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The Relationship Between Spinal Pain and Comorbidity: A Cross-sectional Analysis of 579 Community-Dwelling, Older Australian Women

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ABSTRACT

Objectives: The aims of this study were to (1) report the prevalence and explore the influence of spinal pain on quality of life and (2) assess the relationship between spinal pain and the type and number of comorbidities.

Methods: This cross-sectional study comprised 579 community-dwelling, older Australian women. Women had "spinal pain" if they marked "yes" to neck pain, upper back pain, mid-back pain, and/or lower back pain. Descriptive statistics and binary logistic regression were performed to report the prevalence and explore the relationship between spinal pain and the type and number of comorbidities.

Results: A majority of women (55.8%) who returned surveys had spinal pain. Women with spinal pain had significantly lower physical and mental quality of life scores than women without spinal pain (Medical Outcomes Study: 36 Item Short Form Survey [SF-36] physical component summary: 40.1 ± 11.1 vs 49.0 ± 9.0, and SF-36 mental component summary: 50.0 ± 10.5 vs 53.9 ± 8.2, respectively). Having spinal pain was significantly associated with overweight and obesity (odds ratio 1.98 [95% confidence interval 1.3-2.96] and 2.12 [1.37-3.28]), diabetes (1.93 [1.01-3.67]), pulmonary comorbidity (1.66 [1.04-2.65]), and cardiovascular comorbidity (1.57 [1.07-2.28]). More than half of the women with spinal pain reported 2 or more comorbidities, with comorbidities significantly more common among women with spinal pain than among women without spinal pain. The odds of having spinal pain increased with an increasing number of comorbidities (2 comorbidities: 2.44 [1.47-4.04], 3 comorbidities: 3.07 [1.66-5.67], 4 comorbidities: 5.05 [1.64-15.54]).

Conclusions: Spinal pain is common in community-dwelling, older Australian women and is associated with greater disability and poorer quality of life. Diabetes, cardiovascular disease, pulmonary disease, and obesity appear to have a relationship with spinal pain. There was an incremental increase in the risk of spinal pain associated with increasing comorbidity count. (J Manipulative Physiol Ther 2017;xx:1-8)

Key Indexing Terms: *Pain; Comorbidity; Women's Health; Epidemiology*

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INTRODUCTION

Spinal pain (cervical, thoracic, or lumbar pain) is common, has a substantial socioeconomic burden,[1,2] and constitutes the locus of pain in the majority of patients in chronic pain settings.[3] In Australia, the age-standardized prevalence for neck pain in women has been estimated at 6.7%,[4] and the point prevalence of lower back pain has been estimated at 25.6%.[5] The prevalence of upper or mid-back pain has been estimated at 13% in the Danish population.[6] Although there has been much research describing prevalence, prognosis, and risk factors of lower back or neck pain, epidemiological data on the prevalence of spinal pain (combining cervical, thoracic, and lumbar pain) are rare and inadequately studied. The lifetime prevalence of spinal pain has been reported as between 54% and 80%.[3] A cross-sectional survey on 34 902 Danish twins indicated that 69% reported spinal pain in the past, with 55% reporting spinal pain in the past year.[6]

Comorbid chronic diseases place a considerable burden on individuals, communities, and health care services.[7,8] Feinstein originally described comorbidity as "any distinct additional entity that has existed or may occur during the clinical course of a patient who has the index disease under study."[9] Comorbidity may be the effect of medical diseases existing simultaneously, but independently of each other,[10] or of diseases that may be related.[11]

The relationship between spinal pain and comorbidity is relatively unknown, with few population-based studies exploring spinal pain and comorbidity.[12] In Sweden in 1998, a postal survey was mailed to 3000 adults 35 to 45 years old, investigating the prevalence and consequences of spinal pain. The 1-year prevalence of spinal pain was 66.3%, with women having a slightly higher prevalence than men.[13] For physical-mental comorbidity associated with spinal pain in a nationally representative sample of US adults, the 1-year prevalence of chronic spinal pain was estimated to be 19.0%, and 87.1% of people with chronic spinal pain reported at least 1 other comorbid condition.[14] This US study did not include obesity as comorbidity. Obesity is significantly associated with,[15] and is a predictor for,[16] chronic widespread musculoskeletal pain. It therefore appears reasonable to include this condition (obesity) in epidemiological studies examining comorbidity and pain.[17]

The number of comorbid chronic conditions can be an indirect measure of the ongoing adaptation and physiological dysregulation of bodily processes, known as cumulative allostatic load.[18,19] The number of diagnosed comorbid chronic conditions, irrespective of their nature, should be included in studies investigating comorbidity.[20] No previous population-based study has assessed the relationship between spinal pain and the number of comorbidities; hence, this study is the first to consider the role of spinal pain on overall health burden.

The aims of this study were (1) to report the prevalence and explore the influence of spinal pain on quality of life and (2) to assess the relationship between spinal pain and the type and number of comorbidities.

METHODS

Study Design and Participants

The Australian Longitudinal Study on Women's Health (ALSWH) is a population-based study of the health of a national sample of more than 58 000 Australian women in 4 birth cohorts: 1921-1926, 1946-1951, 1973-1978, and 1989-1995.[21] Detailed methods for the recruitment and maintenance of the ALSWH cohorts have been described elsewhere.[22]

In November 2012, a cross-sectional substudy survey involving 700 women from the 1946-1951 cohort, then aged 61-66 years, was conducted. The substudy deliberately oversampled women with arthritis: the survey was sent to 350 random women who answered "yes" at survey 3 (2001) or survey 4 (2004) to the question, "In the past THREE years have you been diagnosed or treated for "arthritis/rheumatism," and to 350 random women who had never reported any form of arthritis in surveys 3-6 (2001-2010). Women were sent a postal survey asking about their health, arthritis, and experience of pain. For all consenting women, demographic data from ALSWH survey 6 were linked to the substudy data. Details of the protocol for this substudy have been published.[23] This study was approved by the Human Research Ethics Committee of the University of Newcastle under Approval No. H-2012-0144.

Definition of Spinal Pain

Women were defined as having "spinal pain" if they marked "yes" to neck pain, upper back pain, mid-back pain, and/or lower back pain on a homunculus for the question, "Which of your joints have been troublesome (painful, aching, swollen, or stiff) on most days of the past month?"

Type of Comorbidity

The conceptual decision was to study statistical associations between a specific condition (spinal pain) and accompanying chronic diseases (comorbidity) in the category associative co/multimorbidity (statistical association, not or not known to be causal).[24] The presence of comorbidity was based on self-report from those who marked "yes" to the question, "In the past three years, have you been diagnosed or treated for" the following condition: diabetes, heart disease, hypertension, stroke, bronchitis, emphysema, asthma, breast cancer, bowel cancer, skin cancer, lung cancer, depression, anxiety, and/or psychiatric illness. An analysis of agreement between self-report and hospital data for self-reported chronic disease conditions in the mid-age ALSWH cohort indicates sufficient accuracy for use in epidemiological studies.[25] The following comorbidities were grouped together: heart disease and hypertension (grouped as cardiovascular disease); bronchitis, emphysema, and asthma (pulmonary disease); breast,

Table 1. *Sample Characteristics of 579 Community-Dwelling, Older Australian Women and the Proportions of Comorbidities for Women With and Without Self-reported Spinal Pain*

	Total	No Spinal Pain ($n = 323$)	Spinal Pain ($n = 256$)	P
Age, y	64.6 ± 1.5	64.5 ± 1.5	64.6 ±1.4	.342
Living in rural area	359 (62.0%)	188 (58.2%)	171 (66.8%)	**.034**
Marital, unmarried/de facto	467 (80.7%)	271 (83.9%)	196 (76.6%)	**.026**
Education level				
No formal education	85 (14.7%)	43 (13.3%)	42 (16.4%)	
High school or trade	385 (66.5%)	217 (67.2%)	168 (65.6%)	.559
University degree or higher	109 (18.8%)	63 (19.5%)	46 (18.0%)	
Labor force, employed	249 (43.3%)	122 (38.0%)	127 (50.0%)	**.004**
Health status, SF-36				
Physical functioning	75.3 ± 23.9	82.2 ± 1.1	66.6 ± 1.6	**<.0001**
Role physical	70.9 ± 39.7	81.3 ± 33.2	57.6 ± 43.1	**<.0001**
Bodily pain	65.7 ± 24.1	76.1 ± 21.1	52.6 ± 21.2	**<.0001**
General health	69.4 ± 20.4	76.4 ± 17.3	60.7 ± 20.7	**<.0001**
Vitality	60.2 ± 21.1	67.2 ± 17.3	51.5 ± 22.2	**<.0001**
Social functioning	84.9 ± 22.7	90.0 ± 19.6	78.4 ± 24.6	**<.0001**
Role emotional	86.2 ± 31.1	92.0 ± 23.7	78.9 ± 37.2	**<.0001**
Mental health	78.1 ± 16.6	81.1 ± 15.2	74.3 ± 17.6	**<.0001**
SF-36 PCS	45.0 ± 10.9	49.0 ± 9.0	40.1 ± 11.1	**<.0001**
SF-36 MCS	52.1 ± 9.5	53.9 ± 8.2	50.0 ± 10.5	**<.0001**
HAQ	0.4 ± 0.5	0.2 ± 0.4	0.6 ± 0.6	**<.0001**
Type of comorbidities				
Diabetes	45 (7.8%)	17 (5.3%)	28 (10.9%)	**.011**
Cardiovascular disease	161 (27.8%)	76 (23.5%)	85 (33.2%)	**.010**
Stroke	6 (1.0%)	3 (0.9%)	3 (1.2%)	.774
Pulmonary disease	90 (15.5%)	39 (12.2%)	51 (19.9%)	**.010**
Cancer	58 (10.0%)	26 (8.1%)	32 (12.5%)	.076
Mental disorder	93 (16.1%)	41 (12.7%)	52 (20.3%)	**.013**
BMI				
Underweight/normal	211 (36.4%)	140 (43.3%)	71 (27.7%)	
Overweight	210 (36.3%)	107 (33.1%)	103 (40.2%)	**.001**
Obese	158 (27.3%)	76 (23.5%)	82 (32.0%)	**<.0001**
Number of comorbidities				
0	129 (22.3%)	89 (27.6%)	40 (15.6%)	
1	207 (35.8%)	128 (39.6%)	79 (30.9%)	
2	145 (25.0%)	70 (21.7%)	75 (29.3%)	**<.0001**
3	74 (12.8%)	29 (9.0%)	45 (17.6%)	
4	18 (3.1%)	5 (1.6%)	13 (5.1%)	
5	6 (1.0%)	2 (0.6%)	4 (1.6%)	

BMI, body mass index; *HAQ,* Health Assessment Questionnaire; *MCS,* SF-36 mental health component scale; *PCS,* SF-36 physical component scale; *SF-36,* Medical Outcomes Study 36 Item Short Form Survey.
Values are expressed as the mean ± the standard deviation or the number (%) of study participants. Significant P values ≤.05 are in boldface.

bowel, skin, and lung cancers (cancer); depression, anxiety, and psychiatric illness (mental disorders). Overweight and obese categories were assigned using cut points from the World Health Organization Consultation on Obesity.[26] Because of the oversampling of women with arthritis in the substudy, musculoskeletal comorbidity (osteoarthritis and osteoporosis) was not appropriate as a part of this analysis.

Number of Comorbidities

The number of comorbidities (diabetes, cardiovascular disease, pulmonary disease, cancer, mental disorders,

stroke, and overweight/obesity) was aggregated to form an ordinal variable, ranging from 0 (no comorbid conditions) to 7 (at least 1 condition in each of the comorbidity groups).

Health Variables

Health-related quality of life was assessed using the Medical Outcomes Study: 36 Item Short Form Survey (SF-36).[27] The SF-36 assesses 8 different domains of health, and responses from the 36 individual items can be aggregated into physical component summary (SF-36 PCS) and mental component

Table 2. *Association Between the Type and Number of Comorbidities for Women With Self-reported Spinal Pain (n = 256) Compared With That for Women Without Self-reported Spinal Pain (n = 323)*

Comorbidity	Univariate OR (95% CI)	P	Multivariate OR (95% CI)[a]	P
Diabetes	2.21 (1.18-4.12)	.013	1.93 (1.01-3.67)	.044
Cardiovascular disease	1.62 (1.12-2.33)	.010	1.57 (1.07-2.28)	.019
Pulmonary disease	1.81 (1.15-2.85)	.020	1.66 (1.04-2.65)	.034
Cancer	1.63 (0.95-2.82)	.079	1.52 (0.86-2.66)	.147
Mental disorder	1.75 (1.12-2.7)	.014	1.60 (1.00-2.55)	.04
BMI				
Underweight/normal	Reference			
Overweight	1.90 (1.28-2.81)	.001	1.98 (1.3-2.96)	.001
Obese	2.13 (1.39-3.25)	.000	2.12 (1.37-3.28)	.001
Number of comorbidities				
0	Reference			
1	1.37 (0.86-2.19)	.183	1.35 (0.84-2.17)	.217
2	2.38 (1.45-3.91)	.001	2.44 (1.47-4.04)	.001
3	3.45 (1.90-6.28)	.000	3.07 (1.66-5.67)	<.0001
4	5.79 (1.93-17.32)	.002	5.05 (1.64-15.54)	.005
5	4.45 (0.78-25.30)	.092	3.70 (0.64-21.54)	.145

BMI, body mass index; *CI,* confidence interval; *OR,* odds ratio.
Significant *P* values ≤.05 are in boldface.
  [a] Adjusted for residence, marital status, highest educational qualification obtained, and participation in the labor force.

summary (SF-36 MCS) scores relative to population norms.[28] Disability was assessed using the Health Assessment Questionnaire (HAQ),[29] which is a generic, self-report measure of general function commonly used in rheumatic diseases.[30]

Statistical Analysis

Descriptive analyses were performed, with statistical significance tested with Student's *t* test for health and sociodemographic data and χ^2 tests for the difference in the proportions of comorbidities between women with and without spinal pain. Binary logistic regression was used to examine the association between spinal pain and each type of comorbidity individually (diabetes, cardiovascular disease, pulmonary disease, cancer, mental disorders, stroke, and overweight/obesity) and to examine the association between spinal pain and the number of comorbidities. Because of the small number of women reporting stroke (*n* = 6), this condition was removed from binary logistic regression analysis. All univariate analyses were adjusted for residence (urban or rural)[31]; marital status (married/de facto or separated/divorced/widowed/single); highest educational qualification (no formal qualification or high/school certificate/diploma/trade or university degree/higher); and participation in the labor force (employed or not employed). As the sample comprised only women in a specific age range, gender and age were redundant as adjusting variables for this study. Statistical significance was set at *P* < .05. All analyses were conducted using the statistical program STATA 12.0 (StataCorp LP, College Station, Texas). The results have been presented as the odds ratio (OR) with corresponding 95% confidence interval (CI).

RESULTS

Sociodemographic Characteristics and Impact on Health-related Quality of Life

Of the 700 women invited to participate in the substudy, 579 consented and returned surveys (82.7% response rate). Three hundred twenty-three women (55.8%) reported having spinal pain. The mean age of women was 64.6 ± 1.5 years. Women with spinal pain were more likely to reside rurally, be employed in the labor force, and be unmarried or de facto (Table 1). In all 8 domains of the SF-36, women with spinal pain had significantly lower scores than women without spinal pain, indicating women with spinal pain have poorer health-related quality of life. Women with spinal pain had significantly lower physical and mental quality-of-life scores than women without spinal pain (SF-36 PCS: 40.1 ± 11.1 vs 49.0 ± 9.0, SF-36 MCS: 50.0 ± 10.5 vs 53.9 ± 8.2, respectively [see Table 1]). Women with spinal pain had significantly higher HAQ scores than women without spinal pain (0.6 ± 0.6 vs 0.2 ± 0.4), indicating women with spinal pain have diminished functional ability.

Associations Between Spinal Pain and the Type of Comorbidity

The proportion of women with spinal pain and comorbidity ranged from 1.2% for stroke to 40.2% for obesity. Diabetes, cardiovascular disease, pulmonary disease, mental disorder, and obesity were all found to be significantly more common among women with spinal pain than among women without spinal pain (Table 1). On logistic regression, after adjusting for sociodemographic

variables, spinal pain was significantly associated with overweight and obesity (OR 1.98 [95% CI 1.3-2.96] and 2.12 [1.37-3.28]), diabetes (1.93 [1.01-3.67]), pulmonary comorbidity (1.66 [1.04-2.65]), mental comorbidity (1.60 [1.00-2.55]), and cardiovascular comorbidity (1.57[1.07-2.28]) (Table 2). Cancer was not significantly associated with spinal pain at the univariate level (1.63 [CI 0.95-2.82], P = .079).

Associations Between Spinal Pain and the Number of Comorbidities

The number of comorbidities ranged from 0 to 5. Only 15.6% of women with spinal pain reported no comorbidity, significantly less than the percentage of women with no spinal pain (27.6%). More than half of the women with spinal pain reported 2 or more comorbidities, with the number of comorbidities (1-4) significantly more common among women with spinal pain than among women without spinal pain (Table 1). After adjustment for sociodemographic variables, spinal pain was significantly associated with the number of comorbidities (Table 2). The odds of spinal pain increased with an increasing number of comorbidities (2 comorbidities: OR 2.44 [95% CI 1.47-4.04], 3 comorbidities: 3.07 [1.66-5.67], 4 comorbidities: 5.05 [1.64-15.54]). Where 5 comorbidities were reported, the association was not statistically significant (3.70 [0.64-21.54], P = .145).

DISCUSSION

This study reports that individual comorbid chronic diseases appear be significantly related to spinal pain. It is also the first study to report a significant incremental increase in the risk of spinal pain associated with increasing comorbidity count. Comorbid chronic diseases contribute to allostatic load, and of interest to future research should be the investigation of the role of spinal pain as a contributor to dysregulated physiological mechanisms.

Spinal pain is common in this sample of older Australian women, with 55.8% of women reporting spinal pain in the previous month. Older Australian women with spinal pain had significantly more disability and worse physical and mental health-related quality of life than did women without spinal pain. This finding is consistent with that of Boakye et al, who found that spinal disorders had a severe impact on physical and emotional health-related quality of life in veterans as measured by the SF-12,[32] although the disability profile of the veterans limited the generalizability of findings to the broader population. Women with spinal pain had significantly lower scores in all 8 domains of the SF-36. This indicates a generally poorer health status, expresses women's feelings of anxiety and incapability, and reflects their inability to engage in housework and social activities with family, friends, and groups.

Women with spinal pain reported more comorbidities than did women without spinal pain. Notably, 33.2% of women with spinal pain had cardiovascular disease and

20.3% had some form of mental disorder. More than 70% of women with spinal pain were classified as overweight/obese. Obesity has been considered a risk factor for the transition from acute to nonacute, nonspecific spinal pain,[33] and associations between obesity with nonspecific spinal pain are reported.[34] In this study, women who had spinal pain were twice as likely to be obese as those without. Leboeuf-Yde reported that 32% of 65 epidemiological studies showed a statistically significant positive weak association between body weight and lower back pain.[35] Although a decrease in musculoskeletal pain has been found with a weight-reduction program,[36] clinical relevance and causative association between obesity and spinal pain have not been determined.

The associations and risks of several comorbid chronic diseases are well accepted. These include associations among cardiovascular disease, chronic kidney disease, and diabetes[37]; pulmonary disease and diabetes[38]; obesity, diabetes, cardiovascular disease, and general pain[39]; and major depression and cardiovascular disease, diabetes, stroke, chronic obstructive pulmonary disease, and renal disease.[40,41] This study found that spinal pain is significantly associated with individual comorbid conditions including diabetes, cardiovascular disease, pulmonary disease, mental disorders, and overweight/obesity. Women who had spinal pain were twice as likely to have diabetes; the odds of diabetes and mental disorder among women with spinal pain were 1.7 and 1.6, respectively. The findings are similar to those of Von Korff et al,[14] who also found strong associations between spinal pain and mental disorders. Whether spinal pain is a cause, an effect, or merely a concomitant of these comorbid conditions is unknown. The co-existence of spinal pain and comorbidities, as presented in this article, warrants future research into etiological associations via causation, associated risk factors, heterogeneity, and independence[10] for spinal pain and comorbid chronic diseases.

It is important to consider comorbidity in spinal pain management. Comorbidities contribute to poor health outcomes and higher health costs, including costs of fragmented care between hospital stays and outpatient monitoring, health services utilization, polypharmacy,[37] and single disease management approaches.[42] In people with comorbidities, patient complexity should be recognized as an important part of clinical management.[10] Interventions focusing on particular risk factors or difficulties in patients with comorbid chronic diseases may be more effective. In 6 of 10 studies examining complex interventions for patients with multimorbidity, the predominant change was to the organization of care delivery (case management or multidisciplinary team approach), and in 4 of the 10 studies, patient-oriented changes were effective.[43] Although in the United States, physicians see the greatest proportion of spinal pain patients, doctors of chiropractic see the next highest proportion.[44] Taking into account patient preference and

clinical guidelines, physicians should consider the role of chiropractors in multidisciplinary case management to co-manage spinal pain and comorbidity. Such innovative approaches may assist in decreasing the burden of ill-health caused by chronic diseases.[45]

Many health-related problems increase with age, especially with respect to the number of comorbid chronic diseases.[46] The vast majority of women (84.5%) with spinal pain reported at least 1 comorbidity, which is consistent with findings from Von Korff et al (87.1%).[14] One-third of women reported 1 or 2 comorbidities, and nearly one-fourth reported 3 or more comorbidities (Table 1). These figures are slightly higher than those of the Australian Bureau of Statistics 2011-2012 National Health Survey for people with arthritis[47] and lower than comorbidity figures self-reported by senior (aged $\geq$50 years) Australians.[48] Previous studies by Dominick et al[20] found an increased risk of chronic pain associated with 2 or more comorbid conditions, potentially contributing to theories of allostatic load. Comorbid chronic diseases contribute to allostatic load through additional physiological, psychological, behavioral, and social stress relating to the management of the condition and any associated disability.[19,49] In this study, there was an incremental increase in the risk associated with increasing comorbidity count. Compared with no comorbidities, having 1, 2, 3, or 4 comorbidities was significantly associated with a 1.4, 2.4, 3.1, and 5.1 increase in the adjusted odds of having spinal pain, respectively. The point estimates for 2 or more comorbidities are higher than for any single comorbidity. These results are similar to those for comorbid disease and chronic pain, which indicate that accumulated comorbid load is independently associated with chronic pain.[20] In this cohort, once the comorbidity count reached 5, the risk of spinal pain was not statistically significant. This could be explained by the small number of women who self-reported 5 co-morbidities ($n = 6$). An alternate explanation is that once a woman reports 5 comorbidities, the full physical and psychological impact of comorbid chronic conditions and associated increased hospitalization and polypharmacy[50] may suppress the relationship with spinal pain. The mechanism of spinal pain as an increased risk of allostatic load cannot be determined from this analysis. Of interest to future study would be the mechanism of spinal pain as a contributor to dysregulated physiological mechanisms and whether spinal pain carries a greater burden of disease than simply the symptoms and disability of pain.

Strengths and Limitations

This study highlights a major research topic in women's health: chronic disease. Strengths of this study include the sample of community-dwelling women and the use of ALSWH, a large nationally representative sample of Australian women. Recruiting 700 community-based women allowed the inclusion of women with a range of disease severity, disease duration, and geographic and socioeconomic backgrounds.[21] With the use of a community-based national sample, rather than a clinical sample, findings may be generalizable to the wider-aged community. Selection bias is avoided when using community samples as disease clusters appear more frequently in patients seeking care than in the general population.[51] The response rate of 82.7% in the cross-sectional postal survey is also a strength of the study.

The use of the self-report of spinal pain is considered a limitation. The self-reported data on arthritis-related procedures from ALSWH are in good agreement with institutional data and are supported for use in epidemiological studies.[52] Also, in the sampling process, the sample was overstratified for women with arthritis (350 women with arthritis and 350 women without arthritis). Therefore, the sample is not a true random sample of women from the middle-aged 1946-1951 cohort.

CONCLUSIONS

Spinal pain is common in older Australian women and is associated with greater disability and poorer quality of life. Diabetes, cardiovascular disease, pulmonary disease, mental disorder, and obesity appear to be significantly related to spinal pain, and there was an incremental increase in the risk associated with increasing comorbidity count.

CONTRIBUTORSHIP INFORMATION

Concept development (provided idea for the research): K.E.d.L., L.P., J.E.B., F.B.

Design (planned the methods to generate the results): K.E.d.L., L.P., J.E.B., F.B.

Supervision (provided oversight, responsible for organization and implementation, writing of the manuscript): K.E.d.L., L.P., J.E.B., F.B., S.H.

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Practical Applications

- This study found that in older Australian women, spinal pain is significantly associated with individual comorbid conditions including diabetes, cardiovascular disease, pulmonary disease, mental disorders, and overweight/obesity.

- The co-existence of spinal pain and comorbidities, as presented in this article, warrants future research into etiological associations via causation, associated risk factors, heterogeneity, and independence for spinal pain and comorbid chronic diseases.

- There is an incremental increase in the risk associated with increasing comorbidity count. The mechanism of spinal pain as an increased risk of allostatic load cannot be determined; however, investigation into the mechanism of spinal pain as a contributor to dysregulated physiological mechanisms is an interesting line of inquiry.

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