi avaliada por meio de uma escala categórica de 5 pontos, variando de 0 (não limita) a 5 (limita muito intensamente). Dados de um total de 18.930 adultos com DCC e 68.748 adultos sem DCC coletados foram utilizados na análise. Os resultados mostraram maiores prevalências de DCNT entre adultos com DCC, comparados àqueles sem DCC, com destaque para doenças cardiovasculares (40,5%), artrite ou reumatismo (19,3%), depressão (19,3%) e diabetes (11,3%). A multimorbidade, ou a presença de duas ou mais DCNT no mesmo indivíduo, foi reportada por 62,1% dos adultos com DCC. Resultados do modelo de regressão logística ordinal apontaram piores níveis de limitação de atividade para artrite ou reumatismo (OR: 2,1; IC95%: 1,9 a 2,4), outras doenças pulmonares (OR: 1,8; IC95% 1,3 a 2,5), depressão (OR: 1,6; IC95%: 1,4 a 1,8) e doenças cardiovasculares (OR: 1,5; IC95%: 1,3 a 1,6). O estudo apresentado no capítulo três investigou a associação entre DCNT e a utilização dos serviços de saúde e a percepção de saúde em adultos brasileiros com DCC (n=18930). Para este estudo as DCNT investigadas foram: depressão, doenças cardiovasculares, diabetes e artrite ou reumatismo. A utilização dos serviços de saúde foi medida pela procura por serviço de saúde nos últimos 15 dias e pela internação nos últimos 12 meses. A percepção de saúde foi avaliada por meio de uma escala de respostas que varia entre 1 (muito boa) e 5 (muito ruim). Modelo de regressão logística binário foi usado para analisar as associações entre a presença das DCNT e a utilização dos serviços de saúde. Para a associação entre as DCNT e a percepção do estado de saúde foram aplicados modelos de regressão logística ordinal. Os resultados do modelo de regressão logística binário mostraram que depressão (OR: 1,8; IC95%: 1,6 a 2,1), doenças cardiovasculares (OR: 1,5; IC95%: 1,3 a 1,7), diabetes (OR: 1,4; IC95%: 1,2 a 1,8) e artrite ou reumatismo (OR: 1,3; IC95%: 1,1 a 1,5) foram associadas a maior utilização de serviço de saúde nos últimos 15 dias, comparadas a participantes sem a presença destas condições. Para o desfecho de internação nos últimos 12 meses, os resultados mostraram associação para depressão (OR: 2,0; IC95%: 1,5 a 2,7), doenças cardiovasculares (OR: 1,7; IC95%: 1,4 a 2,0) e diabetes (OR: 1,9; IC95%: 1,5 a 2,3). A chance de um participante com DCC e outra DCNT reportar piores níveis de percepção do estado de saúde foi 1,4 (IC95%: 1,3 a 1,6) para depressão, 2,0 (IC 95%: 1,8 a 2,2) para doenças cardiovasculares, 2,1 (IC 95%: 1,8 a 2,5) para diabetes e 2,1 (IC 95%: 1,9 a 2,4) para artrite ou reumatismo comparado ao participante com DCC, mas sem estas condições de saúde. O capítulo quatro

apresenta uma análise secundária do ensaio clínico randomizado, *Get Back to Healthy Trial*, conduzido na Austrália. Dados de 337 pacientes com dor lombar crônica (DLC) foram analisados com o objetivo de descrever padrões de combinações de comorbidades e sua associação com a utilização de serviços de saúde para a dor lombar. Os dados sobre dor lombar e comorbidades foram coletados na avaliação inicial. As comorbidades autorrelatadas coletadas foram as doenças cardiovasculares, respiratórias, gastrointestinais, musculoesqueléticas e neurológicas além da diabetes, dos sintomas psicológicos, dos distúrbios do sono e do câncer. Informações sobre a utilização dos serviços de saúde para a dor lombar foram coletadas quinzenalmente, durante um período de 12 meses, por meio de questionário eletrônico. A utilização dos serviços de saúde foi avaliada pelo número médio de consultas relacionados à dor lombar. Os resultados indicaram que 78% dos participantes apresentaram pelo menos uma comorbidade adicional a DLC, com maiores prevalências para condições musculoesqueléticas (45,1%), distúrbios do sono (32,3%) e condições cardiovasculares (26,7%). Ao agrupar as comorbidades em sistemas de morbidades, foram encontradas maiores prevalências para o sistema neuromuscular (47,8%), saúde mental & distúrbios do sono (42,4%) e cardiometabólico (41,2%). Nossos resultados sugerem que sistemas de morbidades tendem a ocorrer com maior frequência de forma agrupada quando comparados a sua ocorrência de forma não agrupada, com maiores valores para os pares: saúde mental & distúrbios do sono e gastrointestinal (OR: 3,6; IC95%: 2,1 a 6,0), neuromuscular e gastrointestinal (OR: 3,3; IC95%: 1,9 a 5,5) e saúde mental & distúrbios do sono e neuromuscular (OR: 2,9; IC95%: 1,9 a 4,6). O número médio de consultas para dor lombar entre os participantes foi 4,8 no ano. Nenhuma diferença significativa foi observada entre a utilização de serviço de saúde para a dor lombar e a presença de comorbidades específicas, sistemas de morbidades ou número de comorbidades. De maneira geral, os principais achados desta tese revelam alta prevalência de multimorbidade em adultos com DCC. Especificamente entre adultos brasileiros com DCC, as DCNT investigadas foram associadas aos desfechos estudados, com piores níveis de limitação de atividade, maior frequência de utilização de serviço de saúde e piores níveis de percepção do estado de saúde. Entre adultos australianos com DLC também encontramos alta prevalência de comorbidades, mas não houve associação entre as comorbidades e a utilização de serviços de saúde para dor lombar. Por fim, a presente tese fornece informações sobre a necessidade de considerar a presença das DCNT e da multimorbidade durante a avaliação e o manejo de pacientes com DCC e reforça a importância de investigar estratégias de cuidado para este perfil de pacientes.

Palavras-chave: dor crônica na coluna; doenças crônicas não transmissíveis; multimorbidade.

ABSTRACT

Chronic back pain (CBP) is a global public health problem. Evidence indicates the coexistence of CBP and other non-communicable chronic diseases (NCDs), leading to a condition of multimorbidity. However, the role of multimorbidity in adults with CBP remains unclear. This thesis comprises five chapters: one introductory chapter, three chapters reporting results from three studies, and a final chapter presenting overall considerations and conclusions. The studies reported in the second and third chapters are cross-sectional analyses using data from the 2019 National Health Survey (Pesquisa Nacional de Saúde). The study presented in Chapter two investigated the prevalence of NCDs among individuals with and without CBP and the association between the presence of NCDs and activity limitation among those with CBP. The NCDs assessed through self-report included hypertension, heart disease, stroke, arthritis or rheumatism, diabetes, depression, asthma, cancer, other lung diseases, and other mental disorders. Activity limitation was measured on a five-point categorical scale ranging from 0 (no limitation) to 5 (very intense limitation). Data from 18,930 adults with CBP and 68,748 adults without CBP were analyzed. Results showed higher prevalence rates of NCDs among adults with CBP compared to those without, with higher prevalences for cardiovascular diseases (40.5%), arthritis or rheumatism (19.3%), depression (19.3%), and diabetes (11.3%). Multimorbidity, defined as the presence of two or more NCDs, was reported by 62.1% of adults with CBP. Ordinal logistic regression analyses indicated worse levels of activity limitation associated with arthritis or rheumatism (OR: 2.1; 95% CI: 1.9–2.4), other lung diseases (OR: 1.8; 95% CI: 1.3–2.5), depression (OR: 1.6; 95% CI: 1.4–1.8), and cardiovascular diseases (OR: 1.5; 95% CI: 1.3–1.6). The study presented in Chapter three examined the association between NCDs and health service use and self-rated health among Brazilian adults with CBP (n = 18,930). The NCDs investigated included depression, cardiovascular diseases, diabetes, and arthritis or rheumatism. Health service use was measured by seeking care within the past 15 days and hospitalizations within the past 12 months. Self-rated health was assessed on a five-point scale ranging from 1 (very good) to 5 (very poor). Binary logistic regression models were used to analyze associations between NCDs and health service use, and ordinal logistic regression models were applied for associations with self-rated health. Results from binary logistic regression showed that depression (OR: 1.8; 95% CI: 1.6–2.1), cardiovascular diseases (OR: 1.5; 95% CI: 1.3–1.7), diabetes (OR: 1.4; 95% CI: 1.2–1.8), and arthritis or rheumatism (OR: 1.3; 95% CI: 1.1–1.5) were associated with higher health service use in the past 15 days among adults with CBP. Regarding hospitalization, depression (OR: 2.0; 95% CI: 1.5–2.7), cardiovascular disease (OR: 1.7; 95% CI: 1.4–2.0), and diabetes (OR: 1.9; 95% CI: 1.5–2.3) showed the strongest associations. The odds of reporting poorer self-rated health among participants with CBP and comorbid NCDs were 1.4 (95% CI: 1.3–1.6) for depression, 2.0 (95% CI: 1.8–2.2) for cardiovascular diseases, 2.1 (95% CI: 1.8–2.5) for diabetes, and 2.1 (95% CI: 1.9–2.4) for arthritis or rheumatism, compared to participants with CBP but without these conditions. Chapter 4 presents a secondary analysis of the randomized clinical trial *Get Back to Healthy Trial* conducted in Australia. Data from 337 patients with chronic low back pain (CLBP) were analyzed to describe patterns of comorbidity clusters and their association with health service use for low back pain. Data on low back pain and comorbidities were collected at baseline. Self-reported comorbidities included cardiovascular, respiratory,

gastrointestinal, musculoskeletal, and neurological diseases, as well as diabetes, psychological symptoms, sleep disorders, and cancer. Information on health service use for low back pain was collected fortnightly through electronic questionnaires over a 12-month period. Health service use was measured as the mean number of consultations related to low back pain. Results indicated that 78% of participants presented at least one comorbidity in addition to CLBP, with the highest prevalence for musculoskeletal conditions (45.1%), sleep disorders (32.3%), and cardiovascular conditions (26.7%). When grouped into system morbidities, higher prevalences were found for neuromuscular (47.8%), sleep & mental health (42.4%), and cardiometabolic (41.2%) systems. Our results suggest that system morbidities tend to cluster more frequently than expected by chance, with stronger associations for the pairs: sleep & mental health and gastrointestinal (OR: 3.6; 95% CI: 2.1–6.0), neuromuscular and gastrointestinal (OR: 3.3; 95% CI: 1.9–5.5), and sleep & mental health and neuromuscular (OR: 2.9; 95% CI: 1.9–4.6). The mean number of consultations for low back pain was 4.8 in one year. No significant differences were observed between health service use and the presence of specific comorbidities, system morbidities, or the number of comorbidities. Overall, the main findings of this thesis reveal high prevalence rates of multimorbidity among adults with CBP. Specifically, among Brazilian adults, the investigated NCDs were associated with worse activity limitation, greater health service use, and poorer self-rated health. Among Australian adults with CLBP, a high prevalence of comorbidities was also observed, but no association was found between comorbidities and health service use for low back pain. Finally, this thesis provides information on the need to consider the presence of NCDs and multimorbidity during the assessment and management of patients with CBP and reinforces the importance of investigating care strategies for this patient profile.

Keywords: chronic back pain; chronic non-communicable disease; multimorbidity.

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PREFÁCIO

Esta tese foi elaborada no formato opcional, de acordo com a Resolução N°004/2018 do Colegiado do Programa de Pós-Graduação em Ciências da Reabilitação da Universidade Federal de Minas Gerais e foi organizada em 5 capítulos. O primeiro capítulo é constituído pela introdução e apresenta uma breve contextualização sobre o tema proposto, a problematização, a justificativa dos estudos realizados e os objetivos da tese. O segundo e terceiro capítulos apresentam, respectivamente, os artigos: i) *“Prevalence of non-communicable diseases, multimorbidity and their impact on activity limitations among adults with chronic back pain: a national population-based study in a middle-income country”*, publicado no periódico *Brazilian Journal of Physical Therapy* e ii) *“Healthcare utilization and self-reported health of Brazilian adults with chronic back pain and multimorbidity: analysis of the 2019 National Health Survey”*, em processo de revisão por pares no *Musculoskeletal Care*. O capítulo 4, apresenta o produto desenvolvido no intercâmbio realizado na Universidade de Sydney, através do Programa de Doutorado Sanduíche no Exterior (PDSE), o artigo intitulado *“Comorbidity patterns in patients with chronic low back pain and the implications for healthcare utilisation: a secondary analysis of a randomized controlled trial”*, formatado de acordo com as normas do periódico *The Lancet Rheumatology*. Os artigos foram estruturados e redigidos conforme as normas dos periódicos nos quais foram publicados e/ou submetidos. O capítulo 5 apresenta as considerações finais que concluem como os estudos realizados podem contribuir para o avanço do conhecimento na área de Fisioterapia. Por fim, são apresentados os anexos.

1 INTRODUÇÃO

1.1 Doenças Crônicas Não Transmissíveis

As doenças crônicas não transmissíveis (DCNT) constituem um dos maiores problemas de saúde pública em todo o mundo, com sua prevalência em ascensão nos últimos anos (Vos *et al.*, 2016; World Health Organization, 2005). As DCNT são definidas como condições de longa duração e progressão lenta (Bernell; Howard, 2016; World Health Organization, 2005). Elas apresentam etiologia multifatorial e complexa, fatores de risco diversos e associação com desfechos negativos, como a piora da qualidade de vida, a limitação funcional, a maior utilização dos serviços de saúde e a morte prematura (Gijsen *et al.*, 2001; Marengoni *et al.*, 2011; World Health Organization, 2016). Devido a estas características, as DCNT constituem um grande desafio para a saúde da população e para os sistemas de saúde de todo o mundo.

Segundo estimativas do Global Burden of Diseases, as DCNT representam mais da metade da carga global das doenças em todo mundo (Ferrari *et al.*, 2024; Naghavi *et al.*, 2024) e no Brasil elas são consideradas a principal fonte de carga de doenças (Schmidt *et al.*, 2011; Victora *et al.*, 2011). Estudos realizados com dados da Pesquisa Nacional de Saúde (PNS) indicaram que em 2013, 45,1% dos brasileiros (cerca de 66 milhões de pessoas) relataram ter pelo menos uma DCNT (Carvalho Malta *et al.*, 2015). Em 2019 o valor estimado pela PNS foi ainda maior, sendo 47,6% (Malta *et al.*, 2021). Dentre as principais DCNT estão as doenças cardiovasculares, as respiratórias obstrutivas, as degenerativas e as osteomusculares (Bernell; Howard, 2016; World Health Organization, 2016).

1.2 Dor na coluna

1.2.1 Definição e epidemiologia

Uma das DCNT osteomusculares que mais acomete a população mundial é a dor na coluna. A dor na coluna compreende as dores nas regiões da coluna cervical,

torácica e lombar e acomete indivíduos de qualquer idade (Buchbinder *et al.*, 2020; Meucci *et al.*, 2015; Moser; Sommer; Gartlehner, 2024). Segundo as diretrizes internacionais de prática clínica, a dor na coluna pode ser categorizada como um problema de coluna específico, quando sua causa é clinicamente bem definida ou ainda como uma dor inespecífica, (Maher *et al.*, 2011; Maher; Underwood; Buchbinder, 2017; Savigny; Watson; Underwood, 2009) quando a causa da dor não é claramente identificada, o que ocorre em 90% dos casos (Van Tulder; Koes; Bombardier, 2002). A dor na coluna também pode ser classificada em relação ao tempo de permanência dos sintomas, sendo aguda, quando os sintomas apresentam duração por menos de 6 semanas, subaguda, de 6 a 12 semanas e crônica, por 12 semanas ou mais (Koes *et al.*, 2010; Steingrimsdóttir *et al.*, 2017; Van Tulder; Koes; Bombardier, 2002).

A prevalência média da dor na coluna em um ano, em todo o mundo, foi estimada em aproximadamente 38% (Hoy *et al.*, 2012; Vos *et al.*, 2012) e estima-se que, globalmente, uma em cada 13 pessoas apresentou dor na coluna no ano de 2020 (Ferreira *et al.*, 2023). No Brasil, a dor na coluna é a segunda condição mais prevalente entre a população (Nunes *et al.*, 2017) com valores estimados em 18,5% em 2013 (Malta *et al.*, 2017b) e 21,5% em 2019, (Malta *et al.*, 2022) segundo dados da PNS. Valores ainda maiores foram encontrados em estudo transversal realizado em 2021 na cidade de São Paulo, Brasil, que estimou a prevalência de dor na coluna lombar ao longo de um ano em 48,1% e ao longo da vida em 62,6% (Gonzalez *et al.*, 2021). Apesar das diferenças tanto nas definições para dor na coluna quanto nas metodologias utilizadas para estimar sua prevalência, esta condição de saúde apresenta-se em ascensão e estima-se que cerca de 843 milhões de pessoas relatarão dor na coluna em 2050 (Ferreira *et al.*, 2023).

1.2.2 Custo e utilização dos serviços de saúde

A dor na coluna é uma das principais razões para a procura por serviços de saúde, o que acarreta elevado custo para os indivíduos e para os sistemas de saúde (Buchbinder *et al.*, 2018; Ferreira *et al.*, 2011 World Health Organization, 2016). Os custos com a dor na coluna estão relacionados tanto a exames diagnósticos e

tratamentos, classificados como custos diretos, quanto a afastamentos do trabalho e aposentadorias precoces (Hoy *et al.*, 2012) que se referem aos custos indiretos (Dagenais; Caro; Haldeman, 2008). Para a dor lombar, por exemplo, na Austrália são estimados anualmente um custo total de AU\$9 bilhões e nos Estados Unidos as estimativas variam de US\$12,2 a 90,6 bilhões considerando apenas os custos diretos (Dagenais; Caro; Haldeman, 2008). Nos países de baixa e média renda, o impacto clínico e econômico da dor na coluna também é relevante. Evidências provenientes de uma revisão sistemática com dados da Etiópia, Brasil, Nigéria, Argentina e República Sérvia sugerem que a dor na coluna lombar está associada a um custo anual de US\$2,2 bilhões por população entre estes países (Fatoye *et al.*, 2023). A mesma revisão indicou uma taxa de internação de 13,4% a 18,7% entre os pacientes com dor lombar. No Brasil, a situação é semelhante. Em 2016, os custos diretos com problemas de coluna totalizaram US\$71,4 milhões, dos quais 58% corresponderam a custos hospitalares, 20% a fisioterapia e 14% a exames de imagem (Carregaro; Da Silva; Van Tulder, 2019). Ainda, entre os anos de 2012 e 2016, os custos diretos com dor lombar foram de aproximadamente US\$460 milhões e os custos sociais indiretos estimados em mais de US\$2 bilhões (Carregaro *et al.*, 2020). Dentre os custos indiretos, a perda de produtividade devido à dor na coluna possui um alto impacto, representando 79% deste custo para o país (Carregaro *et al.*, 2020). Os dados da Previdência Social reforçam esse achado, ao indicarem a dor na coluna como uma das principais causas de aposentadoria por invalidez (Filho; Silva, 2011). Este cenário agrava ainda mais o impacto social dessa condição de saúde na população e pode estar relacionada à limitação de atividade ou à incapacidade decorrentes da dor na coluna.

1.2.3 Incapacidade

A incapacidade consiste na limitação ou dificuldade do indivíduo realizar atividades em qualquer domínio da vida, incluindo as atividades de vida diária (AVD) e as atividades instrumentais de vida diária (AIVD), devido problemas de saúde (Fried *et al.*, 2004; Guralnik; Fried; Salive, 1996). As AVD incluem as atividades de autocuidado, como por exemplo tomar banho, vestir-se e ir ao banheiro. Já as AIVD

permitem a vida em comunidade, como preparar comida, cuidar da casa ou usar um meio de transporte (Guralnik; Fried; Salive, 1996; Verbrugge; Jette, 1994).

Já é bem demonstrado que a dor na coluna é classificada como a principal causa de incapacidade em todo o mundo (Ferreira *et al.*, 2023) e corresponde a 7,6% ou 42,5 milhões de anos vividos com incapacidade em todas as faixas etárias (Abbafati *et al.*, 2020; Vos *et al.*, 2016, 2017; Wu *et al.*, 2020). A incapacidade gerada pela dor na coluna está em evidência (Buchbinder *et al.*, 2018; Hartvigsen *et al.*, 2018) não apenas nos países de alta renda, mas também nos países de média e baixa renda (Sharma; Mcauley, 2022). Para estes países, o envelhecimento da população, as más condições de vida (Sharma *et al.*, 2019a, 2019b; Sharma; Mcauley, 2022), as ocupações fisicamente exigentes (Sharma; Mcauley, 2022) e a coexistência com outras condições de saúde no indivíduo (Hartvigsen *et al.*, 2018) podem influenciar tanto o aparecimento da incapacidade, quanto seu grau de intensidade. No Brasil, a dor na coluna é uma das principais causas de anos vividos com incapacidade (Vos *et al.*, 2017). Um fator relevante é que a incapacidade aumenta os gastos com a saúde, uma vez que está associada a maior demanda por consultas médicas, maior prescrição de exames e medicamentos, bem como a impactos econômicos decorrentes de afastamentos laborais e aposentadorias precoces (Malta *et al.*, 2017b).

1.2.4 Autoavaliação do estado de saúde

A autoavaliação do estado de saúde é um indicador frequentemente utilizado em pesquisas de saúde populacional (Manor; Matthews; Power, 2001; Theme Filha *et al.*, 2015; Theme Filha; Szwarcwald; Souza Junior, 2008). Ele se destaca por seu baixo custo e pela facilidade de aplicação (Carreras *et al.*, 2020). Apesar de ser aferido por uma única pergunta, este indicador reflete a carga da condição de saúde subjacente, ou seja, incorpora aspectos subjetivos da saúde (Krause; Jay, 1994) e apresenta relações significativas com as condições clínicas e com os indicadores de morbimortalidade (Theme Filha; Szwarcwald; Souza Junior, 2008). Além disso, pode ser considerado um preditor de morbidade e mortalidade da população (Jylhä; Volpato; Guralnik, 2006; Manderbacka *et al.*, 2003; Molarius; Janson, 2002; Theme Filha *et al.*, 2015). De fato, a autoavaliação do estado de saúde tem se mostrado um

indicador válido para aferir o estado de saúde (Manor; Matthews; Power, 2001) e seus resultados são comparáveis às avaliações objetivas de saúde (Carreras *et al.*, 2020). Evidências prévias indicam que indivíduos que se autoavaliam com estado de saúde ruim apresentam maior mortalidade (Tamayo-Fonseca *et al.*, 2013), pior capacidade funcional (Benyamini *et al.*, 2000) e maior limitação de atividade (Manor; Matthews; Power, 2001) em comparação com aqueles que se avaliam com estado de saúde bom ou excelente. Estudos que investigaram indivíduos com dor na coluna, utilizaram a autoavaliação do estado de saúde para avaliar comportamentos de saúde e fatores de risco nesta população (De Cássia Bergamaschi, 2023; Malta *et al.*, 2017b, 2022; Romero *et al.*, 2018). Os achados destes estudos demonstram associação entre a presença de dor crônica na coluna e a autoavaliação do estado de saúde ruim e muito ruim (De Cássia Bergamaschi, 2023; Hartvigsen; Christensen; Frederiksen, 2004; Malta *et al.*, 2017b, 2022; Romero *et al.*, 2018). Considerando a definição atual de dor crônica (Raja *et al.*, 2020) e o modelo biopsicossocial de saúde (Mescouto *et al.*, 2022), a inclusão de dados sobre a percepção do estado de saúde dos indivíduos, pode contribuir para uma melhor compreensão da relação entre a presença de dor crônica na coluna, multimorbidade e saúde percebida.

1.3 Multimorbidade

A multimorbidade é definida como a coexistência de duas ou mais condições crônicas no mesmo indivíduo (Van Den Akker; Buntinx; Knottnerus, 1996; Wallace *et al.*, 2015) e sua prevalência mundial foi estimada em aproximadamente 37,2% (Chowdhury *et al.*, 2023). Na Austrália, por exemplo, a multimorbidade acometeu 38% da população (9,7 milhões de pessoas) no ano de 2022, segundo dados do Australian Institute of Health and Welfare (AIHW). Este percentual variou de 11%, entre pessoas de 11 a 14 anos de idade, a 79% entre aqueles com 85 anos e mais (Australian Institute of Health and Welfare, 2025; Kabir *et al.*, 2024). Em países de média e baixa renda, a prevalência da multimorbidade foi estimada em 36,4%, segundo estudo de revisão sistemática com meta-análise realizado em 2022, com amostra composta por mais de 1,2 milhões de adultos (Asogwa *et al.*, 2022). No Brasil, estudos que utilizaram os dados da PNS 2013 (n= 60.202) e 2019 (n= 81.768) estimaram a presença de

multimorbidade entre adultos em aproximadamente 22,2% (Nunes *et al.*, 2017) e 24%, (De Souza, 2023), respectivamente, em uma lista de 22 condições crônicas investigadas.

A crescente prevalência da multimorbidade pode estar associada principalmente às mudanças nos padrões de estilo de vida (Dhalwani *et al.*, 2017) como alimentação não saudável e elevado tempo em atividades sedentárias, além do envelhecimento populacional (Barnett *et al.*, 2012; Freid; Bernstein; Bush, 2012; The Lancet, 2018; World Health Organisation, 2016). A multimorbidade é responsável por maior utilização dos serviços de saúde (De Souza, 2023) e por custos elevados no sistema de saúde, seja na atenção primária ou em serviços especializados e internações (Kabir *et al.*, 2024; Pati *et al.*, 2014; Rodrigues *et al.*, 2022; Romana *et al.*, 2020; Salisbury *et al.*, 2011; World Health Organisation, 2016; Zhao *et al.*, 2021). O manejo dos cuidados e tratamentos direcionados à multimorbidade podem permanecer durante toda a vida e isto é um desafio para profissionais da saúde que precisam lidar com a gestão desta condição cada vez mais frequente (World Health Organisation, 2016). No Brasil, esse cenário afeta diretamente o orçamento para o Sistema Único de Saúde, dado o envelhecimento populacional em curso no país e sua associação com a presença de multimorbidade (Dhalwani *et al.*, 2017).

1.3.1 Multimorbidade e dor na coluna

Há evidência crescente da coexistência da dor na coluna e outras DCNT (Croft, 2009) como as doenças cardíacas (Romero *et al.*, 2018), hipertensão (Malta *et al.*, 2017b; Romero *et al.*, 2018; Schneider *et al.*, 2007), obesidade (Shiri *et al.*, 2010), depressão (Amiri; Behnezhad; Azad, 2020), diabetes (Pozzobon Id *et al.*, 2019), doença pulmonar obstrutiva crônica (Fuentes-Alonso *et al.*, 2020) e doença cardiovascular (Hestbaek; Leboeuf-Yde; Manniche, 2003; Oliveira *et al.*, 2020; Rzewuska *et al.*, 2017). Este cenário caracteriza a presença de multimorbidade entre indivíduos com dor na coluna. De acordo com evidências recentes, pacientes com dor na coluna e multimorbidade relatam piores níveis de dor e incapacidade (Aparecida *et al.*, 2019; Fanuele *et al.*, 2000), apresentam pior prognóstico (Nordin *et al.*, 2002), maiores chances de autoavaliação de saúde ruim (Rafn *et al.*, 2023) e menor

probabilidade de receber cuidados apropriados (Ramanathan *et al.*, 2018), comparadas àqueles sem multimorbidade. Isso sugere que, do ponto de vista da saúde pública e dos cuidados em saúde, a presença da multimorbidade em indivíduos com dor na coluna pode tornar o manejo desta condição mais complexo. Além disso, outros fatores podem impactar o tratamento de pacientes com dor na coluna e multimorbidade. As intervenções farmacológicas, por exemplo, podem ter suas dosagem e perfis de efeitos adversos dos medicamentos para dor afetados pela presença de outras DCNT (Gloth, 2011). Já as intervenções não farmacológicas, como a terapia por exercícios, podem apresentar limitações, já que a modalidade e a intensidade recomendadas para uma DCNT podem ser contraindicadas ou inadequadas para outras. De acordo com as diretrizes de manejo e tratamento para a dor na coluna, a educação do paciente e os exercícios ativos supervisionados, devem ser a primeira linha de cuidado (Oliveira *et al.*, 2018). Entretanto, a maior parte das evidências que fundamentam as diretrizes provém de ensaios clínicos que não consideraram ou que excluíram indivíduos com condições de saúde coexistentes com a dor na coluna (Foster *et al.*, 2018).

Embora haja evidências sobre o impacto da multimorbidade em termos de número de condições associadas à dor na coluna (Aparecida *et al.*, 2019; Fu *et al.*, 2023; Lemes *et al.*, 2024), informações sobre os tipos de DCNT e seu impacto neste perfil populacional ainda foram conduzidos predominantemente em países de alta renda (Currie; Wang, 2004; Schneider *et al.*, 2007; Von Korff *et al.*, 2005). Há, portanto, a necessidade de pesquisar sobre a prevalência da multimorbidade e das DCNT entre a população com dor na coluna em países de média e baixa renda. Nestes países múltiplos fatores como a pobreza e a desigualdade social podem exacerbar o impacto das DCNT (Miranda *et al.*, 2019).

1.4 Pesquisa Nacional de Saúde e *Get Back to Healthy* (GBTH) Trial

O uso de bancos de dados populacionais e dados clínicos é fundamental para identificar e compreender fatores associados à saúde e gerar informações para subsidiar o desenvolvimento de políticas públicas e estratégias de cuidado à saúde. Neste contexto, para a realização dos estudos desta tese, dois bancos de dados foram

utilizados: o da Pesquisa Nacional de Saúde 2019, conduzida no Brasil, e o do *Get Back to Healthy Trial* conduzido na Austrália. Os estudos apresentados nos capítulos 2 e 3 desta tese são transversais realizados com os dados da PNS 2019. O capítulo 4 apresenta um estudo de análise secundária conduzida com dados do *Get Back to Healthy Trial*.

1.4.1 Pesquisa Nacional de Saúde

A PNS é um inquérito populacional de base domiciliar, com abrangência nacional, realizado pelo Instituto Brasileiro de Geografia e Estatística em parceria com o Ministério da Saúde (Szwarcwald *et al.*, 2014). No Brasil, a PNS é a principal fonte de dados para estudos de conhecimento e fatores associados a condições crônicas e a dor crônica na coluna (DCC). O objetivo da PNS é coletar informações sobre o desempenho do sistema nacional de saúde em relação ao acesso e uso dos serviços disponíveis e à continuidade dos cuidados, assim como sobre as condições de saúde da população, a vigilância das DCNT e os fatores de risco a elas associados (IBGE, 2019). A PNS apresenta um desenho amostral complexo representativo da população brasileira residente em domicílios particulares nas áreas urbana e rural, nas cinco macrorregiões geográficas do Brasil (Stopa *et al.*, 2020; Szwarcwald *et al.*, 2014). A PNS 2019 é a segunda e mais recente edição deste inquérito e sua amostra contemplou um total de 90.846 entrevistados a partir de 15 anos de idade, destes, 88.531 adultos com 18 anos e mais. Prévios estudos utilizaram dados da PNS para estimar a prevalência da DCC e seus fatores associados (Malta *et al.*, 2017b, 2022; Romero *et al.*, 2018), mas ainda há uma lacuna no conhecimento sobre o perfil de multimorbidade entre a população brasileira com DCC e a sua associação com a limitação de atividade, a percepção do estado de saúde e a utilização dos serviços de saúde.

1.4.2 *Get Back to Healthy* (GBTH) Trial

O *Get Healthy Information and Coaching Service*® (*Get Healthy Service*) é um programa gratuito de coaching em saúde para adultos, realizado por telefone, nos

estados de *New South Wales*, *South Australia* e *Queensland* (O'Hara BJ, Phongsavan P, McGill B, Maxwell M, Ahmed N, 2014). Este serviço é financiado pelos governos estaduais desde 2009 e tem como objetivo apoiar e aprimorar a capacidade do indivíduo cuidar de sua própria saúde. Investigações prévias utilizaram dados do *Get Healthy Service* para investigar, por exemplo, aspectos relacionados ao aumento nos níveis de atividade física e fatores de risco comportamentais para doenças crônicas (O'Hara BJ, Phongsavan P, McGill B, Maxwell M, Ahmed N, 2014; Williams *et al.*, 2018) e fatores relacionados a dor lombar crônica (Robson *et al.*, 2019; Williams *et al.*, 2018). O *Get Back to Healthy trial* foi um ensaio clínico desenvolvido para investigar o efeito da introdução de um sistema de apoio para pacientes com dor lombar crônica inespecífica após a alta do tratamento de fisioterapia. (Ho *et al.*, 2021). Um dos objetivos do *Get Back to Healthy Trial* foi avaliar o efeito do programa de coaching em saúde sobre o número de consultas hospitalares, médicas e de outros serviços de saúde relacionadas à dor lombar ao longo de um período de 12 meses após a alta do tratamento, comparado a cuidados habituais. O *Get Back to Healthy Trial* já foi finalizado (dados ainda não publicados) e sua amostra foi constituída por 346 participantes com dor lombar crônica inespecífica. Os dados coletados durante o estudo foram utilizados para a realização da investigação sobre padrões de comorbidades em pacientes com dor lombar crônica e sua implicação para a utilização do serviço de saúde.

1.5 Justificativa

As evidências apresentadas reforçam a relevância de compreender a coexistência das DCNT e da presença da multimorbidade em indivíduos com DCC. A multimorbidade atualmente é um problema de saúde mundial mas há uma lacuna do conhecimento sobre seu impacto em pessoas com DCC de maneira a identificar como a presença das DCNT podem influenciar fatores funcionais, a utilização de serviços de saúde e a percepção do estado de saúde. Os achados deste estudo podem auxiliar na melhor compreensão deste tema e gerar informações para o avanço no conhecimento nesta área e no manejo da DCC.

1.6 Objetivos

Objetivo Geral:

Investigar a prevalência e os padrões de multimorbidade associados à dor crônica na coluna em adultos, bem como sua relação com a limitação de atividades, a utilização de serviços de saúde e a percepção do estado de saúde em contextos populacionais distintos.

Objetivos específicos:

1. Estimar a prevalência das DCNT e da multimorbidade entre adultos brasileiros que relatam dor crônica na coluna e identificar sua associação com a limitação de atividade devido dor crônica na coluna (Capítulo 2);
2. Investigar se a presença de DCNT entre adultos brasileiros com dor crônica na coluna contribui para uma maior utilização de serviços de saúde ou uma pior percepção do estado de saúde (Capítulo 3);
3. Descrever padrões de comorbidades entre adultos australianos com dor lombar crônica e sua associação com a utilização dos serviços de saúde para a dor lombar (Capítulo 4).

2 ESTUDO 1

Título: Prevalence of non-communicable diseases, multimorbidity, and their impact on activity limitations among adults with chronic back pain: a national population-based study in a middle-income country






Estudo publicado no periódico *Brazilian Journal of Physical Therapy*



Original Research

Prevalence of non-communicable diseases, multimorbidity, and their impact on activity limitations among adults with chronic back pain: a national population-based study in a middle-income country



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ABSTRACT

Background: Patients with chronic back pain who also have comorbidities are more likely to report severe symptoms and receive inappropriate care. It is still unclear which types of comorbidity are associated with more disabling symptoms.

Objective: To compare the prevalence of chronic non-communicable disease between adults with and without chronic back pain, estimate the prevalence of multimorbidity in adults with chronic back pain, and identify comorbidities that are associated with activity limitations.

Methods: Data from adults who participated in the 2019 National Health Survey were used to collect information about chronic non-communicable diseases, chronic back pain, and activity limitations. Multimorbidity was defined as the presence of one or more comorbidities in addition to chronic back pain. Difference in proportion and ordinal logistic regression were used in the analyses.

Results: Of the total sample size ($n = 87,678$), 21.6 % ($n = 18,930$) reported having chronic back pain. The prevalence rates of all non-communicable conditions were higher in people with chronic back pain compared to those without chronic back pain. Multimorbidity was reported by 62.1 % (95 %CI: 61.1, 63.6) of the adults with chronic back pain. The odds of a participant with comorbidities reporting a worse activity limitation level were 2.1 (95 %CI: 1.9, 2.4) for arthritis or rheumatism, 1.6 (95 %CI: 1.4, 1.8) for depression, and 1.5 (95 %CI: 1.3, 1.6) for cardiovascular disease compared to participants without this specific comorbidity.

Conclusion: Non-communicable diseases and multimorbidity were prevalent in adults with chronic back pain. Cardiovascular disease, arthritis or rheumatism, and depression, were associated with higher activity limitations due to back pain.

Introduction

Multimorbidity, or the coexistence of multiple health conditions in the same individual, imposes a challenge to healthcare clinicians.¹ Nine

out of 10 patients seen in primary care settings have more than one health condition.^{2,3} Compared to those with a single condition, those with multimorbidity have lower quality of life⁴ and poorer function,⁵ are more likely to die prematurely,⁶ and consume more healthcare

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resources.⁷ Disease management of patients with multimorbidity and chronic pain can become more complex for pharmacological interventions, as dosing and adverse effect profiles of pain medication can be affected by other diseases,⁸ and non-pharmacological interventions, such as exercise therapy, as modality and intensity recommended for a specific disease may be contra-indicated or not suitable for other diseases.

Chronic back pain is ranked as the leading cause of disability worldwide.⁹ Although clinical practice guidelines advise the condition should be managed in primary care,¹⁰ most available evidence used in guidelines comes from trials that did not consider, or excluded people with associated health conditions.¹⁰ There is evidence, mainly from upper income countries, suggesting that chronic non-communicable conditions frequently coexist with chronic back pain,¹¹ such as obesity,¹² depression,¹³ hypertension,^{14–16} diabetes,¹⁷ chronic obstructive pulmonary disease,¹⁸ asthma,¹¹ arthritis¹⁹ and cardiovascular disease.^{11,20,21} Patients with back pain and multimorbidity are more likely to have worse symptoms,^{22,23} show poorer prognosis,²⁴ and receive inappropriate care.²⁵

Previous research in the back pain field focused on the number of comorbidities. Cohort studies have shown that comorbidities are associated with poor prognosis in patients with back pain.^{22,26,27} While some population-based studies have provided information on comorbidities commonly associated with chronic back pain, these studies were predominantly conducted in upper-income countries^{16,28,29} where rates and impact of comorbidity may differ from middle- or lower-income countries (LMICs).³⁰ Population-based studies conducted so far in LMICs focused broadly on multimorbidity (i.e., not specifically related to back pain),^{31,32} or a specific comorbidity (i.e., mental health problems) associated with back pain.^{33–35} Multimorbidity imposes a financial burden on LMICs³⁶ and is complicated by multiple exacerbating factors including adverse environmental and early life stressors linked to poverty, limited social infrastructure and poorer family coping mechanisms that translate into chronic diseases occurring at earlier ages.³⁷ Knowledge about types of comorbidities associated with more disabling back symptoms would enable researchers and clinicians to develop and test management strategies tailored to various comorbidity profiles.

Brazil, a middle-income country, is facing a significant challenge with both back pain³⁸ and multimorbidity.²¹ The 2019 National Health Survey was a population-based study which recruited a representative sample of the Brazilian population and can yield generalisable estimates on comorbidities. Therefore, we aimed to:

- i) compare the prevalence of non-communicable disease in people with and without chronic back pain;
- ii) estimate the prevalence of multimorbidity among people with chronic back pain;
- iii) characterise and contrast the sociodemographic profile among people with back pain who reported having only chronic back pain, multimorbidity and each comorbidity associated with chronic back pain, and
- iv) identify comorbidities associated with activity limitation due to chronic back pain.

Methods

Study design and participants

This is a secondary analysis of data from the 2019 National Health Survey conducted by the Brazilian Institute of Geography and Statistics (abbreviated as IBGE) in partnership with the Brazilian Ministry of Health. The 2019 National Health Survey is a household survey that employs a complex sampling design, ensuring representation of the Brazilian population residing in private households in urban and rural areas across the five geographic macro-regions of Brazil. The census tracts or sets of sectors formed the primary sampling units, and

households constituted the second-stage units, and residents aged 15 years or older were defined as the units of the third stage.^{39,40} More details on the study methods are available elsewhere.³⁹ Data collection for the 2019 National Health Survey occurred between August 26, 2019, and March 13, 2020. Hand-held computers were used to collect survey information and all interviewers received training. The interviewer explained to residents the objectives, the data collection procedures and the importance of their participation in the research. The National Health Survey results are published in IBGE through descriptive analyses of main health indicators in mass media circulation so that the population is aware of the main results. A total of 88,531 adult respondents participated in the 2019 National Health Survey. The data used for the current study were obtained through microdata publicly accessible on the National Health Survey (NHS) website.⁴¹

The present study used data from all adult individuals 18 years of age or older, who responded to the Chronic Diseases Module of the 2019 National Health Survey. The National Health Survey defines chronic in the survey questionnaire pack as conditions that last >6 months. All adults who provided self-reported information about their weight and height were included so that body mass index (BMI) could be calculated. Additionally, all participants received an explanation on the concept of chronic disease and signed an informed consent form before data collection.

Variables

Sociodemographic and lifestyle

The sociodemographic and lifestyle variables in the data set included: sex (according to biological characteristics),⁴² age groups, education levels, per capita household income, location of residence, presence of private health plan, smoking, abusive alcohol consumption; BMI, calculated by the weight and height reported by the respondent.

Presence and duration of chronic back pain

The presence of chronic back pain was assessed by the following question: “Do you have chronic back problems, such as chronic pain in your back or neck, lumbago, sciatica, or problems in the vertebrae or discs?” The response options were “yes” or “no”. For affirmative responses regarding the presence of chronic back pain, respondents answered a follow-up question about the age when the current back pain started. Symptom duration was calculated by subtracting the respondent’s age when back pain started from the age at the time of the survey. Symptom duration was categorised as greater than 1 year and equal or less than a year.

Presence of chronic non-communicable conditions

The presence of non-communicable disease was identified through the question: “Has any doctor ever diagnosed you with [disease]?” The chronic non-communicable conditions investigated included: hypertension, heart disease, cerebrovascular accident (stroke), diabetes, asthma, arthritis or rheumatism, cancer, depression, other mental health conditions and other lung diseases. The responses were dichotomous (yes or no). Participants with and without chronic back pain who responded affirmatively to at least one chronic condition were categorised as having a chronic non-communicable condition (or comorbidity). For analysis purposes, hypertension, heart disease, and stroke were categorised into cardiovascular diseases.^{20,43} The presence of multimorbidity^{1,44} among participants with chronic back pain was determined based on the positive response to one or more comorbidities in addition to the presence of chronic back pain (chronic back pain + 1 or more chronic conditions) which could range from two to five comorbidities. Females who reported the presence of diabetes and/or hypertension only during pregnancy were not included as hypertensive and/or diabetic individuals. Individuals who declared that they had never had their blood pressure checked or their blood glucose tested were not considered to have hypertension or diabetes, respectively.

Outcome variables

Activity limitation due to chronic back pain was assessed with the question: “In general, to what extent does your back problem limit your usual activities (such as working, household chores, etc.?)”. The response options included: (1) no limitation; (2) mild limitation; (3) moderate limitation; (4) severe limitation; (5) very severe limitation.¹⁵ Supplementary material – Table 1 describes the variables investigated in this study.

Ethical aspects

2019 National Health Survey data are available for public access and use; the current study was approved by the Comissão Nacional de Ética e Pesquisa (CONEP) Distrito Federal, Brasília, Brazil (n° 3529,376, 2019).

Data analysis

To characterise the sample, we presented sociodemographic characteristics, lifestyle, chronic conditions, and the presence of multimorbidity using proportions and 95 % confidence intervals (CI), means with 95 %CI, or median with interquartile range (IQR), depending on the distribution of the data. Multimorbidity clusters were depicted as proportions and 95 %CI for the total sample and stratified by sociodemographic characteristics and activity limitation due to chronic back pain. Sociodemographic data were chosen for comparison (i.e., sex, age, education levels, smoking, alcohol consumption) because these are more prevalent in specific groups^{14,45,46} and are known lifestyle risk factors for back pain^{45,46} or other chronic conditions.⁴⁷ Comparisons within and between comorbid groups were conducted using mean difference (MD) and proportion difference (PD), along with their respective 95 %CI.

We employed an ordinal logistic regression model⁴⁸ to identify which type of comorbidity was associated with activity limitation due to chronic back pain. The outcome variable was the level of activity limitation due to chronic back pain with “no limitation” serving as the reference category. We estimated the odds of moving to a higher category of activity limitation due to chronic back pain for each identified comorbidity group. We presented the adjusted odds ratio for the association of each comorbid group with activity limitation controlled for the presence of all comorbidities. We did not control for other confounding variables because making causal inferences was beyond the scope of this study. The 95 %CI was reported for each estimate. For comparison purposes only, we estimated the odds of moving to a higher category of activity limitation due to chronic back pain for the no-comorbidities back pain group. Data were organised and analysed using Stata® software, version 15.1, through the survey module, which considers the effects of complex sampling.^{39,41,49} Expansion factors and sampling weights were considered in all analyses. Data from the National Health Survey are collected with a complex sampling design; therefore, statistical analysis was carried out with an application that considers the effect of the sampling plan and unequal selection probabilities. Because of weighting, it is expected that there will be differences between the prevalence estimates calculated using the study sample and the prevalence estimates calculated with weighting.

Results

Participants characteristics

Among the total participants (n = 87,678), 21.6 % (n = 18,930) reported chronic back pain. Participants with chronic back pain were older (MD: 6.7 years, 95 %CI: 6.5, 7.0), presented with higher BMI (MD: 0.5 kg/m², 95 %CI:0.4, 0.6) and showed higher proportions of females (PD: 10.0 %, 95 %CI: 8.9, 11.0) and of participants in the illiterate or incomplete primary school (PD: 15.5 %, 95 %CI: 14.3, 16.6) than those participants without chronic back pain. Specifically for the chronic back pain group, most participants (96.0 %, 95 %CI: 95.5, 96.5) reported experiencing symptoms for more than one year. Two-thirds of the people with chronic back pain presented with some activity limitations (68.2 %, 95 %CI: 66.8, 69.5) (i.e., scored at equal to or greater than mild activity

Table 1

Description of study variables in the population with and without chronic back pain.

Characteristics	Chronic back pain	
	No (n = 68,748)	Yes (n = 18,930)
Sex		
Female	50.7 (49.9, 51.3)	60.0 (58.8, 61.2)
Age groups (years)		
Mean (95 % CI)	43.3 (43.1, 43.6)	51.3 (50.8, 51.7)
18–29	24.9 (24.2, 25.6)	10.2 (9.3, 11.2)
30–39	22.4 (21.8, 23.0)	15.1 (14.2, 16.0)
40–49	17.7 (17.2, 18.3)	20.0 (18.9, 21.1)
50–59	15.6 (15.1, 16.0)	23.2 (22.2, 24.3)
60–69	10.8 (10.4, 11.2)	17.6 (16.6, 18.4)
70–79	5.7 (5.4, 5.9)	9.7 (9.0, 10.4)
80 and more	2.6 (2.4, 2.8)	3.9 (3.5, 4.4)
Educational levels		
Illiterate or incomplete primary school	31.5 (30.8, 32.2)	47.0 (45.7, 48.4)
Complete primary school or incomplete high school	15.0 (14.5, 15.5)	12.0 (11.2, 12.9)
Complete secondary school or tertiary education incomplete	36.9 (36.2,37.6)	27.1 (25.9, 28.4)
Tertiary education complete	16.4 (15.7,17.1)	13.6 (12.6, 14.7)
Household income		
≤1 minimum wage	50.8 (49.9, 51.6)	52.0 (50.5, 53.4)
> 1 and ≤ 3 minimum wage	37.4 (36.7, 38.1)	37.0 (35.7, 38.4)
> 3 and ≤ 5 minimum wage	6.5 (6.1, 6.9)	5.6 (5.0, 6.1)
> 5 minimum wage	5.1 (4.7, 5.5)	5.2 (4.6, 5.8)
Household situation		
Urban	86.5 (86.1, 86.9)	84.7 (83.8, 85.6)
Health Insurance		
Yes	26.8 (26.0, 27.6)	27.8 (26.4, 29.3)
Smoking		
Non-smoking	62.9 (62.3, 63.6)	52.0 (50.6, 53.4)
Ex-smoker	24.7 (24.2, 25.3)	33.8 (32.5, 35.1)
Smoker	12.2 (11.7, 12.6)	14.0 (13.2, 14.9)
Abusive alcohol consumption		
Yes	2.3 (2.1, 2.5)	3.1 (2.6, 3.6)
BMI (kg/m²)		
Mean (95 % CI)	26.3 (26.3, 26.4)	27.1 (27.0, 27.3)
Duration of chronic back pain		
≤1 year	–	3.9 (3.4, 4.4)
>1 year	–	96.0 (95.5, 96.5)
Activity limitation due to chronic back pain		
No limitation	–	31.8 (30.4, 33.1)
Mild limitation	–	32.8 (31.6, 34.1)
Moderate limitation	–	19.1 (18.1, 20.2)
Severe limitation	–	11.8 (10.9, 12.8)
Very severe limitation	–	4.2 (3.7, 4.7)

Data are proportions (95 % confidence interval), unless otherwise indicated. BMI, body mass index.

Sample size include 68,748 people without chronic back pain (population size [N] = 157,559,876) and 18,930 with back pain (population size [N] =

34,131,360). Proportions or means with 95 % Confidence Interval (CI) incorporate appropriate weights to control complex sample design.

limitation). Of these, 32.8 % (95 %CI: 31.6, 34.1) of participants reported having mild activity limitation and 35.2 % (95 %CI: 33.8, 36.7) reported “moderate” to “very severe” limitation (Table 1).

Prevalence of chronic non-communicable conditions and multimorbidity

The prevalence rates of chronic non-communicable conditions are described in Fig. 1. The top three most prevalent non-communicable diseases in people without chronic back pain were cardiovascular diseases (22.8 %; n = 17,179), followed by depression (7.7 %; n = 5001) and diabetes (6.7 %; n = 5038). The order of prevalence changed in those people with chronic back pain with cardiovascular diseases (40.5 %; n = 7666), arthritis or rheumatism (19.3 %; n = 3678), and depression (19.3 %; n = 3179) being the top three most prevalent conditions. The prevalence rates of all non-communicable conditions were higher in people with chronic back pain, particularly for cardiovascular disease (PD:17.7 %, 95 %CI:16.4, 18.9), arthritis or rheumatism (PD:15.0 %, 95 %CI: 13.5, 16.4) and depression (PD: 11.6 %, 95 %CI: 10.0, 13.1), compared to those without chronic back pain. The prevalence rate of multimorbidity in those with chronic back pain was 62.1 % (95 %CI: 61.1, 63.6; n = 11,608).

Sociodemographic profile among people with chronic back pain

Among those with chronic back pain, we found that the no-comorbidities back pain group and the multimorbidity group were relatively similar regarding smoking, and abusive alcohol consumption; but not for sex, age, education level, and BMI (Table 2). Regarding sex, a higher proportion of females was found in the multimorbidity group compared to the no-comorbidities back pain group (PD=20.8 %, 95 %CI: 18.6, 22.8). The proportions of females were higher across all comorbidity groups. For instance, in comparison with the no-comorbidities chronic back pain group, the group reporting comorbid depression showed the highest proportion of females (PD=34.2 %, 95 %CI: 31.9, 36.4), and the group reporting other lung diseases as comorbidity showed the smallest proportion of females (PD=20.3 %, 95 %CI: 15.0, 25.7).

The mean age was 12.1 (95 %CI: 11.7, 12.5) years higher in the multimorbidity group compared to the no-comorbidities chronic back pain group. Among the comorbidity groups, the largest age differences were found for the group reporting comorbid cancer (MD=18.2 years, 95 %CI: 17.1, 19.2) and for the group reporting comorbid diabetes (MD=17.5 years, 95 %CI: 16.8, 18.2) compared to the no-comorbidities chronic back pain group. Regarding education level, a higher proportion of illiterate participants or participants with incomplete primary school was found in the multimorbidity group compared to the no-comorbidities chronic back pain group (PD: 9.2, 95 %CI: 7.2, 11.3). This finding was similar across all comorbidity groups.

The mean BMI was 1.4 kg/m² (95 %CI:1.3, 1.6) higher in the multimorbidity group compared to the no-comorbidities chronic back pain group. Among the comorbidity groups, the largest BMI differences were found for the group reporting comorbid diabetes (MD=2.6 kg/m², 95 %CI:2.4, 2.9) and for the group reporting comorbid cardiovascular disease (MD=1.9 kg/m², 95 %CI:1.8, 2.1) compared to the no-comorbidities chronic back pain group.

Level of activity limitation associated with multimorbidity/comorbidities

Fig. 2 presents the proportion of people in each activity limitation category across all groups. Differences in proportions between the no-comorbidities chronic back pain group and the multimorbidity group were more evident in the no activity limitation category and the severe and very severe activity limitation categories. While the no-comorbidities chronic back pain group showed a higher proportion of participants reporting no activity limitation (PD=15.5 %, 95 %CI:13.1, 18.0) compared to the multimorbidity, the multimorbidity group showed higher proportions of participants reporting severe (PD=7.5 %, 95 %CI: 4.9, 10.2) and very severe (PD=3.6 %, 95 %CI: 0.8, 6.3) activity limitation. All comorbidity groups showed similarly low proportions of participants with no activity limitation and higher proportions at higher activity limitation levels, particularly for severe and very severe activity limitation categories (Table 2).

The results of the ordinal logistic regression models indicate that the odds of a participant with a specific comorbidity reporting a worse activity limitation level were 2.1 (95 %CI: 1.9, 2.4) for arthritis or rheumatism, 1.8 (95 %CI: 1.3, 2.5) for other lung disease, 1.6 (95 %CI: 1.4, 1.8) for depression, 1.5 (95 %CI: 1.3, 1.6) for cardiovascular disease, and

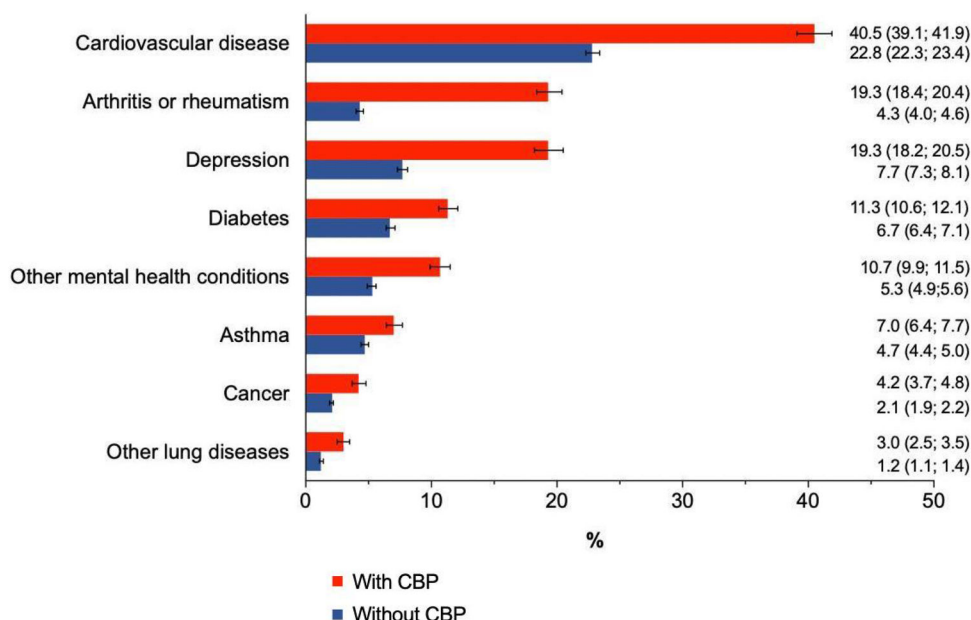


Fig. 1. Prevalence of comorbidities investigated in the population with and without chronic back pain, National Health Survey, 2019. CBP, chronic back pain.

Table 2
Sociodemographic characteristics for adults with chronic back pain according to presence and types of comorbidities.

Characteristics	No-comorbidities chronic back pain group (n = 7322)	Multimorbidity (n = 11,608)	Comorbidities							
			Cardiovascular disease (n = 7666)	Arthritis or rheumatism (n = 3678)	Depression (n = 3179)	Diabetes (n = 2038)	Other mental health conditions (n = 1739)	Asthma (n = 1298)	Cancer (n = 759)	Other lung disease (n = 525)
Sex, Female	46.9 (44.8, 49.1)	67.8 (66.4, 69.2)	66.3 (64.6, 68.1)	79.3 (76.9, 81.5)	81.1 (78.7, 83.4)	68.1 (64.3, 71.7)	78.2 (74.9, 81.2)	71.8 (67.1, 76.1)	69.8 (64.0, 75.1)	64.3 (57.5, 70.6)
Age, years Mean (95 %CI)	43.5 (42.9, 44.1)	55.9 (55.3, 56.5)	59.8 (59.1, 60.6)	60.4 (59.6, 61.2)	52.1 (51.1, 53.2)	61.5 (60.5, 62.6)	47.6 (46.3, 48.8)	49.3 (47.7, 50.9)	62.0 (60.4, 63.6)	56.7 (54.3, 59.0)
18–29	18.5 (16.6, 20.5)	5.3 (4.5, 6.1)	2.0 (1.5, 2.7)	1.2 (0.7, 2.1)	6.5 (5.0, 8.4)	0.5 (0.2, 1.2)	12.5 (9.8, 16.0)	13.8 (10.3, 18.2)	0.4 (0.0, 2.2)	7.6 (4.9, 11.7)
30–39	24.1 (22.4, 25.9)	9.6 (8.7, 10.7)	6.2 (5.19, 7.58)	5.5 (4.2, 7.2)	12.8 (10.7, 15.2)	5.0 (3.3, 7.5)	17.9 (15.1, 21.0)	15.7 (12.6, 19.5)	4.8 (2.7, 8.3)	6.0 (3.6, 9.8)
40–49	23.5 (21.9, 25.3)	17.8 (16.4, 19.4)	14.3 (12.5, 16.5)	12.5 (10.7, 14.6)	22.8 (20.1, 25.7)	11.1 (7.9, 15.3)	24.3 (21.2, 27.8)	20.4 (15.8, 26.0)	13.3 (9.3, 18.7)	17.8 (10.0, 29.7)
50–59	20.5 (18.8, 22.2)	24.9 (23.5, 26.3)	25.2 (23.4, 27.0)	27.4 (25.0, 30.0)	26.9 (24.0, 30.0)	24.6 (21.5, 28.1)	23.8 (20.8, 27.1)	20.6 (17.0, 24.7)	21.3 (17.0, 26.8)	24.0 (17.6, 31.9)
60–69	8.5 (7.6, 9.5)	22.9 (21.6, 24.2)	26.4 (24.6, 28.2)	28.4 (26.0, 30.9)	19.5 (17.2, 22.2)	31.8 (28.2, 35.6)	14.5 (12.1, 17.3)	17.9 (14.8, 21.4)	29.2 (23.6, 35.6)	20.5 (15.1, 27.2)
70–79	3.5 (2.9, 4.2)	13.5 (12.5, 14.6)	17.8 (16.4, 19.4)	17.3 (15.4, 19.3)	8.5 (7.0, 10.2)	20.2 (17.6, 22.9)	5.4 (3.9, 7.3)	7.3 (5.7, 9.3)	22.9 (18.1, 28.6)	16.5 (11.6, 22.9)
≥80	1.1 (0.8, 1.5)	5.6 (5.0, 6.4)	7.7 (6.7, 8.8)	7.3 (6.0, 8.9)	2.7 (2.0, 3.7)	6.5 (4.8, 8.6)	1.2 (0.7, 2.0)	3.9 (2.6, 5.7)	7.7 (5.4, 10.9)	7.2 (4.7, 10.9)
Education levels										
Illiterate or incomplete primary school	39.1 (37.1, 41.2)	51.8 (50.1, 53.5)	59.0 (56.8, 61.1)	57.0 (54.3, 59.7)	44.6 (41.7, 47.6)	64.6 (60.8, 68.3)	32.9 (29.3, 36.7)	44.3 (39.2, 49.5)	46.0 (40.0, 52.2)	54.9 (46.4, 63.1)
Complete primary school or incomplete high school	13.7 (12.3, 15.2)	11.0 (10.0, 12.0)	10.8 (9.6, 12.1)	11.5 (9.7, 23.5)	12.5 (10.3, 14.9)	9.6 (7.5, 12.1)	14.2 (11.5, 17.3)	12.9 (10.0, 16.5)	12.8 (8.4, 19.0)	13.4 (9.1, 19.2)
Complete secondary school or tertiary education incomplete	32.5 (30.4, 34.6)	23.9 (22.4, 25.5)	19.9 (18.0, 21.9)	20.7 (18.5, 23.2)	25.8 (23.4, 28.5)	18.5 (15.5, 21.9)	32.8 (29.4, 36.4)	27.5 (23.4, 32.1)	25.1 (20.1, 30.6)	24.7 (18.0, 32.9)
Tertiary education complete	14.5 (12.9, 16.2)	13.1 (11.9, 14.4)	10.1 (8.8, 11.6)	10.6 (9.0, 12.4)	16.9 (14.6, 19.4)	7.1 (5.5, 9.1)	19.9 (17.2, 23.1)	15.1 (12.3, 18.4)	15.9 (12.2, 20.5)	6.8 (4.8, 9.7)
BMI, kg/m² Mean (95 %CI)	26.1 (25.9, 26.3)	27.8 (27.5, 28.0)	28.3 (28.0, 28.6)	28.0 (27.7, 28.4)	28.1 (27.6, 28.7)	29.4 (28.8, 30.0)	27.7 (27.2, 28.2)	27.9 (26.9, 29.0)	27.8 (27.1, 28.6)	27.7 (25.7, 29.7)
Smoking										
Non smoker	58.1 (55.9, 60.2)	48.4 (46.6, 50.3)	47.0 (44.6, 49.4)	48.9 (46.1, 51.6)	51.9 (48.3, 55.4)	46.2 (42.3, 50.2)	49.5 (45.5, 53.4)	47.4 (42.2, 52.2)	45.4 (39.2, 51.7)	34.8 (25.9, 44.9)
Former smoker	26.0 (24.2, 27.9)	38.5 (36.8, 40.2)	41.0 (38.8, 43.3)	39.0 (36.2, 41.7)	34.0 (30.8, 37.3)	44.1 (40.2, 48.1)	35.5 (31.8, 39.4)	36.0 (31.3, 40.9)	39.2 (33.6, 45.1)	45.5 (36.8, 54.4)
Smoker	15.8 (14.3, 17.4)	12.9 (11.9, 14.0)	11.8 (10.7, 13.1)	12.0 (10.3, 14.0)	14.0 (12.0, 16.2)	9.5 (7.4, 12.0)	14.8 (12.4, 17.7)	16.5 (13.1, 20.6)	15.3 (10.9, 20.9)	19.6 (14.1, 26.4)
Abusive consumption of alcohol										
Yes	3.5 (2.8, 4.4)	2.8 (2.3, 3.5)	2.8 (2.2, 3.6)	2.2 (1.4, 3.4)	1.8 (1.2, 2.7)	2.1 (1.3, 3.3)	1.9 (1.1, 3.0)	4.0 (2.0, 7.8)	3.3 (1.2, 8.6)	2.9 (1.4, 5.9)
Activity limitation due to										

(continued on next page)

Table 2 (continued)

Characteristics	No-comorbidities chronic back pain group (n = 7322)	Multimorbidity (n = 11,608)	Comorbidities							
			Cardiovascular disease (n = 7666)	Arthritis or rheumatism (n = 3678)	Depression (n = 3179)	Diabetes (n = 2038)	Other mental health conditions (n = 1739)	Asthma (n = 1298)	Cancer (n = 759)	Other lung disease (n = 525)
chronic back pain										
No limitation	41.5 (39.2, 43.7)	25.9 (24.4, 27.4)	24.1 (22.3, 25.9)	15.8 (13.8, 18.2)	22.5 (19.8, 25.4)	22.5 (19.3, 26.0)	27.6 (23.9, 31.6)	28.2 (24.2, 32.6)	29.6 (23.9, 35.9)	20.1 (14.8, 26.7)
Mild limitation	32.0 (30.0, 34.1)	33.3 (31.7, 35.0)	33.4 (31.4, 35.5)	31.2 (28.6, 34.0)	29.1 (26.2, 32.3)	34.3 (30.6, 38.1)	29.4 (26.0, 33.1)	28.0 (24.2, 32.3)	30.6 (25.2, 36.5)	26.7 (20.3, 34.3)
Moderate limitation	17.2 (15.4, 19.3)	20.3 (19.0, 21.6)	21.0 (19.4, 22.7)	25.6 (23.2, 28.0)	23.3 (20.5, 26.3)	19.3 (16.5, 22.3)	21.3 (18.3, 24.7)	20.0 (16.3, 24.3)	17.0 (13.3, 21.5)	18.5 (13.6, 24.8)
Severe limitation	7.1 (6.2, 8.1)	14.7 (13.4, 16.1)	15.5 (13.8, 17.4)	19.1 (17.2, 21.2)	17.6 (15.6, 19.9)	17.0 (13.8, 20.8)	15.0 (12.5, 17.8)	17.0 (12.7, 22.4)	16.2 (12.0, 21.5)	22.8 (14.8, 33.4)
Very severe limitation	1.9 (1.5, 2.5)	5.6 (4.9, 6.4)	5.7 (4.9, 6.7)	8.0 (6.6, 9.6)	7.3 (5.7, 9.2)	6.7 (5.0, 9.0)	6.4 (4.8, 8.6)	6.4 (4.4, 9.3)	6.4 (3.8, 10.6)	11.5 (7.2, 18.0)

Data are proportion (95 % confidence interval) unless otherwise indicated. BMI, body mass index.

Sample size without CBP (n) 68,748 and with CBP (n) 18,930; Population size (N) 34,131,360.

Proportions or means with 95 % Confidence Interval (CI) incorporate appropriate weights to control complex sample design.

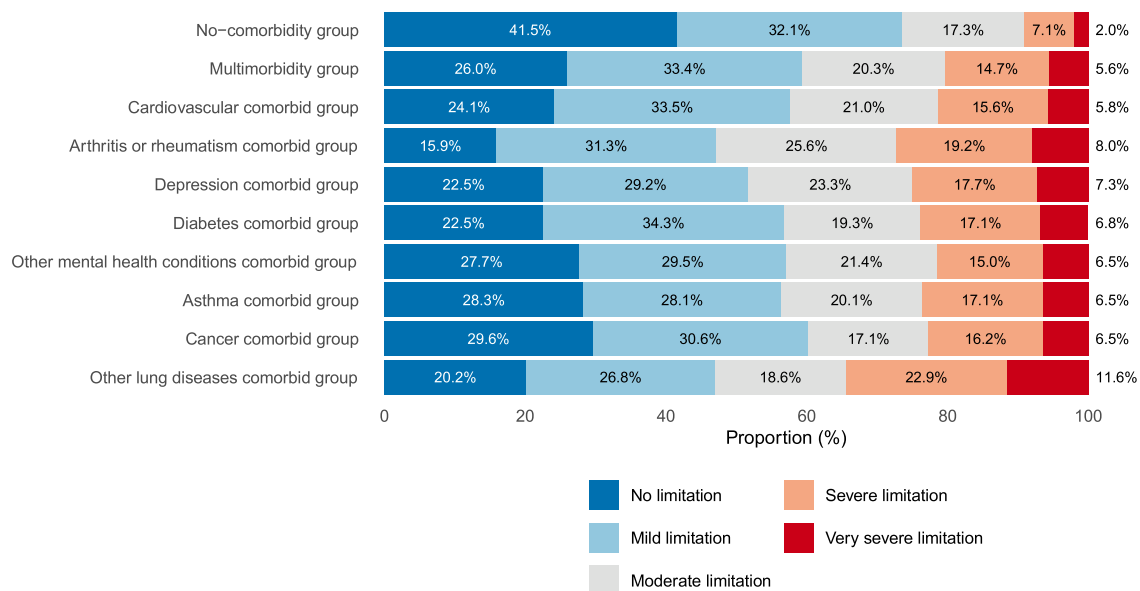


Fig. 2. Level of activity limitation by comorbidity among population with chronic back pain, National Health Survey, 2019.

1.3 (95 %CI: 1.1, 1.5) for diabetes compared to a participant without this specific comorbidity. No association with activity limitation was found for the comorbidities of asthma 1.1 (95 %CI: 0.9, 1.3), cancer 1.0 (95 %CI: 0.7, 1.3) and other mental health conditions 1.0 (95 %CI: 0.9, 1.2) (Table 3).

Discussion

This study using national population-based data revealed that non-communicable diseases are more prevalent in adults with chronic back pain compared to adults without chronic back pain. While the most prevalent conditions among adults with chronic back pain were cardiovascular disease (40.5 %, 95 %CI: 39.1, 41.9), arthritis or rheumatism (19.3 %, 95 %CI: 18.2, 20.5) and depression (19.3 %, 95 %CI: 18.4,

20.4), the conditions more prevalent in adults without chronic back pain were cardiovascular disease (22.8 %, 95 %CI: 22.3, 23.4), depression (7.7 %, 95 %CI: 7.3, 8.1), and diabetes (6.7 %, 95 %CI: 6.4, 7.1). Our findings also showed that comorbidity is very common among Brazilian adults with chronic back pain. Six in every 10 people with chronic back pain also report having at least one other chronic health condition. These people are more likely to be females, older, obese, have low education levels and report more activity limitation than those with chronic back pain but no comorbidities. The comorbidities most likely to be associated with activity limitation in people with chronic back pain were arthritis or rheumatism, followed by other lung disease, depression, cardiovascular disease and diabetes.

Our findings confirmed previous evidence from upper income countries that adults with chronic back pain have a higher prevalence of

Table 3

Association between activity limitation and comorbidity groups among people with chronic back pain.

Chronic conditions	OR (95 % CI)
Chronic back pain with no-comorbidities ^a	
No	1.0
Yes	0.4* (0.4, 0.5)
Arthritis or rheumatism	
No	1.0
Yes	2.1* (1.9, 2.4)
Other lung disease	
No	1.0
Yes	1.8* (1.3, 2.5)
Depression	
No	1.0
Yes	1.6* (1.4, 1.8)
Cardiovascular disease	
No	1.0
Yes	1.5* (1.3, 1.6)
Diabetes	
No	1.0
Yes	1.3* (1.1, 1.5)
Asthma	
No	1.0
Yes	1.1 (0.9, 1.3)
Cancer	
No	1.0
Yes	1.0 (0.7, 1.3)
Other mental health conditions	
No	1.0
Yes	1.0 (0.9, 1.2)

Note: OR, odds ratio; 95 % CI, 95 % confidence interval; CBP, chronic back pain. Activity limitation due to chronic back pain (0: no limitation; 1: mild; 2: moderate; 3: severe; 4: very severe). ^a was included only for comparison and was not included in the multiple ordinal analysis.

Sample size (n) 18,930. Population size (N) 34,131,360.

* Indicate significant associations ($p < 0.05$).

chronic non-communicable conditions than those without back pain. Comparison between our findings and these previous studies should be done with caution due to differences in symptoms duration and chronic conditions investigated. Data from Germany shows a higher prevalence of osteoarthritis (50 % versus 21 %), hypertension (26 % versus 21 %), myocardial infarction (3 % versus 2 %), cancer (5 % versus 3 %) and diabetes (3.5 % versus 2.5 %) in adults who experience back pain in the past seven days compared to those without back pain during the same period.¹⁶ A study using a large health plan dataset from the United States compared the prevalence of chronic conditions between adults who have sought medical care for back pain and adults with no diagnosis of back pain.⁵⁰ The prevalence of rheumatism (40.3 % versus 11.9 %), arthritis (34.4 % versus 10.9 %), osteoarthritis (14.2 % versus 3.8 %) and depression (13.0 % versus 6.1 %) among adults who sought medical care for their back pain were higher than those with no diagnosis of back pain in the same database.⁵⁰ The explanation for the coexistence of chronic back pain with other chronic conditions is still uncertain. Some of these conditions may share similar lifestyle risk factors, such as smoking,⁵¹ obesity¹² and depressive symptoms⁵² which may explain the coexistence of back pain with these chronic conditions. Further longitudinal studies are needed to investigate whether there is any cause-effect relationship.

The high prevalence of multimorbidity found in this study aligns with the findings of previous studies conducted in upper income countries.^{25,28,53} National population data from Australia shows that 74 % of people with back pain aged 45 and over were classified as having a comorbidity (i.e., reported also having one or more - up to 9 - chronic conditions).⁵⁴ Other studies investigating a higher number of comorbidities found higher prevalence estimates. For instance, data from Germany investigating the lifetime prevalence of 31 comorbidities among people who reported low back pain in the past week found a comorbidity prevalence of 92 %.¹⁶ Similarly, data from the United States

found a multimorbidity prevalence of 87 % (i.e., out of 20 possible comorbidities) among adults with chronic spinal pain in the past 12 months.²⁸ Despite the use of different definitions for symptom duration and number and type of chronic conditions investigated, multimorbidity among adults with chronic back pain may be prevalent regardless of countries' income level. One possible explanation for the high prevalence of multimorbidity is that chronic back pain may be part of a cluster of chronic conditions,¹¹ which may share common risk factors, such as obesity^{55,56} and higher BMI.⁵⁷

In the current study, the factors associated with comorbidity among people with chronic back pain were female sex, older age, higher BMI, and lower level of education. Our results aligned with evidence from previous studies.^{21,58-66} A recent systematic review with meta-analysis on the prevalence of multimorbidity in LMICs⁶¹ gives support for an association between multimorbidity, female sex and old age. These associations may be explained because females seek health services more often compared to men⁶⁷ and most chronic conditions are more prevalent in older populations. Another finding was the association of multimorbidity with high BMI, because obesity is a known risk factor for back pain and a variety of chronic conditions, including diabetes,⁵⁵ hypertension⁵⁶ and cardiovascular disease.⁵⁶ The mechanism might involve the inflammatory role of excess adipose tissue which has been documented,^{68,69} particularly in cardiovascular disease^{56,57} and cancer.⁷⁰ Regarding the association between multimorbidity and lower education, similar results were found in a recent meta-analysis of cross-sectional studies.⁵⁸ The authors showed that adults with lower levels of education had a greater chance of multimorbidity (OR=1.64, 95 %CI: 1.41, 1.91). The lack of access to health information and healthcare services among those with low levels of education may have a role in this association.^{59,71}

The most frequent chronic health conditions among adults with chronic back pain observed in this study were cardiovascular disease, arthritis or rheumatism, and depression. A similar scenario regarding the type of comorbidity associated with back pain has been found in previous studies.^{13,16,28,29} Hypertension, osteoarthritis and/arthritis, mental and behavioural conditions (i.e., including depression) were respectively in first, second, and fifth place among the 10 most frequent conditions found in people with low back pain in Germany.¹⁶ Arthritis,^{16,54} circulatory system disease,⁵⁴ mental and behavioural disorders,²⁹ and hypertension^{28,54} were the four most prevalent conditions among adults with chronic back pain in previous studies carried out in Canada, Australia, and the United States. Among older adults with back pain, musculoskeletal conditions (such as pain and osteoarthritis),²⁷ heart disease,²⁷ and depression⁷² were among the 10 most prevalent conditions in recent cohort studies.^{27,72} Taken together, these findings suggest that cardiovascular diseases, musculoskeletal conditions, and mental health problems are the comorbidities that most frequently co-occur with chronic back pain.

We found that the high prevalence of multimorbidity is accompanied by activity limitations. While we found that a third of the sample (35.1 %) reported activity limitation ranging from "moderate" to "very severe", the proportion of people in the multimorbidity group (40.6 %) was higher than in the no-comorbidities chronic back pain group (26.2 %). These results are in agreement with previous population-based studies showing that people with back pain reporting other comorbidities present with higher disability.^{23,28} In fact, the higher number of comorbidities is considered a poor prognostic factors for disability in acute²² and chronic low back pain.^{26,72} Most importantly, we identified specific comorbidities, such as arthritis or rheumatism, other lung diseases, depression, and cardiovascular diseases, more likely to be associated with activity limitation related to back problems. For instance, adults with chronic back pain and arthritis or rheumatism are twice as likely (OR=2.1; 95 % CI: 1.9, 2.4) to report higher levels of activity limitations compared to adults without this condition. Clinicians should be aware that most people with chronic back pain with these specific comorbidities may present with more disabling symptoms.

Although comorbidity is prevalent among people with chronic back pain, most clinical practice guidelines for back pain do not have clear recommendations on how patients with multimorbidity or patients with specific comorbidities should be managed in clinical practice.⁷³ We now have more information about comorbidities that co-exist with chronic back pain that are associated with greater disability. Although the exact mechanism linking back pain with these range of comorbidities is unclear, we would argue that the presence of these conditions would need to be accounted for when designing or implementing treatment strategies. Future studies are still needed in this area to disentangle the best approaches for treating each of these combination comorbidities. While trials in this field are needed, preliminary evidence has started to emerge.^{74,75} Recent studies have tested different approaches, including healthy lifestyle interventions targeting a specific group of people with chronic back pain who are overweight or obese,⁷⁶ interventions targeting the prevention of the comorbidity itself (i.e., major depression) in people with chronic back pain,⁷⁷ or interventions testing different care pathways or multidisciplinary approaches.⁷⁸

Our study has some limitations. Given the nature of our cross-sectional study design, we are unable to investigate causal relationships between chronic back pain and comorbidities. In addition, the definition of chronic back pain and number of comorbidities considered in the 2019 National Health Survey may limit direct comparisons across international studies. Finally, we collected self-reported data which may result in under- or overestimates of prevalence.^{79,80} Nevertheless, an important strength is that this population-based study uses recent representative sample data from an upper middle-income country.³⁹

Conclusions

Brazilian adults with chronic back pain show higher prevalence rates of non-communicable diseases compared to those without chronic back pain. We found that six in every ten adults with chronic back pain have one or more comorbidities. People with chronic back pain and comorbidity reported higher activity limitations related to back problems than those people who have only chronic back pain. Cardiovascular disease, arthritis or rheumatism, and depression were the most prevalent chronic health conditions in this population and were associated with higher levels of activity limitations related to chronic back pain. These findings suggest that the comorbidity patterns associated with chronic back pain are similar regardless of the countries' income level. Further research should focus on designing and testing new interventions addressing or preventing the prevalent comorbidities that co-occur and make patients with chronic back pain more disabled.

Declaration of competing interest

The authors declare that they have no conflict of interests.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.bjpt.2025.101241](https://doi.org/10.1016/j.bjpt.2025.101241).

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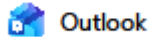
3 ESTUDO 2

Título: Healthcare utilization and self-reported health of Brazilian adults with chronic back pain and multimorbidity: analysis of the 2019 national health survey

Estudo em processo de revisão por pares no periódico *Musculoskeletal Care*

22/10/2025, 14:15

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Manuscript submitted to Musculoskeletal Care

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Healthcare utilization and self-reported health of Brazilian adults with chronic back pain and multimorbidity: analysis of the 2019 National Health Survey

Under Review: Musculoskeletal Care

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ABSTRACT

Objectives: The impact of multimorbidity on healthcare utilization and self-rated health among adults with chronic back pain (CBP) remains unclear. This study investigated healthcare utilization and self-reported health status among adults with CBP and multimorbidity.

Study design: Population-based cross-sectional study.

Methods: Data were obtained from 18,930 adults with self-reported CBP in the 2019 Brazilian National Health Survey. Participants reported diagnoses of cardiovascular disease, diabetes, depression, and arthritis/rheumatism. Outcomes included healthcare utilization in the past 15 days, hospitalization in the past 12 months, and self-rated health. Associations were assessed using logistic regression models and presented as odds ratios (OR) with 95% confidence intervals (CI). The results were compared to adults with CBP without multimorbidity.

Results: Depression (OR=1.8; 95% CI: 1.6, 2.1), cardiovascular disease (OR=1.5; 95% CI: 1.3, 1.7), diabetes (OR=1.4; 95% CI: 1.2, 1.8), and arthritis/rheumatism (OR=1.3; 95% CI: 1.1, 1.5) were associated with higher odds of healthcare utilization in the previous 15 days. Hospitalization was more likely among individuals with depression (OR=2.0; 95% CI: 1.5, 2.7), diabetes (OR=1.9; 95% CI: 1.5, 2.3), and cardiovascular disease (OR=1.7; 95% CI: 1.4, 2.0). The odds of reporting poorer self-rated health were 2.1 (95%CI: 1.8, 2.5) for diabetes, 2.1 (95%CI: 1.9, 2.4) for arthritis/rheumatism, 2.0 (95%CI: 1.8, 2.2) for cardiovascular disease, and 1.4 (95%CI: 1.3, 1.6) for depression.

Conclusions: Multimorbidity significantly increases healthcare utilization and worsens self-rated health among adults with CBP. These findings underscore the importance of integrated care strategies tailored to individuals with CBP and coexisting chronic conditions.

Keywords: Non-communicable diseases; Multimorbidity, Chronic back pain; Healthcare utilization; Self-reported health.

INTRODUCTION

Back pain is a widely prevalent condition and one of the most common reasons individuals seek healthcare services (Buchbinder et al., 2018; Damian Hoy et al., 2012). This contributes to the high burden on healthcare systems globally. In low-and middle-income countries (LMIC), the annual cost of back pain has been estimated at US\$2.2 billion, according to a systematic review that including data from Ethiopia, Brazil, Nigeria, Argentina, and Serbia. The same review reported hospitalization rates ranging from 13.4% to 18.7% among patients with low back pain (Fatoye, Gebrye, Mbada, & Useh, 2023). In Brazil, over 250,000 hospital days and approximately 36,000 hospital admissions were attributed to back problems in 2016 (Carregaro, da Silva, & van Tulder, 2019). That same year, the public healthcare system was estimated to have spent approximately US\$72 million on this issue, with 58% of this amount allocated to hospital care (Carregaro et al., 2019).

Back pain frequently coexists with other chronic conditions, such as osteoarthritis, (Vigdal, Storheim, Killingmo, Småstuen, & Grotle, 2023) cardiovascular disease, (Oliveira et al., 2020) depression (Amiri, Behnezhad, & Azad, 2020) and diabetes, (Pozzobon Id et al., 2019) leading to multimorbidity (Wallace et al., 2015). Multimorbidity, defined as the simultaneous presence of two or more chronic conditions in an individual, represents a growing global challenge with significant negative impacts on both healthcare utilization (Neba, Wang, Kolala, & Sambamoorthi, 2024; Palladino, Lee, Ashworth, Triassi, & Millett, 2016) and quality of life (Fortin et al., 2004). In the context of healthcare management, multimorbidity among patients with back pain can complicate treatment, as interactions between coexisting chronic conditions may exacerbate the challenges of managing this condition (Bours, 2021). The global prevalence of multimorbidity has been estimated at 37.2%, with rates of 38.7% in upper-middle-income countries and 32.1% in LMIC (Chowdhury, Chandra Das, Sunna, Beyene, &

Hossain, 2023). In Brazil, multimorbidity is estimated at 29.9% with chronic back pain (CBP) being the second most prevalent chronic condition (Silva da Silveira, Monteiro dos Santos, de Camargo Cancela, & Bezerra de Souza, 2024).

Previous studies have shown that patients with back pain and multimorbidity are more likely to experience worse symptoms, (Aparecida et al., 2019; Fanuele, Birkmeyer, Abdu, Tosteson, & Weinstein, 2000) poorer prognosis, (Lemes et al., 2024; Nordin et al., 2002) higher activity limitations (Ferreira et al., 2025) and inadequate care (Ramanathan, Hibbert, Wiles, Maher, & Runciman, 2018). In high-income countries, evidence suggests that multimorbidity among patients with back pain is associated with higher healthcare utilization (Bailes et al., 2021; Nimgade, Mcneely, Milton, & Celona, 2010; Ritzwoller, Crouse, Shetterly, & Rublee, 2006; Rundell, Karmarkar, & Patel, 2024; Wong, Côté, Tricco, Watson, & Rosella, 2022). However, in LMIC, these results may differ (Sharma & McAuley, 2022) due to sociodemographic factors (Badley, Millstone, & Perruccio, 2018) and inequalities in healthcare access (Álvarez-Gálvez et al., 2023). Although studies from LMIC have assessed the association between back pain and multimorbidity, they have either investigated multimorbidity in general or focused on a single comorbidity associated with back pain, without investigating healthcare utilization (Demyttenaere et al., 2007; Francisco et al., 2021; Selvamani, Sangani, & Muhammad, 2022; Stubbs et al., 2016).

Thus, the objectives of this study were: i) to estimate the proportion of healthcare utilization and self-reported health among adults with CBP, both with and without multimorbidity; and ii) to identify the non-communicable disease (NCD) associated with higher healthcare utilization and poorer health status in the CBP population. We analyzed nationally representative data from Brazil, a middle-income country and the seventh most populous in the world, providing valuable insights into this population. Understanding the impact of multimorbidity on individuals with CBP can contribute to the development of more effective

management strategies tailored to subgroups of back pain individuals, considering coexisting conditions. Furthermore, this knowledge can guide healthcare professionals toward more efficient and personalized care.

METHODS

Study design and participants

This is a cross-sectional analysis that used data from the National Health Survey (NHS), 2019. The NHS is a household survey conducted by the Brazilian Institute of Geography and Statistics and the Ministry of Health of Brazil (Szwarcwald et al., 2014). The NHS sample is representative of the Brazilian population, including residents of households across the entire country. The sampling design follows a three-stage cluster sampling approach. In the first stage, primary sampling units (PSU), formed by census sectors or groups of sectors, are selected. In the second-stage, households are selected within each PSU, and the third-stage units are residents aged 15 or older. The subsample of primary sampling units was selected using simple random sampling, and for each selected household, one resident was chosen at random to respond to the specific questionnaire (Stopa et al., 2020; Szwarcwald et al., 2014). Detailed information on the methodological aspects of the NHS, including its procedures and sampling plan, has been published previously (Stopa et al., 2020).

For this study, the subsample of adults aged 18 years or older who reported experiencing CBP was used (n= 18,930 [21.6% of the total NHS sample]). The presence of CBP was defined by a positive response to the question: "Do you have chronic spine condition, such as chronic back or neck pain, low back pain, sciatica, or issues with your vertebrae or discs?" The response is dichotomous (yes or no).

Variables

Sociodemographic and lifestyle

For sample characterization, the following variables were collected: sex, age, race/skin color, educational level, per capita household income, location of residence, presence of private health insurance, smoking, abusive alcohol consumption and body mass index (BMI), calculated by the weight and height reported by the respondent.

Presence of chronic non-communicable disease (NCD)

The presence of other chronic NCD coexisting with CBP was identified through the question: "Has a doctor ever diagnosed you with [name of the disease]?" The most chronic NCD investigated were hypertension, heart disease, stroke, diabetes, arthritis or rheumatism, and depression. The responses to these questions are dichotomous (yes or no). Participants were considered to have NCD if they responded affirmatively to the presence of at least one of the conditions investigated. For analysis purposes, hypertension, heart disease, and stroke were categorized into cardiovascular disease (Oliveira et al., 2020; Ryan, McDonough, Kirwan, Leveille, & Martin, 2014).

Outcome variables

The outcome variables were healthcare utilization and self-reported health status. Healthcare utilization was measured using responses to the following questions: "In the past two weeks, did you seek any site, healthcare service, or health professional for care related to your own health?" (Seeking health services in the last 15 days) and "In the past 12 months, have you been hospitalized for 24 hours or more?" (Hospitalization in the last 12 months). The responses to both questions were dichotomous (yes or no). Self-reported health status was assessed through the response to the question: "Overall, how would you rate your health?" The response options were: (1) Very good; (2) Good; (3) Regular; (4) Poor; (5) Very poor.

Data Analysis

To characterize the sample, sociodemographic variables, lifestyle factors, and the presence of NCD were described using proportions or means, accompanied by 95% confidence intervals (95% CI). The chronic condition groups were described using proportions and 95% CI for the total sample and stratified by sociodemographic characteristics, healthcare utilization, and health status perception. Comparisons between comorbidity groups were performed using mean differences (MD) and proportion differences (PD), along with their respective 95% CI, using as reference the no-comorbidities back pain group. Analyses were conducted using complete-case data, with individuals with missing values excluded.

We employed a binary logistic regression model to identify the healthcare utilization for each chronic conditions investigated. The ordinal logistic regression model was used to identify self-reported health status levels and the NCD. We estimated the odds of moving to a worse category of self-reported health status for each chronic condition group analyzed. Both unadjusted and adjusted models were utilized. Adjustments were made for sex, age, educational level, presence of private health insurance, smoking, abusive alcohol consumption, and BMI, as these variables are associated with the multimorbidity and back pain (Álvarez-Gálvez et al., 2023; D. Hoy, Brooks, Blyth, & Buchbinder, 2010). The data were organized and analyzed using Stata® software, version 15.1. Sample weighting factors were applied in all analyses.

ETHICAL CONSIDERATIONS

Data from the 2019 NHS are available for public access and use. The current study was approved by the *XXXXXXX-blinded* (No. 3529376, 2019).

RESULTS

Sample Characteristics

In the studied sample, the women comprised the majority (60.0%; 95%CI: 58.7, 61.2). The mean age of the participants was 51.3 years (95%CI: 50.8, 51.7), and the average BMI of 27.1 kg/m² (95%CI: 27.0, 27.3). More than half of participants (57.0%; 95%CI: 55.7, 58.3) reported having at least one chronic condition coexisting with CBP. Among the conditions investigated, cardiovascular disease was the most prevalent (40.5%; 95%CI: 39.1, 41.9), followed by arthritis or rheumatism (19.3%; 95%CI: 18.4, 20.4) and depression (19.3%; 95%CI: 18.2, 20.5). Regarding healthcare utilization, 31.8% (95%CI: 30.5, 33.0) of participants reported seeking health services in the past 15 days, and 10.2% (95%CI: 9.3, 11.2) reported being hospitalized in the past 12 months. Additionally, 53.7% (95%CI: 52.3, 55.1) of participants rated their health status as regular, poor or very poor (Table 1).

Sociodemographic profile by comorbidity groups

The proportion of females was higher across all comorbidity groups, with the highest proportion observed in the depression group compared to the no-comorbidities CBP group (PD: 32.3%; 95%CI: 30.2, 34.4). The diabetes group showed the largest age differences (MD: 17.6; 95%CI: 16.9, 18.3), the highest proportion of individuals with no formal education or incomplete primary education (PD: 26.3; 95%CI: 23.3, 29.3), and the greatest BMI differences (MD: 2.6; 95%CI 2.4, 2.9) compared to the no-comorbidities CBP group. In the no-comorbidities CBP group, higher proportions of current smokers and individuals with abusive alcohol consumption, were observed compared to all comorbidity groups (Table 2).

Healthcare utilization and self-reported health status

Among the comorbidity groups, the highest proportion of individuals seeking health services in the past 15 days was observed in the depression group (PD: 23.8; 95%CI 20.6, 27.1) and the diabetes group (PD: 23.0; 95%CI: 19.2, 26.9), while the lowest was in the cardiovascular disease group (PD: 18.2%; 95%CI: 15.5, 20.8), compared to the no-comorbidities CBP group. Regarding hospitalization in the past 12 months, the highest proportion was found for the diabetes group (PD: 12.1; 95%CI: 8.3, 17.0) and lowest was in the arthritis or rheumatism group (PD: 6.4%; 95%CI: 2.8, 10.0) (Table 2). The greatest differences in self-reported poor or very poor health were observed in the arthritis or rheumatism group (PD: 38.5%; 95%CI: 33.9, 43.2) and the diabetes group (PD: 37.9; 95%CI: 32.7, 43.1), compared with the no-comorbidities CBP group (Table 2).

Table 3 presents the results of logistic regression for seeking health services in the past 15 days, hospitalization in the past 12 months, and self-reported health status across the comorbidity groups. After adjusting for sex, age, health insurance, excessive alcohol consumption, smoking, BMI, and race/skin color, the odds of seeking health services in the past 15 days were significantly higher among participants with specific NCDs: cardiovascular disease (OR: 1.4; 95%CI: 1.2, 1.6), depression (OR: 1.6; 95%CI: 1.4, 1.9), diabetes (OR: 1.4; 95%CI: 1.1, 1.7), and arthritis or rheumatism (OR: 1.2; 95%CI: 1.0, 1.4). For hospitalization in the past 12 months, higher odds were observed among those with cardiovascular disease (OR: 1.8; 95%CI: 1.5, 2.2), depression (OR: 1.9; 95%CI: 1.4, 2.4), and diabetes (OR: 1.9; 95%CI: 1.5, 2.4), whereas no significant association was found for arthritis or rheumatism. With respect to self-reported health status, individuals with comorbidities had significantly higher odds of reporting poorer health compared to those without. The adjusted odds were 1.6 (95%CI: 1.4, 1.8) for cardiovascular disease, 1.6 (95%CI: 1.4, 1.9) for depression, 1.9 (95%CI: 1.6, 2.2) for diabetes, and 1.9 (95%CI: 1.6, 2.1) for arthritis or rheumatism.

DISCUSSION

Using data from a nationally representative sample, including 18,930 adults with CBP interviewed in the 2019 NHS, we evaluated the presence of multimorbidity and association with healthcare utilization, hospitalization, and self-reported health status. Our results showed that more than half of individuals with CBP (57%) had at least one chronic NCD coexisting. Among the comorbidity groups, individuals with diabetes exhibited the greatest differences in lower education levels, and higher BMI, emphasizing the substantial impact of this condition on overall health. Healthcare utilization was more frequent in the diabetes and depression group. Poorer self-reported health was consistently observed across all comorbidity groups, with the most pronounced differences found in diabetes and the arthritis or rheumatism groups.

In our study, approximately six in ten individuals with CBP presented with multimorbidity. This finding is consistent with previous studies in Brazil, where a high prevalence of multimorbidity has been reported among older adults chronic with back pain ($n = 220$), the mean number of comorbidities per individual was four (3-6) (Lemes et al., 2024). Among those with acute low back pain ($n = 602$), 41.9% had more than three comorbidities based on a list of twelve comorbidities (Aparecida et al., 2019). Our findings are also consistent with results from high-income countries that estimated the prevalence of multimorbidity among adults with CBP (Ramanathan et al., 2018; Schneider, Mohnen, Schiltenswolf, & Rau, 2007; Von Korff et al., 2005). Studies conducted in the United States (Von Korff et al., 2005) and Germany (Schneider et al., 2007), have estimated the prevalence of multimorbidity among adults with back pain to be 78% and 54%, respectively. In Australia, a population-based study estimated multimorbidity in 74% of individuals aged 45 years or older with back pain (AIHW, 2020). Although our study investigated a smaller number of NCDs, multimorbidity was still present in over half of the CBP population.

We also observed that women, older adults, and individuals with lower education levels were more likely to belong to comorbidity groups, patterns similarly reported in LMIC (Asogwa et al., 2022; Chowdhury et al., 2023). A systematic review across six middle-income countries (China, Ghana, India, Mexico, Russia, and South Africa) found that most individuals with multimorbidity were women (56.9%), and had low educational attainment (61.3%) (Chowdhury et al., 2023). In our data, education level, and BMI were specifically distinct in the diabetes group compared to individuals with CBP and no comorbidities.

Regarding healthcare utilization, individuals with CBP and multimorbidity used services more frequently than those without comorbidities. Depression group showed the strongest association with healthcare utilization, and both depression and diabetes groups were significantly associated with higher hospitalization rates. These findings mirror previous evidence from high-income countries (Nordin et al., 2002; Ritzwoller et al., 2006). For example, a study in the U.S. found higher odds of healthcare use among patients with back pain and diabetes (OR: 2.0; 95%CI: 1.6, 2.4), hypertension (OR: 1.7; 95%CI: 1.7, 1.9), rheumatoid arthritis (OR: 1.3; 95%CI: 1.1, 1.6), and depression (OR: 1.2; 95%CI: 1.1, 1.4) (Ritzwoller et al., 2006).

Within the diabetes group, higher healthcare utilization may be partially explained by the elevated BMI values in this group. Elevated BMI levels may lead to inflammatory metabolic mechanisms (De Heredia, Gómez-Martínez, & Marcos, 2012; Tangvarasittichai, 2015) or biomechanical alterations, such as increased joint loading (Vincent, Raiser, & Vincent, 2012), which contribute to complications and greater demand for healthcare services. Additionally, diabetes management often involves multiple treatment components, including medication use and regular follow-up with healthcare professionals (Elsayed et al., 2023). Some medications used to treat diabetes may influence pain and contribute to muscle loss (Fabiane, Ward, Iatridis, & Williams, 2016; Martini et al., 2012; Welch, 2014); further affecting health and healthcare

utilization. Additionally, individuals with diabetes are less likely to engage in regular physical activity (Qiu, Sun, Cai, Liu, & Yang, 2012), which can further aggravate the condition.

Depression is also highly prevalent in individuals with CBP (Amiri et al., 2020; Hu et al., 2022; Pinheiro et al., 2015), and the bidirectional relationship between the two conditions complicates management. Individuals with depression are more likely to use healthcare services, including emergency care (OR: 1.3; 95%CI: 1.3, 1.3) and be hospitalized (OR: 1.2; 95%CI: 1.2, 1.3) (Bailes et al., 2021). Depression and CBP are leading causes of disability, and their co-occurrence poses significant clinical challenges (Roughan et al., 2021).

Our results showed that adults with CBP and multimorbidity reported poorer health status compared to those with CBP alone. The worst perceived health was reported by individuals with depression, arthritis or rheumatism, and diabetes. Interestingly, while no association was found between arthritis or rheumatism and healthcare utilization, individuals with this condition reported significantly worse health status, possibly due to pain, disability, or functional limitations associated with the condition (Peat & Thomas, 2021; Ritzwoller et al., 2006) .

This study has important implications for clinical practice. Although healthcare utilization was slightly more pronounced in diabetes and depression groups, the differences across comorbidity groups were not significant. These results suggest that the presence of multimorbidity significantly impacts adults with CBP, regardless of the specific coexisting condition. However, current clinical guidelines often fail to address comorbidity management in CBP (Foster et al., 2018). First-line treatments, such as patient education and supervised physical activity (Foster et al., 2018), should be tailored considering the presence of multimorbidity and specific NCD profiles to optimize treatment outcomes. Additionally, sociodemographic factors and NCD-related complications must be also accounted for in treatment planning.

A multidisciplinary, integrated approach is essential. Health educational initiatives targeting shared NCD risk factors should be implemented to promote healthy behaviors (Smith, Wallace, Clyne, Boland, & Fortin, 2021) and reduce long-term complications. Given the lack of clear clinical guidelines for these complex cases, and the fact that most evidence excludes people with comorbidities, (Meyer & Wulff, 2019) more research is needed to support clinical decision-making (Foster et al., 2018). Moreover, perceived health status, as a key indicator of negative outcomes, should be given attention when designing interventions for this population.

Limitations

This study has some limitations. First, the NHS is based on self-reported data, which may introduce recall, or social desirability bias. However, this method of data collection has been extensively used in both national (Caldeira, Soares, da Silva, Veiga, & Claro, 2022) and international (Pickens, Pierannunzi, Garvin, & Town, 2018; Riley et al., 2016) population-based studies. Second, due to the cross-sectional design, we are unable to explore causal relationships between comorbidities and healthcare utilization or health perception. Third, the definition of CBP used in the NHS may limit comparability with other studies that use different criteria. Additionally, the healthcare utilization data refer to general service use and are not specific to back pain, which could affect the interpretation of associations. However, we believe this does not compromise the study's objective, which was to analyze healthcare utilization and health perception among individuals with CBP and comorbidities (Stopa et al., 2020).

A strength of this study is the use of nationally representative data from Brazil, an upper-middle-income country. Therefore, our findings may be generalized to similar settings and contribute to the evidence base in low- and middle-income countries. Another strength is the focus on a large and specific population subgroup — adults with chronic back pain — which is

often underrepresented in population-level analyses of multimorbidity. This allows for more targeted insights into a highly prevalent and disabling condition.

CONCLUSION

This study demonstrated that multimorbidity among Brazilian adults with CBP increases healthcare utilization, especially in individuals with diabetes and depression. Worse self-reported health status was also found in the multimorbidity group, particularly among those with arthritis or rheumatism and diabetes. The results highlight the need for an integrated and personalized approach to manage CBP with multiple comorbidities. Future studies should investigate the effectiveness of interventions that combine pain management with the treatment of coexisting NCD. Additionally, it is essential to explore strategies to improve healthcare access for these patients, promoting more effective and continuous care.

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Table 1: Description of study variables in the sub-sample with chronic back pain, NHS 2019.

Characteristics	Proportion (CI 95%)
Sex, Female	60.0 (58.8, 61.2)
Age groups (years)	
Mean	51.3 (50.8, 51.7)
18-29	10.2 (9.3, 11.2)
30-39	15.1 (14.2, 16.0)
40-49	20.0 (18.9, 21.1)
50-59	23.2 (22.2, 24.3)
60-69	17.6 (16.6, 18.4)
70-79	9.7 (9.0, 10.4)
80 and more	3.9 (3.5, 4.4)
Educational levels	
Illiterate or incomplete primary school	47.0 (45.7, 48.4)
Complete primary school or incomplete high school	12.0 (11.2, 12.9)
Complete high school or incomplete college/university	27.1 (25.9, 28.4)
Complete college/university	13.6 (12.6, 14.7)
Household income	
≤1 minimum wages	52.0 (50.5, 53.4)
> 1 and ≤ 3 minimum wages	37.0 (35.7, 38.4)
> 3 and ≤ 5 minimum wages	5.6 (5.0, 6.1)
> 5 minimum wages	5.2 (4.6, 5.8)
Skin color or ethnicity	
White	44.2 (42.8, 45.5)
Black	11.2 (10.4, 12.0)
Asian	0.9 (0.6, 1.3)
Brown	43.1 (41.8, 44.4)
Indigenous	0.4 (0.3, 0.6)
Household situation	
Urban	84.7 (83.8, 85.6)
Health Insurance, yes	27.8 (26.4, 29.3)
Smoking	
Non, smoking	52.0 (50.6, 53.4)
Ex, smoker	33.8 (32.5, 35.1)
Smoker	14.0 (13.2, 14.9)
Abusive alcohol consumption, yes	3.1 (2.6, 3.6)
BMI (kg/m²)	
Mean	27.1 (27.0, 27.3)
Normal (< 25)	36.7 (35.5, 38.0)
Overweight (≥25, < 30)	37.8 (36.5, 39.1)
Obesity (≥30)	25.3 (24.0, 26.7)
Number of comorbidities	
0	42.9 (41.7, 44.2)
1	31.7 (30.6, 32.8)
2	18.1 (17.1, 19.0)
3	6.3 (5.6, 7.1)
4	1.0 (0.7, 1.3)
Cardiovascular disease, yes	40.5 (39.1, 41.9)
Arthritis or rheumatism, yes	19.3 (18.4, 20.4)
Depression, yes	19.3 (18.2, 20.5)

Diabetes, <i>yes</i>	11.3 (10.6, 12.1)
Seeking health services in the last 15 days, <i>yes</i>	31.8 (30.5, 33.0)
Hospitalization in the last 12 months, <i>yes</i>	10.2 (9.3, 11.2)
Perception of health status	
Very good	7.3 (6.6, 8.1)
Good	37.5 (36.2, 38.8)
Regular	41.9 (40.7, 43.1)
Poor	10.3 (9.5, 11.1)
Very poor	2.7 (2.4, 3.1)

Note: Sample size (n) 18930; Population size (N) 34131360.

BMI, body mass index; NHS, National Health Survey.

Proportions with 95% Confidence Interval (CI) incorporate appropriate weights to control complex sample design.

Table 2: Sociodemographic characteristics for adults with chronic back pain according to presence chronic non-communicable disease. NHS, 2019.

Characteristics	No-comorbidities CBP	Cardiovascular disease	Arthritis or rheumatism	Depression	Diabetes
Proportion	42.9 (41.6, 44.2)	40.5 (39.1, 41.9)	19.3 (18.4, 20.3)	19.3 (18.2, 20.5)	11.3 (10.5, 12.1)
Sex, Female	48.7 (46.7, 50.7)	66.3 (64.6, 68.1)	79.3 (77.0, 81.6)	81.1 (78.8, 83.5)	68.1 (64.4, 71.8)
Age, years					
Mean (95% CI)	43.5 (42.9, 44.0)	59.8 (59.1, 60.6)	60.4 (59.6, 61.2)	52.1 (51.1, 53.2)	61.5 (60.5, 62.6)
Education levels					
Illiterate or incomplete primary school	38.3 (36.4, 40.2)	59.0 (56.8, 61.1)	57.0 (54.3, 59.7)	44.6 (41.7, 47.6)	64.6 (60.8, 68.3)
Complete primary school or incomplete high school	13.1 (11.9, 14.5)	10.8 (9.6, 12.1)	11.5 (9.7, 13.5)	12.5 (10.3, 14.9)	9.6 (7.5, 12.1)
Complete secondary school or tertiary education incomplete	32.9 (31.0, 34.9)	19.9 (18.0, 11.6)	20.7 (18.5, 23.2)	25.8 (23.4, 28.5)	18.5 (15.5, 21.9)
Tertiary education complete	15.5 (14.0, 17.1)	10.1 (8.8, 11.6)	10.6 (9.0, 12.4)	16.9 (14.6, 19.4)	7.1 (5.5, 9.1)
BMI, kg/m²	26.1 (25.9, 26.2)	28.3 (28.0, 28.6)	28.0 (27.7, 28.4)	28.1 (27.6, 28.7)	29.4 (28.8, 30.0)
Smoking					
Non, smoker	57.1 (55.1, 59.1)	47.0 (44.6, 49.4)	48.9 (46.1, 51.6)	51.9 (48.3, 55.4)	46.2 (42.3, 50.2)
Former smoker	26.9 (25.1, 28.8)	41.0 (38.8, 43.3)	39.0 (36.2, 41.7)	34.0 (30.8, 37.3)	44.1 (40.2, 48.1)
Smoker	15.8 (14.5, 17.3)	11.8 (10.7, 13.1)	12.0 (10.3, 14.03)	14.0 (12.0, 16.2)	9.5 (7.4, 12.0)
Abusive consumption of alcohol	3.6 (2.8, 4.6)	2.8 (2.2, 3.6)	2.2 (1.4, 3.4)	1.8 (1.2, 2.7)	2.1 (1.3, 3.3)
Health Insurance	26.0 (24.0, 28.1)	27.7 (25.8, 29.7)	29.2 (26.2, 31.8)	34.5 (31.7, 37.4)	26.6 (23.3, 30.1)
Seeking health services in the last 15 days	21.3 (19.7, 22.9)	39.6 (37.7, 41.5)	41.8 (39.1, 44.6)	45.2 (42.2, 48.2)	44.4 (40.3, 48.6)
Hospitalization in the last 12 months	6.4 (5.4, 7.5)	14.2 (12.5, 16.0)	12.9 (11.1, 14.6)	17.1 (13.6, 20.6)	19.1 (15.6, 22.6)
Perception of health status					
Very good	12.2 (10.9, 13.6)	3.1 (2.5, 3.9)	2.5 (1.8, 3.5)	4.7 (3.4, 6.5)	0.7 (0.3, 1.6)
Good	48.1 (46.1, 50.1)	27.4 (25.6, 29.2)	23.3 (20.7, 26.1)	30.3 (27.6, 33.2)	20.3 (17.2, 23.8)
Regular	33.3 (31.4, 35.3)	50.4 (48.6, 52.3)	49.2 (46.5, 52.0)	43.4 (40.4, 46.4)	53.4 (49.4, 57.3)
Poor	5.4 (4.6, 6.3)	14.4 (13.1, 15.7)	18.4 (16.5, 20.5)	15.5 (13.5, 17.7)	19.2 (16.0, 22.9)
Very poor	0.8 (0.6, 1.0)	4.5 (3.8, 5.3)	6.3 (5.2, 7.8)	5.8 (4.6, 7.4)	6.2 (4.7, 8.0)

Data are proportion (95% confidence interval) unless otherwise indicated. NCD, non-communicable disease; BMI, body mass index.

Sample with CBP (n) 18930. Population size (N) 34131360. NHS, National Health Survey.
Proportions or means with 95% Confidence Interval (CI) incorporate appropriate weights to control complex sample design.

Table 3: Association between health utilization, perception health status and chronic conditions among people with chronic back pain, NHS, 2019.

Chronic conditions	Sought health service in the last 15 days ^a		Hospitalization in the last 12 months ^a		Perception health status ^b	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Cardiovascular disease	1.5* (1.3, 1.7)	1.4* (1.2, 1.6)	1.7* (1.4, 2.0)	1.8* (1.5, 2.2)	2.0* (1.8, 2.2)	1.6* (1.4, 1.8)
Depression	1.8* (1.6, 2.1)	1.6* (1.4, 1.9)	2.0* (1.5, 2.7)	1.9* (1.4, 2.4)	1.4* (1.3, 1.6)	1.6* (1.4, 1.9)
Diabetes	1.4* (1.2, 1.8)	1.4* (1.1, 1.7)	1.9* (1.5, 2.3)	1.9* (1.5, 2.4)	2.1* (1.8, 2.5)	1.9* (1.6, 2.2)
Arthritis or rheumatism	1.3* (1.1, 1.5)	1.2 (1.0, 1.4)	1.0 (0.7, 1.2)	1.0 (0.8, 1.3)	2.1* (1.9, 2.4)	1.9* (1.6, 2.1)

Model 1: crude

Model 2: adjusted for sex, age, health insurance, abusive consumption of alcohol, smoke, BMI, race.

a: Binary logistic regression model; b: Ordinal logistic regression model.

* Indicate significant associations ($p < 0.05$).

4 ESTUDO 3

Título: Comorbidity patterns in patients with chronic low back pain and the implications for healthcare utilisation: a secondary analysis of a randomized controlled trial

Estudo a ser submetido no periódico *The Lancet Rheumatology* após considerações da banca e co-autores.

Comorbidity patterns in patients with chronic low back pain and the implications for healthcare utilisation: a secondary analysis of a randomized controlled trial

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Summary:

Background: Low back pain (LBP) is a leading cause of disability worldwide and a common reason for seeking medical care. Evidence suggests frequent coexistence between LBP and other long-term conditions (LTCs) or comorbidities, which may increase the complexity of management. This study aimed to describe comorbidity patterns among individuals with chronic LBP and to investigate their association with LBP-related healthcare utilisation.

Methods: This was a secondary analysis of data from the Australian Get Back to Healthy Trial, which included adults with chronic LBP. Comorbidities were assessed at baseline, and LBP-related healthcare utilisation was recorded every 15 days through online questionnaires during a 12-month follow-up. Each patient contact with a health service was recorded as a LBP-related healthcare utilisation.

Findings: Among 346 participants enrolled in the original trial, 337 (97%) provided complete follow-up data and were included in this analysis. Of these, 74 participants (22%) reported no comorbidities beyond chronic LBP, while 263 (78%) reported at least one comorbidity, and 196 (58%) presented with multimorbidity (two or more comorbidities in addition to LBP). The most prevalent comorbidities were musculoskeletal conditions (n=152, 45.1%), sleep-related problems (n=109, 32.3%), and cardiovascular conditions (n=90, 26.7%). Participants had a mean of 4.8 LBP-related healthcare consultations over the 12-month follow-up. Healthcare utilisation for LBP was similar across groups defined by single or paired system morbidities, with no significant differences compared with participants with LBP alone.

Interpretation: Multimorbidity is highly prevalent among individuals with chronic LBP. However, in this sample, the presence of comorbidities or their combinations did not substantially influence LBP-related healthcare utilisation. These findings highlight the need for further research to explore how specific patterns or severity of comorbidities may affect healthcare needs and outcomes in people with chronic LBP

Funding: The *Get Back to Healthy trial* is funded by the National Health and Medical Research Council (NHMRC) (APP1180474), and Sydney, Western Sydney, and South Western Sydney Local Health Districts in New South Wales, Australia.

Introduction

Low back pain (LBP) is a leading cause of disability worldwide.¹ It is a common reason for people to seek medical care² and therefore creates a significant economic burden on healthcare systems globally.³ In the United States of America, direct costs related to LBP range from US\$12.2 to 90.6 billion⁴ and, in Australia, LBP accounts for over AU\$1 billion in annual healthcare costs.⁵ The prevalence of LBP is rising and is projected to affect approximately 843 million people by 2050.¹ Despite efforts to improve LBP management, estimates suggest that healthcare utilisation, due to this condition, is increasing,⁶ posing a significant challenge to healthcare systems.

Six in every ten patients with LBP have an additional long-term condition (LTC) or comorbidity,⁷ a chronic condition co-occurring with LBP.⁸ Common comorbidities found to co-occur with LBP are cardiovascular diseases,⁹⁻¹⁰ osteoarthritis or arthritis,¹¹ depression¹² and diabetes.¹³ Patients with LBP and comorbidities are more likely to report worse symptoms,¹⁴ have poorer prognoses^{10,15} and receive inadequate care¹⁶ than those without comorbidities. Multimorbidity, defined as the presence of two or more long-term comorbidities,¹⁷ typically requires multifaceted care, including regular consultations with various healthcare providers and long-term pharmacological treatment.¹⁸ For instance, the rate of in-person consultations among individuals with diabetes is 12.7 per person-year (95% CI: 12.7 to 12.7) with one comorbidity and 18.7 (95% CI: 18.7 to 18.8) with three or more comorbidities, compared to 10.3 (95% CI: 10.3 to 10.4) in those without comorbidities.

Management of patients with LBP and other comorbidities may be more complex. Some medications prescribed for chronic LBP can cause adverse effects. For instance, the prescription of non-steroidal anti-inflammatory drugs, a guideline-recommended pharmacological intervention for LBP, may increase the risk of heart attack and stroke in those with co-existing cardiovascular diseases¹⁹ particularly in those already taking hypertensive medication.^{20,21} Furthermore, prescription of non-pharmacological interventions, such as self-management or exercise therapy, endorsed by clinical practice guidelines²² and clinical care standards, may also be challenging for this population. People with LBP and depression may feel less motivated and fail to adhere to an exercise program.^{23,24} Similarly, patients with LBP with arthritis may need an exercise program that accounts for their functional limitation.²³

Comorbidities may be grouped according to system morbidities, that is the presence of LTCs in an individual that may exhibit pathophysiological relationships or commonly observed patterns of co-occurrence.^{25,26} For example, the presence of cardiovascular disease and diabetes may be grouped into cardiometabolic system morbidities.²⁵ Previous studies have shown that for people with chronic LBP symptoms (i.e., symptoms lasting for 3 months or longer), the presence of one or more comorbidities increases healthcare utilisation. Each additional comorbidity

has been associated with a 21% increase in the odds of using any rehabilitation service (OR: 1.2; 95% CI: 1.1 to 1.3).²⁷ Psychiatric comorbidities, particularly depression, have also been linked to higher healthcare use, including emergency department visits (OR: 1.3; 95% CI: 1.3 to 1.4), hospitalizations (OR: 1.2; 95% CI: 1.2 to 1.3), and epidural steroid injections (OR: 1.2; 95% CI: 1.2 to 1.2).²⁸ However, despite growing evidence on the association between comorbidities and healthcare utilisation, the studies have not explored patterns of co-occurring comorbidities (only count of LTCs) and their relationship with healthcare utilisation in people with LBP.^{28–31}

The presence of particular LTCs in people with LBP may have distinct associations with individual health and healthcare utilisation, as interactions between coexisting comorbidities are often heterogeneous.³² Identifying various patterns of comorbidities in patients with LBP and their impact on healthcare utilisation may help reveal patient subgroups with specific health condition profiles, which in turn could support the development of more targeted, personalised, and effective interventions.

Therefore, in a secondary analysis of data from the Australian *Get Back to Healthy Trial*, of people with LBP, this study aims to:

- i) describe the morbidity patterns of the study participants, including the number and types of comorbidities and system morbidities;
- ii) identify pairs of system morbidities (i.e., presence of two system morbidities) that occur more frequently together than would be expected if these system morbidities occurred separately;
- iii) describe LBP-related healthcare utilisation by system morbidities and pairs of system morbidities;
- iv) investigate whether LBP-related healthcare utilisation is associated with particular system morbidities.

Methods

Study design

This is a secondary analysis of a randomized controlled trial, the *Get Back to Healthy Trial (GBTH)* (ACTRN12620000889954).³³ This trial evaluated the effectiveness of directly referring patients with LBP to the *Get Healthy Service*®—a free, pre-existing, community-based health coaching program in New South Wales — at the point of discharge, from a public hospital physiotherapy outpatient department or a private general practitioner, physiotherapist, or chiropractor, following treatment for chronic non-specific LBP. This trial evaluated the effect of the health coaching program on the number of hospital, medical, and health service

encounters for LBP over a 12-month period following discharge from treatment. Data regarding LBP and comorbidities were collected at baseline and the LBP-related healthcare utilisation data were collected on a fortnightly basis via an electronic survey over a 12-month period from baseline (12/01/2021) to follow-up (12/01/2024) using the Research Electronic Data Capture (REDCap).

Participants

Patients with chronic non-specific LBP who were discharged from a public hospital physiotherapy outpatient department or a private general practitioner, physiotherapist, or chiropractor in New South Wales were included. Inclusion criteria were: i) 18 years old or more; ii) having chronic non-specific LBP for a minimum duration of 12 months. (Non-specific LBP was defined as LBP without diagnosis of specific cause, and the absence of serious spinal pathology or indicators of potentially serious conditions using red flags); iii) having been discharged from treatment within the previous 6-months; iv) with adequate vision, hearing and independent ambulatory status to safely engage in physical activities. A detailed description of the study methods and objectives of the trial has been previously published.³³ All participants signed the informed consent form. Ethical approval was granted by the Western Sydney Local Health District Human Research and Ethics Committee (2020/ETH00115).

Data collection

The clinical variables collected at baseline were sex (self-reported), age (years), height and weight (converted to Body Mass Index (BMI)), education level, ethnic origin, smoking status, alcohol use, and the comorbidities which were collected via general medical history questions. The presence and type of comorbidities were assessed with the question: "Have you ever experienced any of the following health problems (in the past or currently)? Please tick all the boxes that apply, otherwise please select no." The list included the conditions: cardiovascular; respiratory; gastro-intestinal; musculoskeletal; psychological symptoms; neurological conditions; sleep-related problems; cancers; any other medical conditions (e.g. diabetes). Comorbidity was determined based on the positive response to one or more of the listed conditions while multimorbidity was defined as the presence of two or more comorbidities in addition to the presence of LBP at baseline. Additionally, the nine comorbidities were grouped into system morbidities based on shared characteristics, pathophysiological relationships, and commonly observed patterns of co-occurrence.^{25,34,35} Five system morbidities were identified: cardiometabolic (i.e., cardiovascular, respiratory and diabetes), gastrointestinal, neuromuscular (i.e., musculoskeletal and neurological), sleep & mental health (i.e., psychological and sleep related-problems), and cancer.

Study outcomes

The variables of interest were: (i) comorbidities coexisting with LBP (type and number); (ii) system morbidities, defined as two or three combinations of comorbidities coexisting with LBP (cardiometabolic, neuromuscular, gastrointestinal, sleep & mental health or cancer); and (iii) pairs of system morbidities, defined as combinations of two system morbidities coexisting with LBP. The outcome variable was LBP-related healthcare utilisation, (defined as the total number of encounters with hospital, medical and health services for LBP over a 12-month period from baseline). The LBP-related healthcare utilisation data were collected at the baseline assessment and fortnightly throughout the 12-month follow-up period, via REDCap. Encounters with hospital, medical, and health services for LBP were defined as: a visit to any hospital service due to LBP; a visit to a community-based medical or health practitioner due LBP; any diagnostic tests for LBP; a visit to any hospital, medical and health service to receive or fulfill a script for prescription medications for LBP, or a visit to any non-hospital medical service for LBP. Each healthcare encounter was counted as an individual visit.

Data analysis

All study variables are presented descriptively. Categorical variables are reported using frequency (n) and proportion (%), and continuous variables are reported using either the mean for normally distributed data or median for non-normally distributed, along with the standard deviation (SD) or interquartile range (IQR, respectively). To characterise the sample sociodemographic characteristics, the presence of multimorbidity, the number and types of comorbidities, system morbidities, and pairs of system morbidities coexisting with LBP are described, using frequencies and proportions. LBP-related healthcare utilisation is reported as the mean total healthcare use in the sample and is presented according to system morbidities and pairs of system morbidities.

Role of the funding source

The *Get Back to Healthy trial* is funded by the National Health and Medical Research Council (NHMRC) (APP1180474), and Sydney, Western Sydney, and South Western Sydney Local Health Districts in New South Wales, Australia. External grant bodies (NHMRC and Western Sydney Local Health District) peer-reviewed the trial during the funding process. The NHMRC has no role in the trial design, implementation, data collection and analysis, decision to publish, or preparation of the manuscript. Western Sydney Local Health District clinicians and consumer groups (Allied Health Consumer Committee) were involved in the trial design process; however, funding was granted independent from their involvement in the trial.

Results

For this secondary analysis, a total of 337 participants (97%) out of 346 in the GBTH trial provided follow-up data on healthcare utilisation and were therefore included in the present study. Participant's baseline characteristics are shown in Table 1. Participants were on average 65.7 (SD = 11) years old, with a mean BMI of 28.4 (SD = 6.3) kg/m². More than half of the participants were female (n=186, 55.4%) and reported being retired (n=196, 58.3%). Table 2 shows the prevalence of comorbidities, system morbidities, and pairs of system morbidities among the participants. Of the 337 participants, 74 participants (22%) reported no comorbidities in addition to chronic LBP. Most participants (n=263, 78%) reported at least one comorbidity in addition to chronic LBP and more than half (n=196, 58%) reported multimorbidity (two or more comorbidities in addition to chronic LBP). The most prevalent comorbidities were musculoskeletal conditions (n=152, 45.1%), followed by sleep-related problems (n=109, 32.3%), and cardiovascular conditions (n=90, 26.7%).

Regarding system morbidities, most study participants (n=263, 78%) reported at least one system morbidities, and more than half (n=189, 56%) reported more than one system morbidities. The three most frequent system morbidities were: neuromuscular (n=161, 47.8%), sleep & mental health (n=143, 42.4%), and cardiometabolic (n=139, 41.2%) (Table 2), in line with the most common comorbidities reported. These three system morbidities were also among the most prevalent pairs of system morbidities: neuromuscular and sleep & mental health (n=90, 26.7%), cardiometabolic and neuromuscular (n=79, 23.4%), and cardiometabolic and sleep & mental health (n=70, 20.8%) (Table 2).

Table 3 shows the results for the odds ratios of the system morbidities occurring more frequently together as a pair of system morbidities than it would be expected if the system morbidities occurred separately. The pair of system morbidities reported to occur more frequently were the sleep & mental health and gastrointestinal (OR: 3.6, 95%CI: 2.1 to 6.0), followed by neuromuscular and gastrointestinal (OR: 3.3, 95%CI: 1.9 to 5.5), and sleep & mental health and neuromuscular (OR: 2.9, 95%CI: 1.9 to 4.6). No significant associations were observed for the neuromuscular and cancer (OR: 1.4, 95%CI: 0.8 to 2.3) and sleep & mental health and cancer (OR: 1.6, 95%CI 0.9 to 2.8).

Regarding LBP-related healthcare utilisation, participants received an average of 4.8 consultations over the 12-month follow-up period. Figure 1 shows the LBP-related healthcare utilisation (i.e., mean number of consultations for chronic LBP). LBP-related healthcare utilisation was similar across the system morbidities and pairs of system

morbidities. No difference was found when comparing these groups with people with only chronic LBP (Figure 1).

Discussion

Our results revealed a high prevalence of comorbidities and system morbidities alongside chronic LBP. Musculoskeletal conditions (45·1%), sleep-related problems (32·3%), and cardiovascular conditions (26·7%) were the comorbidities most frequently reported. Similarly, the most common systems involved were neuromuscular (47·8%), sleep & mental health (42·4%), and cardiometabolic (41·2%). The analyses pairs of system morbidities suggest that specific combinations, such as sleep & mental health and gastrointestinal, neuromuscular and gastrointestinal and sleep & mental health and neuromuscular, occurred more frequently than would be expected if these system morbidities occurred separately. Regarding LBP-related healthcare utilisation, no clear variation in the number of consultations was identified for any single of the system morbidities and pairs of system morbidities when compared to people reporting only chronic LBP.

We found that seven out of ten participants reported at least one comorbidity, and five out of ten exhibited multimorbidity. These findings are consistent with recent evidence from both high-income^{16,36,37} and middle-income countries.^{15,38} Representative data from the Australian population indicate that among adults over 45 years with back pain, 74% have one or more comorbid conditions in addition to LBP.³⁶ A population-based study in Brazil reported that six out of ten adults with chronic back pain had one or more additional comorbidities. The prevalence of comorbidities was higher among adults with chronic back pain compared to those without chronic back pain.³⁸ Taken together, these findings reinforce that chronic LBP frequently coexists with other chronic conditions. Evidence indicates that chronic LBP frequently occurs alongside other chronic conditions³⁹ that share common risk factors, such as elevated BMI.⁴⁰ In our study, the high prevalence of comorbidities may be explained by the participants' advanced age (65·7, SD = 11·0) and mean BMI (28·5, SD = 6·3). Aging contributes to the accumulation of chronic conditions through physiological changes, prolonged exposure to risk factors, and increased baseline systemic inflammation.⁴¹⁻⁴³ Elevated BMI, in turn, is a well-established risk factor for multiple comorbidities, including cardiovascular diseases,^{40,44} diabetes,⁴⁵ and cancer.⁴⁶

While our study identified prevalent system morbidities (i.e., neuromuscular, sleep & mental health and cardiometabolic) that are aligned with previous studies,^{36,37,47} we were also able to identify pairs of system morbidities that are more likely to cooccur, including neuromuscular and sleep & mental health (26·7%), cardiometabolic and neuromuscular (23·4%), and cardiometabolic and sleep & mental health (20·8%). These

findings reinforce that comorbidities do not occur in isolation but instead follow interrelated patterns. Notably, the predominance of the neuromuscular and sleep & mental health (26.7%) strengthens the well-established link between chronic pain, sleep disturbances, and depression.⁴⁸⁻⁵⁰ Likewise, the cardiometabolic and neuromuscular (23.4%) highlights the interplay of systemic inflammation, lifestyle factors, and the chronification of pain.^{40,51,52}

Our study revealed that pairs of system morbidities occurred more frequently than would be expected if system morbidities manifested independently. This supports the evidence that multimorbidity in individuals with chronic LBP follows recurrent, structured patterns rather than a random accumulation of conditions.³⁹ Particularly, gastrointestinal system morbidities was more likely among participants with sleep & mental health (OR: 3.6, 95%CI: 2.1 to 6.0) and neuromuscular system morbidities (OR: 3.3, 95%CI: 1.9 to 5.5) compared with those without these systems morbidities. In addition, the likelihood of sleep & mental health system morbidities was almost threefold higher in individuals with neuromuscular system morbidities (OR: 2.9, 95%CI: 1.9 to 4.6). Taken together, these findings highlight the interdependence of comorbidity systems among participants in our study.

In contrast to previous studies,^{53,54} which reported higher healthcare utilisation among adults with multimorbidity, our analysis did not find significant differences in healthcare utilisation among patients with system morbidities. This may be partly explained by our focus on LBP-related healthcare utilisation, by patient self-management outside formal services, and by the impact on healthcare attendance during the COVID-19 pandemic.⁵⁵ Previous studies examining adults with LBP and comorbidities have demonstrated that comorbid conditions increase healthcare utilisation.⁵⁶ For instance, in a study of insured adults in the US, depression (OR: 2.6; 95% CI: 1.1 to 5.8) and sleep disturbances (OR: 2.2; 95% CI: 1.5 to 3.3) was associated with higher healthcare utilisation in patients with LBP.⁵⁶ Additionally, comorbidities, particularly diabetes and cardiovascular disease or hypertension, increased the likelihood of hospitalization by twice (OR: 2.0; 95% CI: 1.6 to 2.4) and by 70% (OR: 1.7; 95% CI: 1.5 to 1.9) respectively, among patients with LBP.³¹ However, these findings do not specifically address LBP-related healthcare. Studies focusing on the use of rehabilitation services to improve back function have shown that each additional chronic condition increases the odds of rehabilitation use by 17% (OR: 1.1, 95% CI: 1.0 to 1.3), and having four or more chronic conditions more than doubles the odds (OR: 2.1, 95% CI: 1.2 to 3.7). Despite strategies to mitigate its impact,⁵⁷ the COVID-19 pandemic may have influenced our results, particularly regarding healthcare utilisation and reduced access to care and may still have influenced both the sample and the outcomes observed.

An important strength of our study is the fortnightly collection of LBP-related healthcare utilisation data, which enhances the reliability of this measure. A potential limitation is that the sample consisted of patients enrolled in a clinical trial with specific inclusion criteria, possibly limiting participant diversity. Nevertheless, the patterns - based analysis of comorbidity systems, combined with the representativeness of the GBHT cohort, reinforces the study's contribution to understanding chronic LBP pain and multimorbidity. Other limitations include the use of self-reported data, which may be affected by recall and reporting biases, however, the fortnightly collections likely reduced recall bias; and the collection of comorbidity information only at baseline, without distinguishing between past and current conditions.

These findings reinforce that the management of chronic LBP should extend beyond care focused solely on the symptoms of the condition. The high prevalence of comorbidities, which often occur in specific patterns, can further complicate care. Treatment burden represents a major challenge for patients with multiple chronic conditions. Managing the workload from several diseases simultaneously, along with multiple medications or therapies, increases the complexity of self-care, and in patients with chronic pain, the pain itself may further amplify this difficulty. These results underscore the importance of considering mental load and the effort required to manage multiple conditions, reinforcing the need for integrated, patient-centered care for people with chronic LBP.

Contributors: FEMR, PRZ, FPH, NBI, were responsible for conceptualisation and development of the methodology. FEMR, PRZ, FPH, NBI, TY, FML, RK verified the data. TY, RK, FPH, PRZ were responsible for data analysis, search for data resources, data extraction, and visualisation. FEMR wrote the first draft of the manuscript. All authors contributed to the study's design, interpretation of data, and provided critical feedback. All authors reviewed the methods and results, and approved the final version of the manuscript.

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Variables	Mean (SD)	n (%)
Sex (<i>Female</i>)		186 (55.4%)
Age (<i>years</i>)	65.7 (11.0)	
BMI (<i>kg/m²</i>)	28.4 (6.3)	
Ethnic origin		
Not indigenous		329 (98.5%)
Aboriginal		4 (1.2%)
Education level		
High school		67 (19.9%)
Graduate (<i>TAFE, college, or equivalent</i>)		112 (33.3%)
Graduate (<i>Bachelor's, Master's</i>)		148 (44%)
Doctorate (<i>PhD</i>)		9 (2.7%)
Employment Status		
Employed casual		29 (8.6%)
Employed part time (<i>up to 38h/week</i>)		48 (14.3%)
Employed full time (<i>≥40 h/week</i>)		37 (11.0%)
Retired		196 (58.3%)

Table 1: Baseline characteristics (n=337)

Prevalence data	Total sample (n=337)
Number of comorbidities	n (%)
0	74 (21.9%)
1	67 (19.8%)
2	79 (23.4%)
3	54 (16.0%)
4	28 (8.3%)
5	15 (4.4%)
6	9 (2.6%)
7	10 (2.9)
8	1 (0.3%)
Comorbidities*	
Cardiovascular conditions (<i>yes</i>)	90 (26.7%)
Respiratory conditions (<i>yes</i>)	71 (21.1%)
Diabetes (<i>yes</i>)	12 (3.6%)
Gastro-intestinal conditions (<i>yes</i>)	87 (25.8%)
Musculoskeletal conditions (<i>yes</i>)	152 (45.1%)
Neurological conditions (<i>yes</i>)	39 (11.6%)
Psychological symptoms (<i>yes</i>)	81 (24%)
Sleep-related conditions (<i>yes</i>)	109 (32.3%)
Cancers (<i>yes</i>)	65 (19.3%)
Number of system morbidities*	
1	74 (22%)
2	96 (28.5%)
3	53 (15.7%)
4	30 (8.9%)
5	10 (3.0%)
System morbidities*	
Neuromuscular (N)	161 (47.8%)
Mental health & sleep (S)	143 (42.4%)
Gastrointestinal (G)	87 (25.8%)
Cardiometabolic (H)	139 (41.2%)
Cancer (C)	65 (19.3%)
Pairs of System morbidities	
Neuromuscular and Sleep & mental health	90 (26.7%)
Cardiometabolic and Neuromuscular	79 (23.4%)
Cardiometabolic and Sleep & mental health	70 (20.8%)
Neuromuscular and Gastrointestinal	60 (17.8%)
Sleep & mental health and Gastrointestinal	57 (16.9%)
Cardiometabolic and Gastrointestinal	47 (13.9%)
Cardiometabolic and Cancer	39 (11.6%)
Neuromuscular and Cancer	35 (10.4%)
Sleep & mental health and Cancer	34 (10.1%)
Gastrointestinal and Cancer	24 (7.1%)

Note: Percentages may exceed (or not add up to) 100% because comorbidities, system morbidities, and pairs of system morbidities are not mutually exclusive; participants may belong to more than one group

Table 2: Prevalence of comorbidities, system morbidities and pairs of system morbidities among participants

System morbidities	Cardiometabolic	Neuromuscular	Sleep & mental health	Gastrointestinal	Cancer
	OR (CI95%)	OR (CI95%)	OR (CI95%)	OR (CI95%)	
Cardiometabolic					
Neuromuscular	1.9 (1.2, 2.9) *				
Sleep & mental health	1.7 (1.1, 2.7) *	2.9 (1.9, 4.6) *			
Gastrointestinal	2.0 (1.2, 3.3) *	3.3 (1.9, 5.5) *	3.6 (2.1, 6.0) *		
Cancer	2.6 (1.5, 4.5) *	1.4 (0.8, 2.3)	1.6 (0.9, 2.8)	1.9 (1.0, 3.4) *	

*Significant values for pairs of system morbidities occurring together more frequently than would be expected if the system morbidities were independent.

Table 3: The odds ratios for all base pairs of system morbidities.

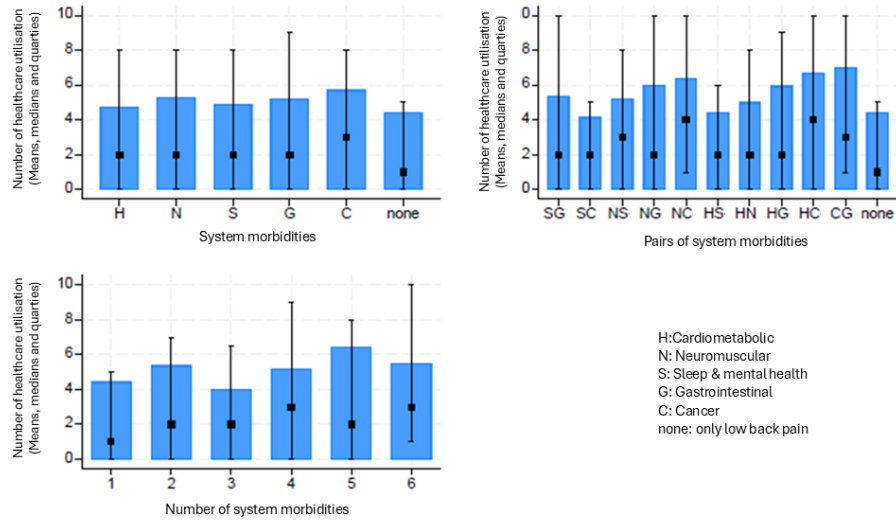


Figure 1: Number of healthcare utilisation among participants with chronic low back pain and system morbidities, pairs of system morbidities and number of system morbidities.

5 CONSIDERAÇÕES FINAIS

A DCC e as DCNT são um desafio para a saúde pública mundial e resultam em encargos econômicos e sociais substanciais. Evidências apontam a coexistência da DCC e das DCNT configurando-se num quadro de multimorbidade. Indivíduos com DCC e multimorbidade apresentam piores níveis de dor e incapacidade e maior chance de apresentarem pior prognóstico e receberem cuidado inadequado. Além disso, outros fatores como, por exemplo, as interações medicamentosas, as alterações comportamentais ou a prescrição de exercício físico podem tornar o cuidado dos pacientes com DCC e multimorbidade mais complexo. Profissionais de saúde, como os fisioterapeutas desempenham papel fundamental no tratamento de pacientes com DCC através de triagens, avaliações e intervenções terapêuticas. É importante que considerem fatores relacionados a multimorbidade em pacientes com DCC e estejam melhor preparados para o manejo destes pacientes.

Com o intuito de expandir o conhecimento sobre a relação entre a DCC e as DCNT, os resultados reportados pelos estudos incluídos nesta tese indicam a elevada prevalência das DCNT e de multimorbidade entre adultos brasileiros e australianos com DCC. As condições mais frequentemente encontradas foram as osteomusculares, as condições de saúde mental e as condições cardiovasculares. Entre os adultos brasileiros com DCC, a presença de DCNT esteve associada a maiores níveis de limitação de atividade, pior percepção do estado de saúde e maior utilização dos serviços de saúde, em comparação àqueles com DCC, mas sem a presença de DCNT. Entre os participantes australianos, não foi evidenciado uma associação entre a presença de comorbidades e a utilização de serviços de saúde relacionados à dor lombar.

O estudo 1 estimou a prevalência das DCNT entre adultos brasileiros com e sem DCC e investigou a associação entre a presença das DCNT e a limitação de atividade nos indivíduos com DCC. Para este estudo foram utilizados dados da PNS 2019, que contempla uma amostra representativa da população brasileira. Os resultados mostram que a prevalência das DCNT é maior entre aqueles com DCC, com destaque para as doenças cardiovasculares, artrite ou reumatismo, depressão e diabetes. A cada 10 adultos com DCC, aproximadamente 6 apresentaram

multimorbidade. Maiores proporções de multimorbidade foram encontradas entre as mulheres, pessoas de idade avançada, maior índice de massa corporal (IMC) e menor escolaridade. Além disso, foi identificado que adultos com DCC e artrite ou reumatismo, doenças pulmonares, depressão e doenças cardiovasculares têm maiores chances de relatarem piores níveis de limitação de atividade comparados a adultos com DCC, mas sem a presença destas condições específicas. Estes achados reforçam a importância de considerarmos a presença das DCNT durante a avaliação e tratamento de pacientes brasileiros com DCC. Ademais, é fundamental atentar para grupos específicos como mulheres, pessoas mais velhas, indivíduos com maior IMC e menor escolaridade ao planejar as intervenções.

A partir dos resultados encontrados no estudo 1 e da subamostra de adultos brasileiros com DCC, o estudo 2 investigou se a presença de DCNT contribui para uma maior utilização de serviços de saúde ou uma pior percepção do estado de saúde. Foram investigadas as DCNT que apresentaram maior prevalência no estudo 1, a saber: artrite ou reumatismo, doenças cardiovasculares, depressão e diabetes. Os resultados mostram que ter doenças cardiovasculares, diabetes e depressão aumenta a chance de maior utilização de serviços de saúde, especialmente para a depressão e diabetes. Para a percepção do estado de saúde, os resultados formam semelhantes. A presença das DCNT aumenta a chance de relatar piores níveis de percepção de saúde, especialmente para a artrite ou reumatismo e a diabetes. Estes achados sugerem que entre pacientes com DCC, a presença de depressão e diabetes pode ser um fator que aumenta a complexidade do manejo do cuidado em saúde. Ademais, embora não tenha se associado a maior utilização de serviços de saúde, a artrite ou reumatismo apresentou associação com piores níveis de percepção do estado de saúde. Esse resultado sugere que o impacto funcional e a carga subjetiva da doença devem ser considerados, juntamente com os indicadores objetivos, na construção de intervenções mais integradas e centradas no paciente.

Já o estudo 3 teve como objetivo descrever padrões de multimorbidade entre adultos australianos com dor lombar crônica e sua associação com a utilização dos serviços de saúde para a dor lombar. Os achados deste estudo indicam alta prevalência de multimorbidade entre a amostra estudada. As comorbidades mais prevalentes foram as musculoesqueléticas, os distúrbios do sono e as condições cardiovasculares. Um resultado interessante deste estudo foi a identificação de que

sistemas de comodidades apresentam maior chance de coexistirem em pares, comparado a sua presença de forma isolada. Esse achado corrobora com evidências prévias e reforça a complexidade do manejo clínico de pacientes DCC, uma vez que a interação entre condições crônicas pode, por exemplo potencializar limitações funcionais e influenciar de forma negativa no prognóstico. Em contraste com o segundo estudo, os resultados do estudo 3 não mostraram associação entre a presença de comorbidades e a utilização de serviços de saúde para dor lombar. Esse resultado pode ter sido devido a diferenças na pergunta relacionada ao uso do serviço de saúde, no perfil dos participantes e nas condições avaliadas.

Os resultados desta tese contribuem para o avanço do conhecimento na área da saúde e da fisioterapia ao ampliar a compreensão sobre a presença das DCNT entre adultos com DCC. Embora as diretrizes de tratamento para dor na coluna ainda não apresentem orientações claras sobre o manejo de pacientes com multimorbidade ou com DCNT específicas, os achados aqui apresentados reforçam a necessidade de desenvolver abordagens avaliativas e terapêuticas que incorporem a presença destas condições no cuidado de pacientes com DCC. Nesse contexto, para avançar no conhecimento sobre este tema é necessário investir em estudos longitudinais que permitam compreender a direção e a magnitude das associações entre essas condições, bem como identificar fatores modificáveis que possam reduzir o risco de complicações, como a incapacidade e o uso excessivo de serviços de saúde. Além disso, pesquisas que testem intervenções centradas na pessoa, com abordagens multidisciplinares e gestão integrada das DCNT poderão oferecer subsídios para o desenvolvimento de políticas públicas e práticas clínicas mais efetivas. A realização de estudos de *co-design* podem ser uma estratégia promissora, pois o desenvolvimento de ações a partir da participação ativa de profissionais de saúde, incluindo médicos e fisioterapeutas, pacientes e pesquisadores favorece a construção de cuidado em saúde mais factível e alinhado às necessidades da prática clínica. Em conformidade com as diretrizes de manejo da dor na coluna, profissionais inseridos nos serviços de saúde, incluindo a Atenção Primária à Saúde, podem oferecer educação e aconselhamento sobre os fatores envolvidos no manejo da DCC e fatores de risco compartilhados entre as DCNT, bem como a adoção de comportamentos saudáveis com o objetivo de diminuir o impacto destas condições na saúde dos pacientes.

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ANEXO 1 PARECER DO COMITÊ DE ÉTICA PLATAFORMA BRASIL

COMISSÃO NACIONAL DE
ÉTICA EM PESQUISA



PARECER CONSUBSTANCIADO DA CONEP

DADOS DO PROJETO DE PESQUISA

Título da Pesquisa: Pesquisa Nacional de Saúde 2019

Pesquisador: EDUARDO MARQUES MACARIO

Área Temática:

Versão: 3

CAAE: 11713319.7.0000.0008

Instituição Proponente: Departamento de Análise em Saúde e Vigilância de Doenças Não

Patrocinador Principal: MINISTERIO DA SAUDE

DADOS DO PARECER

Número do Parecer: 3.529.376

Apresentação do Projeto:

As informações elencadas nos campos "Apresentação do Projeto", "Objetivo da Pesquisa" e "Avaliação dos Riscos e Benefícios" foram retiradas do arquivo "Informações Básicas da Pesquisa" (PB_INFORMAÇÕES_BÁSICAS_DO_PROJETO_1326098.pdf, de 23/08/2019).

INTRODUÇÃO:

Os inquéritos de saúde são importantes instrumentos na avaliação dos sistemas de saúde sob a ótica do usuário. Eles também vêm sendo usados, e de maneira crescente, como meio de se obter informações autorreferidas sobre morbidades e estilos de vida. 1,2 Um dos principais objetivos dos inquéritos de saúde é prover informações de saúde que, em sua maioria, não possuem registro nos sistemas de informação de saúde (SIS). A insuficiência dos SIS para suprir necessidades da gestão enfatiza a importância de coletar dados primários por meio de inquéritos de saúde de base populacional. 1,2 Realizados com determinada periodicidade, eles permitem consolidar informações como base de referência populacional no estabelecimento da vigilância e monitoramento de morbidades e seus determinantes, por exemplo. 2 Ainda, torna-se possível estabelecer o perfil de saúde dos entrevistados, bem como exposições e condições de risco da população em questão, além de obter um grande volume de indicadores que, quando analisados em conjunto com informações demográficas e socioeconômicas, possibilitam investigar as relações entre essas diversas variáveis. 2,3 Outra questão importante dos inquéritos é a provisão

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COMISSÃO NACIONAL DE
ÉTICA EM PESQUISA



Continuação do Parecer: 3.529.376

TCLE / Termos de Assentimento / Justificativa de Ausência	ANEXO_3_1_TCLE_Informante_domicilio_alterado.doc	04/07/2019 12:58:10	EDUARDO MARQUES MACARIO	Aceito
Projeto Detalhado / Brochura Investigador	Projeto_PNS2019_limpo.docx	04/07/2019 12:54:57	EDUARDO MARQUES MACARIO	Aceito
Projeto Detalhado / Brochura Investigador	Projeto_PNS2019_alterado.docx	04/07/2019 12:54:00	EDUARDO MARQUES MACARIO	Aceito
Outros	ANEXO2_Medidas_antropometricas.pdf	10/04/2019 12:49:29	EDUARDO MARQUES	Aceito
Folha de Rosto	FolhadeRosto_assinada.pdf	10/04/2019 12:27:42	EDUARDO MARQUES	Aceito

Situação do Parecer:
Aprovado

BRASILIA, 23 de Agosto de 2019

Assinado por:
Jorge Alves de Almeida Venancio
(Coordenador(a))

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ANEXO 2- QUESTIONÁRIO DA PESQUISA NACIONAL DE SAÚDE 2019

https://www.pns.icict.fiocruz.br/wp-content/uploads/2023/06/Questionario_PNS_2019_26062023.pdf

Número das questões e variáveis do dicionário do questionário utilizadas nos estudos 2 e 3 da tese

Parte de identificação e controle

V0024 a V0026

Módulo C – Características gerais dos moradores

C006 a C009

Módulo D – Características de educação dos moradores

D001 a D014

Módulo I – Cobertura plano de saúde

I00102

Módulo J – Utilização de serviços de saúde

J014 e J037

QUESTIONÁRIO MORADOR SELECIONADO

Módulo M- -Características do trabalho e apoio social

M001

Módulo N – Percepção do estado de saúde

N001

Módulo P – Estilos de vida

P00102 e P00103; P00402 e P00403; P027 e P028

P050 a P052

Módulo Q – Doenças crônicas

Q00201, Q00202, Q03001, Q03002, Q06306, Q068, Q074, Q079, Q084, Q085, Q087, Q092, Q0110, Q011604, Q0120

Variáveis de Amostragem

V00291

Variáveis derivadas do próprio Dicionário das Variáveis da Pesquisa Nacional de Saúde 2019

VDF004, VDD004A

ANEXO 3- BASELINE QUESTIONNAIRE GET BACK TO HEALTHY TRIAL

BASELINE QUESTIONNAIRE

We expect that this questionnaire will take approximately 35-45 minutes to complete. There is an option to save your responses and return to the questionnaire later if you are unable to complete it immediately.

SECTION 1: IDENTIFICATION

1. Date: ____ / ____ / ____

2. Participant study ID: _____

3. Age: _____

4. Sex: Male Female

5. Are you of Aboriginal, Torres Strait Islander or Maori origin? No Aboriginal Torres Strait Islander Maori

SECTION 2: ANTHROPOMETRICS AND DEMOGRAPHICS MEASUREMENT

1. Weight: _____ kg Height: _____ m BMI: _____ kg/m²

2. Marital Status: Single Married or in a domestic partnership Divorced Widowed

3. Highest Degree or Schooling Level: Elementary High School Graduate (TAFE, college, or equivalent)
 Graduate (Bachelor's, Master's) Doctorate (PhD)

4. Current employment status:

- | | |
|---|--|
| <input type="checkbox"/> Employed full time (40 or more hours per week) | <input type="checkbox"/> Unemployed and not currently looking for work |
| <input type="checkbox"/> Employed part time (up to 39 hours per week) | <input type="checkbox"/> Casual |
| <input type="checkbox"/> Unemployed and currently looking for work | <input type="checkbox"/> Retired |
| | <input type="checkbox"/> Unable to work |

5. Occupation (if applicable): _____

6. What is your gross weekly household income (annual income in brackets)?

- No or negative income \$2,000-\$3,999 (\$104,000-\$207,999)

- \$1-\$799 (\$1-\$41,599)
- \$800-\$1,999 (\$41,600-\$103,999)

- \$4,000 or more (\$208,000 or more)
- Prefer not to answer

SECTION 3: MEDICAL HISTORY

Medical History

1. Have you ever experienced any of the following health problems (in the past or currently)? Please tick all the boxes that apply, otherwise please select no. Please answer any relevant questions.

-
- a.** Cardiovascular conditions:
- No
 - High blood pressure (hypertension)
 - High cholesterol levels (hypercholesterolemia)
 - High lipid levels (hyperlipidemia)
 - Heart attack
 - Heart murmur
 - Diseases of the arteries
 - Anemia
 - Varicose veins or blood clots
 - Other, please specify _____

-
- b.** Respiratory conditions:
- No
 - Asthma
 - Chronic obstructive pulmonary disease (COPD)
 - Pneumonia
 - Bronchitis
 - Emphysema
 - Abnormal chest X-ray
 - Obstructive sleep apnea: **bi.** Do you use a CPAP machine? No Yes
 - Other, please specify _____

-
- c.** Gastrointestinal conditions:
- No
 - Liver disease
 - Gall bladder disease
 - Acid reflux
 - Other, please specify _____
-

d. Musculoskeletal conditions: No
 Lower back pain
 Leg pain
 Upper or middle back pain
 Migraine or recurrent headache
 Osteoarthritis, please specify: Hands/wrists Fingers Spine Hip Knees
 Osteoporosis
 Swollen or painful knees or ankles
 Swollen, stiff or painful joints
 Pain in your legs after walking short distances
 Broken bones, please specify which bone: _____ How many years ago? _____
 Neck pain
 Other, please specify _____

e. Psychological symptoms: No
 Depression or anxiety
 Nervous or emotional problems
 Other, please specify _____

ei. Have you ever received any professional help for it? (e.g. psychologist, GP, psychiatrist, counsellor) No Yes
eii. Do you currently receive any professional help for it? No Yes

f. Neurological conditions: No
 Stroke
 Seizures/Epilepsy
 Peripheral neuropathy
 Other, please specify _____

g. Sleep-related Problems: No
 Insomnia symptoms (hard to fall asleep, hard to stay asleep)
 Snoring
 Other, please specific _____

h. Cancers: No
 Yes, please specify: _____ How many years ago? _____

i. Any other medical conditions: No
 Yes, please specify _____

Smoking History

3. Have you ever had a history of smoking cigarettes, cigars or a pipe?

- No, never smoked → *Skips to 4*
 Occasional smoker
 Ex-smoker
 Current Smoker

3a. At what age did you start smoking? _____

3b. How many cigarettes did you previously/do you currently smoke on average per day? _____

3c. How many cigars did you previously/do you currently smoke on average per day? _____

3d. How many pipefuls did you previously/do you currently smoke on average per day? _____

3e. If you are an ex-smoker, when did you last smoke? _____ or N/A (current smoker)

Alcohol Consumption History

4. Have you ever consumed alcohol?

- No → *Skips to LOW BACK PAIN HISTORY*
 Yes

4a. In the past, have you ever been a heavy drinker (consumption of more than 5 drinks per day)? No Yes

4b. How often do you consume alcohol?

- | | | |
|--|---|---|
| <input type="checkbox"/> Never | <input type="checkbox"/> Once a month (approximately) | <input type="checkbox"/> Sometimes/week |
| <input type="checkbox"/> Once a year or less | <input type="checkbox"/> Sometimes/Month | <input type="checkbox"/> Daily |
| <input type="checkbox"/> Sometimes/year | <input type="checkbox"/> Once a week | |

ANEXO 3- FORTNIGHTLY FOLLOW -UP QUESTIONNAIRE GET BACK TO HEALTHY TRIAL

FORTNIGHTLY FOLLOW-UP QUESTIONNAIRE

1. Have you experienced low back pain in the last 2 weeks (fortnight)?
- No → skips to Q2
 - Yes

PAIN INTENSITY *(observation: this question will only appear if yes is selected for Q1)*

1a. Over the last 2 weeks (fortnight), what was the average intensity of your low back pain on a scale of 0 (no pain) to 10 (the worst pain imaginable)?

0	1	2	3	4	5	6	7	8	9	10
No pain					Moderate Pain					Worst possible pain

PAIN FREQUENCY *(observation: this question will only appear if yes is selected for Q1)*

1b. Over the last 2 weeks (fortnight), how many days did you experience low back pain? _____

USE OF CARE OF TREATMENTS FOR LOW BACK PAIN

Hospital, Medical and Health Services for Low Back Pain

2. Over the last 2 weeks (fortnight), did you seek care from any medical or health services for your low back pain?

<input type="checkbox"/> I did not seek care from any health professionals or health services → skip to Q3	
<input type="checkbox"/> Surgery	i. What type of surgery? <ul style="list-style-type: none"> <input type="checkbox"/> Microdiscectomy <input type="checkbox"/> Discectomy <input type="checkbox"/> Laminectomy <input type="checkbox"/> Decompression <input type="checkbox"/> Fusion <input type="checkbox"/> Unsure <input type="checkbox"/> Other, please specify

	<p>ii. What type of hospital did you receive treatment? <input type="checkbox"/> Private Hospital <input type="checkbox"/> Public Hospital</p> <p>iii. How much did this surgery cost (out of pocket) in total?</p>
<input type="checkbox"/> Emergency department visit	<p>iv. How many days did you spend at the hospital in total?</p>
<input type="checkbox"/> Nursing	<p>v. Where did you encounter a nurse? <input type="checkbox"/> Hospital <input type="checkbox"/> GP/medical practice <input type="checkbox"/> Other, please specify</p> <p>vi. How many visits/sessions?</p> <p>vii. How much did these visits/sessions cost (out of pocket) in total over the last 2 weeks?</p>
<input type="checkbox"/> Imaging/Scans	<p>viii. Please indicate which type(s): <input type="checkbox"/> X-ray <input type="checkbox"/> Ultrasound <input type="checkbox"/> CT scan <input type="checkbox"/> Nerve conduction studies <input type="checkbox"/> MRI <input type="checkbox"/> Other, please specify</p> <p>iv. How much did these scans cost (out of pocket) in total over the last 2 weeks?</p>
<input type="checkbox"/> General practitioner (GP)	<p>x. How many visits/sessions?</p> <p>ix. How much did these visits/sessions cost (out of pocket) in total over the last 2 weeks?</p>
<input type="checkbox"/> Pharmacist	<p>xi. How many visits to a pharmacist?</p> <p>xii. How much did these visits/sessions cost (out of pocket) in total over the last 2 weeks?</p>
<input type="checkbox"/> Physiotherapist	<p>xiii. Where did you visit a physiotherapist? <input type="checkbox"/> Public hospital <input type="checkbox"/> Private hospital</p>

	<input type="checkbox"/> Private clinic xiv. How many visits/sessions? xv. How much did these visits/sessions cost (out of pocket) in total over the last 2 weeks?
<input type="checkbox"/> Chiropractic	xvi. How many visits/sessions? xvii. How much did these visits/sessions cost (out of pocket) in total over the last 2 weeks?
<input type="checkbox"/> Exercise physiologist	xviii. Where did you visit an exercise physiologist? <input type="checkbox"/> Public hospital <input type="checkbox"/> Private hospital <input type="checkbox"/> Private clinic xix. How many visits/sessions? xx. How much did these visits/sessions cost (out of pocket) in total over the last 2 weeks?
<input type="checkbox"/> Massage therapist	xxi. How many visits/sessions? xxii. How much did these visits/sessions cost (out of pocket) in total over the last 2 weeks?
<input type="checkbox"/> Psychiatrist, Psychologist, or Counsellor	xxiii. Where did you visit a psychiatrist, psychologist, or counsellor? <input type="checkbox"/> Public hospital <input type="checkbox"/> Private hospital <input type="checkbox"/> Private clinic xxiv. How many visits/sessions? xxv. How much did these visits/sessions cost (out of pocket) in total over the last 2 weeks?
<input type="checkbox"/> Health coaching	xxvi. How many visits/sessions? xxvii. How much did these visits/sessions cost (out of pocket) in total over the last 2 weeks?

<input type="checkbox"/> Natural therapies (e.g. acupuncture)	xxviii. How many visits/sessions? xxvix. How much did these visits/sessions cost (out of pocket) in total over the last 2 weeks?
<input type="checkbox"/> Osteopath	xxx. How many visits/sessions? xxxi. How much did these visits/sessions cost (out of pocket) in total over the last 2 weeks?
<input type="checkbox"/> Specialist	xxxii. Please indicate which type(s): <input type="checkbox"/> Orthopaedic surgeon <input type="checkbox"/> Pain physician <input type="checkbox"/> Rheumatologist <input type="checkbox"/> Neurologist <input type="checkbox"/> Other, please specify: <i>(Observation: the following questions will only appear if the participant has selected any of the specialist options.)</i> xxxiii. How many appointments? xxxiv. How much did these visits/sessions cost (out of pocket) in total over the last 2 weeks?
<input type="checkbox"/> Other, please specify: _____	xxxv. How many treatment sessions/appointments? xxix. In total over the last 2 weeks, how much did these visits/sessions cost you (out of pocket)?

(Observation: this question will only appear if the participant has selected any option except "I did not seek care")

MINI CURRÍCULO

Érica Ferreira é fisioterapeuta graduada pela Universidade Federal de Minas Gerais (1996). Possui experiência na assistência fisioterapêutica especialmente na atenção primária à saúde, com atuação por mais de dez anos no Sistema Único de Saúde. Além disso, possui experiência em docência em Fisioterapia. É mestre em Ciências da Reabilitação pela Universidade Federal de Minas Gerais (2021), onde desenvolveu estudos sobre o Exame Clínico Objetivo Estruturado e sua relação com estresse, ansiedade e autoeficácia em estudantes de fisioterapia. Atualmente é doutoranda no Programa de Pós-Graduação em Ciências da Reabilitação a Universidade Federal de Minas Gerais, sob orientação do professor Rafael Zambelli, investigando a associação entre dor crônica na coluna e doenças crônicas não transmissíveis. Realizou doutorado sanduíche na The University of Sydney, Austrália (2024–2025). Avaliadora voluntária da PEDro.

ATIVIDADES REALIZADAS DURANTE O DOUTORADO

Artigos publicados:

Ferreira, F. R., Ferreira, **É. D. M. R.**, & Vaz, D. V. (2021). Extensão universitária na interface virtual: Estratégias de aprimoramento docente e discente do curso de fisioterapia da Universidade Federal de Minas Gerais (UFMG). *Medicina (Ribeirão Preto)*.

Malta, D. C., Bernal, R. T. I., Ribeiro, E. G., **Ferreira, E. D. M. R.**, Pinto, R. Z., & Pereira, C. A. (2022). Chronic back pain among Brazilian adults: data from the 2019 National Health Survey. *Revista Brasileira de Epidemiologia*, 25, e220032.

Magalhães, D. S., McAuley, J. H., Maher, C. G., **Ferreira, E. D. M. R.**, Oliveira, T. E. P., Mastahinich, M. E. R., ... & Pinto, R. Z. (2024). An e-learning program improves low back pain beliefs of physiotherapists: a randomised trial. *Journal of Physiotherapy*.

Ferreira, É. D. M. R., Lemes, Í. R., Ribeiro, E. G., Malta, D. C., Maher, C. G., McAuley, J. H., ... & Pinto, R. Z. (2025). Prevalence of non-communicable diseases, multimorbidity, and their impact on activity limitations among adults with chronic back pain: a national population-based study in a middle-income country. *Brazilian Journal of Physical Therapy*, 29(5), 101241.

Artigos submetidos:

Ferreira, E. M. R., Freire, A.P.C.F., Lemes, Í. R., Caldeira, T. C. M., Malta, D. C., Ribeiro, E.G., Franco M.R., Magalhães D. S., Pinto R. Z. Healthcare utilization and self-reported health

of Brazilian adults with chronic back pain and multimorbidity: analysis of the 2019 National Health Survey.

Nunes, S. M., Rizzo, R. L., Franco, M. R., Ferreira, F. R., Barros, L. J. G., Maciel, I., Santos, R. L. G. M., Nascimento, R. R., Couto, J., **Ferreira, E. M. R.**, Maher, C. G., McAuley, J. H., Pinto, R. Z. Effectiveness of Yoga in people with chronic non-specific low back pain and poor prognosis (YOBACK-PRO): Protocol for a randomized clinical trial.

Resumos publicados e/ou apresentados

Pinto, R. Z., **Ferreira, E.M.R.**, Caldeira T.C.M., Malta D.C., Ribeiro E.G., Esposito, E.; McAuley, J. Comorbidities and Activity Limitation in Chronic Back Pain, Brazilian National Health Survey 2019. International Association for the Study of Pain, IASP 2024, World Congress on Pain <https://posters.worldcongress2024.org/poster/comorbidities-and-activity-limitation-in-chronic-backpain-brazilian-national-health-survey-2019/>

Ferreira, É. D. M. R., Caldeira, T. C. M., Malta, D. C., Ribeiro, E. G., & Pinto, R. Z. (2024). PRESENCE OF MULTIMORBIDITY AMONG ADULTS WITH CHRONIC BACK PAIN IN BRAZIL, NATIONAL HEALTH SURVEY 2019. *Brazilian Journal of Physical Therapy*, 28, 100721. <https://doi.org/10.1016/j.bjpt.2024.100721>

Ferreira, É. D. M. R., Caldeira, T. C. M., Malta, D. C., Ribeiro, E. G., & Pinto, R. Z. (2024). TREATMENT FOR CHRONIC BACK PAIN AND MULTIMORBIDITY AMONG BRAZILIAN ADULTS: WHERE ARE WE IN RELATION TO THE RECOMMENDED GUIDELINES? *Brazilian Journal of Physical Therapy*, 28, 100722. <https://doi.org/10.1016/j.bjpt.2024.100721>.

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Ferreira, É. M. R.; Caldeira T, C. M.; Malta, D.C.; Ribeiro, E. G.; Pinto, R. Z. Investigações sobre dor crônica na coluna e condições crônicas em brasileiros: análise da pesquisa nacional de saúde de 2013 e 2019. In: 13º Congresso Internacional de Fisioterapia, 2023, Florianópolis. Anais do 13º Congresso Internacional de Fisioterapia, 2023.

Ferreira, É. M. R., Malta, D. C.; Maher C.G.; McAuley J. H.; Jones, M.D.; Pinto, R. Z. Prevalence of non-communicable chronic conditions and activity limitation in chronic back pain, Brazilian National Health Survey 2019. In: Australian Pain Society 45th Annual Scientific Meeting 2025. Melbourne, 2025.

Ferreira, É. M. R.; Freire A. P. C. F.; Lemes, I. R.; Franco, M. R.; Caldeira, T. C. M.; Malta D. C.; Pinto, R. Z. Healthcare utilization and health status among Brazilian adults with chronic back pain and chronic conditions: Brazilian National Health Survey, 2019. In: Australian Pain Society 45th Annual Scientific Meeting 2025. Melbourne, 2025.

Trabalhos publicados em anais de eventos (resumo)

Esposito, E.; Fernandes, V. C.; **Ferreira, E. M. R.**; Lemes, Ítalo Ribeiro; Pinto, R. Z. A. Sintomas depressivos em idosos com dor lombar crônica submetidos a um tratamento baseado em exercícios: um estudo de série de casos. In: 13º Congresso Internacional de Fisioterapia, 2023, Florianópolis. Anais do 13º Congresso Internacional de Fisioterapia, 2023.

Apresentação de trabalho e palestra em eventos científicos

IX Encontro de saúde do IFRJ – CAMPUS REALENGO, 07 de dezembro de 2021. Palestra sobre Projeto Aprender Palpando.

Orientação e participação em bancas em oito Trabalhos de Conclusão do Curso de Especialização em Ortopedia da Escola de Fisioterapia e Terapia Ocupacional da UFMG;

Co-orientação de Trabalho de Conclusão de Curso Sistemas de Informação, Universidade Federal de Ouro Preto, Minas Gerais. Outubro/2023 a Dezembro/2025. Coorientação voluntária.

Co-orientação de PROGRAMA DE BOLSAS DE INICIAÇÃO CIENTÍFICA E TECNOLÓGICA DA FAPEMIG, Universidade Federal de Ouro Preto, Minas Gerais. Outubro/2022 a setembro/2023. Coorientação voluntária.

ATIVIDADES REALIZADAS DURANTE O PROGRAMA DE DOUTORADO SANDUÍCHE NO EXTERIOR

Participação como ouvinte no Annual Scientific Meeting 2024. Sydney Musculoskeletal Health, 2024.

Participação semanal dos seminários do grupo de pesquisa do Prof. Dr. **Chris Maher**, diretor do Instituto de Saúde Musculoesquelética e Professor da Escola de Saúde Pública da Universidade de Sydney.

Participação semanal dos seminários do grupo Musculoskeletal Health Research Group, Charles Perkins Centre (CPC-MSK) da Universidade de Sydney.

Participação semanal dos seminários do Grupo Back Pain da Universidade de Sydney, liderado pelo professor Paulo Ferreira.

Treinamento presencial sobre *Risk of Bias 2 Tool - Cochrane*, ministrado pelo Prof. Dr. **Jonathan Sterne** (um dos criadores da Rob.2) da *University of Bristol* e oferecido pelo *Centre for Pain IMPACT* da UNSW, Australia

Vista a Universidade de Melbourne

Visita a La Trobe University

Realização de cursos online na plataforma da USYD:

Doctoral Writing

Writing Academic Style

Writing a literature review

Treinamento e capacitação no site da PEDro para a avaliação de artigos de forma voluntária.

Apresentação de dois resumos no Australian Pain Society 45th Annual Scientific Meeting 2025. Melbourne, 2025.