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Study of Common Causes and Risk Factors of Lower Back Pain in Adults

Dr. Priti S. Arikar

Assistant Professor in the Department of Dravyaguna Vigyana

BMAC & RH

Butibori Nagpur, Maharahtra- 441122

Orcid id: https://orcid.org/0009-0008-7113-9735

Abstract — Lower back pain is a prevalent medical condition affected by interrelated physical, occupational, behavioral, and psychological variables. The separation of associated exposures and specific causes is necessary for an appropriate analysis and planning of prevention efforts. This paper offers a framework for cross-sectional study design investigating lower back pain and its associated factors among adults aged 18-60 years. Simulated provisional analyses involve 300 subjects, with 120 having had the problem of lower back pain in the last year and 180 without these symptoms. The information covers demographic variables, body mass index, occupational lifting, recreational activity, sitting time, smoking, perceived stress, and symptom triggers reported by participants. The provisional 12-month prevalence is 40.0% (95% confidence interval [CI] 34.6%-45.6%). Increased likelihood of reporting pain is connected with being 45-60 years old (odds ratio [OR] 2.48; 95% CI 1.54-3.98), obesity (OR 2.07; 95% CI 1.22-3.52), occupational lifting (OR 2.54; 95% CI 1.55-4.15), lack of recreational activity (OR 1.96; 95% CI 1.23-3.13), and high perceived stress (OR 2.60; 95% CI 1.60-4.22). No statistically significant associations with sex, sitting, and smoking were found. The framework provides for a multidimensional approach but recognizes the limitations of cross-sectional analysis that cannot show temporality or causality. Real data from participants and additional studies are needed to validate these connections.

Keywords — Lower back pain, adults, associated factors, occupational lifting, obesity, perceived stress.

Introduction

Low back pain interferes with daily activity, work performance, sleep and quality of life. WHO estimates that 619 million people suffered from low back pain worldwide in 2020. WHO further notes that about 90% of cases are nonspecific, which means that the specific disease or anatomical cause could not be determined [1]. Consequently, the study of "common causes" should exclude any attempt of making an exact anatomical diagnosis from the questionnaire responses only.

It is important to distinguish between specific causes, associated factors, and symptom triggers. Specific causes should be diagnosed by clinical examination. Associated factors represent a characteristic that occurs more often in people with pain. Symptom triggers are activities that a participant thinks caused or worsened symptoms. The concepts overlap in practice but have separate evidentiary meanings.

According to Hartvigsen and his co-authors, the low back pain can be defined as a complex phenomenon, involving biological, psychological, and social factors [2]. This view refutes attempts at explaining the problem with the use of posture, body weight, or physical labor only. It is also supportive of analyzing several exposures at once instead of looking for a universal reason.

The current paper proposes a design of an adult survey considering the above-mentioned distinctions. It assesses the presence of symptoms as well as demographic, occupational, and behavioral factors. Symptoms' triggers are recorded as separate variable, but specific clinical causes remain out of reach of the survey's diagnostic tools.

Literature Review

Lower Back Pain Prevalence

The systematic review by Hoy et al. found great variance in the prevalence in different populations and studies [3]. This is because of differences in symptom definitions, recall period, age range, and sampling. Therefore, a survey describing 12 months symptoms is not comparable to point prevalence and chronic pain surveys without explanation.

Symptom Questionnaire

Kuorinka et al. have developed standardized Nordic questionnaires for musculoskeletal symptoms [4]. Their methodology allows for consistency in anatomical localization and recall period. However, symptom questionnaires describe reported complaints and not their pathological cause. Therefore, the interpretation of the causes of self-reported complaints should be done with caution.

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Exposure to Occupation Loading

The meta-analysis by Coenen et al. investigated occupational lifting and low back pain [5]. Their exposure-response results indicate that lifting frequency and load need to be considered. However, occupational pain depends on many factors. Moreover, questionnaire cannot prove tissue damage due to any specific lifting episode.

Body Weight and Smoking



Shiri et al. published meta-analysis about obesity as a risk factor for low back pain [6]. It shows that body mass index should be included even though it is not direct measurement of conditioning and body composition.

Shiri et al. investigated association of smoking with low back pain [7]. They performed meta-analysis and described evidence from the cohort studies. It justifies analysis of this factor, but it doesn't mean that each local sample will provide statistically significant estimation. Intensity, duration of exposure, confounders and sample size may influence the result.

Recreational Physical Activity and Sedentary Behaviour

Shiri and Falah-Hassani investigated prospective studies of leisure time physical activity [8]. It is essential to consider difference between recreational physical activity and occupational load. These two factors should not be regarded as one.

In their review of longitudinal studies, Alzahrani et al. concluded that sedentary time was not consistently associated with the onset of low back pain, though it was linked to disability [9]. This questions the idea that being seated for a long period inevitably leads to developing back pain. Duration of sitting, variability in movements, symptoms, and their consequences are distinct characteristics and need to be examined separately.

Psychological Factors

According to Pinheiro et al., depressive symptoms were associated with the occurrence of episodes of low back pain [10]. It supports that psychological factors should be included in researches. Depression and stress are different things: the latter is measured with just one question and cannot duplicate a depressive scale or make a diagnosis of the disorder.

Prevention and Multifaceted Approach

Steffens et al. conducted a systematic review that demonstrated that prevention strategies included exercises, including exercise plus education [11]. The evidence related to prevention should be distinguished from evidence of exposure, since finding a correlate is not equivalent to the ability to modify it in order to prevent a symptom.

WHO guideline for managing chronic primary low back pain highlights the importance of person-centred and integrated care in primary and community settings [12]. It is relevant because it highlights the importance of taking into account the whole person rather than reducing symptoms to one physical attribute. WHO guideline is about management of chronic primary pain and not about the proof that general survey proves the presence of this condition.

Gap in the Research

The practical gap that is being addressed here is the separation of symptoms, associated exposures and perceived triggers within a clear analytical framework. Such approach enables examining common beliefs about explanation without making unproven diagnoses or claims about causality.

Aim and Objectives

The aim of the study is to examine lower back pain and associated factors among adults aged 18–60 years.

Objectives of this study are to estimate the prevalence of symptoms within the sample in the last 12 months, to compare selected exposures in adults with and without symptoms, to identify the triggers as seen by participants, and to identify priorities for further longitudinal examination.

The null hypotheses are formulated that the reported lower back pain is unrelated to each selected demographic, occupational, and behavioural exposure.

Materials and Methods

Study Design and Setting

It is planned to conduct community-based analytical cross-sectional survey. Participants will be recruited from the sampling frame of the defined area independently of their pain.

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Households will be randomly selected, and from them randomly selected one adult per household. It reduces the interdependence of observations and prevents the selection of those who attend health services. Locations, dates, response rate and other deviations from the plan will be recorded in the process of conducting the study.

Eligibility Criteria

Eligible subjects are adults aged 18–60 years who lived in the area under study for at least six months and could provide informed consent.

Participants will be recruited regardless of the type of their occupation and the pain status. Those who are unable to participate in the study and complete a clear interview will require an appropriate alternative method. In case of clinical symptoms that are detected during the process of the field work participants will be referred, but not diagnosed by questionnaire administrator.

Sample Size

Given the assumed prevalence of 50%, confidence level of 95% and absolute precision of six percentage points we have:

$$n = \frac{1.96^2 \times 0.50 \times 0.50}{0.06^2} \approx 267$$

Target number of 300 responses exceeds this number slightly. The number of invitations will be 334 assuming 10% non-response.

This calculation relies on approximate independence of the sampling process. In case of clustering, differences in selection probabilities or substantial non-response additional plans and analysis will be needed.

Outcome Definition

Outcome is self-reporting pain or discomfort between the lower rib margin and buttock region lasting at least one day during the last 12 months.

The diagram of the body will help with identification of the anatomical location. The participants will be categorized as having or not having lower back pain. This measure reports symptoms and does not define chronicity, severity, radiculopathy or any diagnosis.

Exposure Assessment

Age categories are 18–29, 30–44, 45–60 years. Main comparison between ages includes two first categories.

Body mass index will be calculated based on measured height and weight. For the current analysis, obesity is defined as 30 kg/m² and needs to be specified precisely rather than included into mixed classification.

Occupational lifting frequently means handling loads of at least 10 kg ten or more times a day, at least three days a week. Participants without frequent occupational lifting will form reference group.

Low leisure-time activity means spending less than 150 moderate-equivalent minutes a week during the last typical week with vigorous minutes weighted twice. It is an indicator of leisure activity in the current study, not physical activity overall.

Prolonged sitting means spending at least 8 hours a day. Current smoking includes daily or occasional smoking. Frequent perceived stress means reporting feelings of being stressed 'often' or 'very often' in the past month.



Participant-Attributed Triggers

Individuals reporting pain can choose more than one activity believed to have aggravated or precipitated their symptoms. Possible choices include lifting, long periods of sitting, bending, housework, and unknown.

The answers are analyzed as perceptions. They are not considered confirmed causes.

Quality Assurance

Standardized interviewer training is required. Checking height/weight instruments and questionnaires for missing responses is suggested.

Conducting another pilot for wording and length of interview is necessary. There is no mentioned pilot reliability or validity coefficient since no field validation was done.

Statistical Analysis

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Categorical variables are summarized in terms of frequencies and percentages. A Wilson interval is provided for the estimated prevalence uncertainty.

Pain status by exposure comparison involves Pearson's chi-square test. The unadjusted prevalence odds ratio with its 95% CI using the displayed two-by-two table is calculated.

The analyses are exploratory, and two-sided p-value less than .05 is used without any multiplicity adjustment. An adjusted model is not reported since there is no marginal table showing joint associations.

Results

Characteristics of Sample

The provisional sample consists of 300 individuals: 165 females and 135 males. Out of them, 120 have lower back pain in the last year.

Table 1. Provisional demographic distribution

Characteristic	Category	Total, n	Lower back pain, n	No lower back pain, n
Age	18–29 years	60	12	48
	30–44 years	105	38	67
	45–60 years	135	70	65
Sex	Women	165	68	97
	Men	135	52	83
Body mass index	Below 30 kg/m²	225	80	145
	At least 30 kg/m²	75	40	35

Each characteristic totals 300, including 120 participants with symptoms and 180 without symptoms.

Symptoms Prevalence - Provisional

12 month prevalence rate is 120/300 which is equal to 40.0%, with a 95% confidence interval from Wilson method of 34.6%–45.6%.

The prevalence rises with respect to the specified age groups: 20.0% for those aged 18-29, 36.2% for those aged 30-44, and 51.9% for those aged 45-60.



These values are sample based estimates and not population parameters.

Relationship with Selected Risk Factors

Occupational lifting, obesity, lack of leisure activity, stress, and older age have positive association with pain complaints.

Associations With Selected Exposures

Frequent occupational lifting, obesity, low leisure-time activity, frequent stress, and older age show positive associations with reported pain.

Table 2. Provisional exposure comparisons

Exposure	Pain / no pain among exposed	Pain / no pain in reference group	Unadjusted OR (95% CI)	*P*
Age 45–60 versus 18–44 years	70 / 65	50 / 115	2.48 (1.54–3.98)	<.001
Women versus men	68 / 97	52 / 83	1.12 (0.70–1.78)	.636
Obesity versus BMI below 30	40 / 35	80 / 145	2.07 (1.22–3.52)	.006
Frequent occupational lifting	55 / 45	65 / 135	2.54 (1.55–4.15)	<.001

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Low leisure-time activity	68 / 72	52 / 108	1.96 (1.23–3.13)	.005
Sitting at least eight hours daily	65 / 85	55 / 95	1.32 (0.83–2.10)	.239
Frequent perceived stress	60 / 50	60 / 130	2.60 (1.60–4.22)	<.001
Current smoking	25 / 25	95 / 155	1.63 (0.89–3.00)	.114

Each comparison independently totals 300 participants.

Stress has the highest value for the stress estimate, but overlapping confidence intervals mean it cannot be ranked among the independent predictors.

Absolute Differences in Symptom Occurrence

While odds ratios need to be interpreted with absolute proportions, particularly when the event is frequent.

Table 3. Provisional symptom prevalence within selected exposure categories

Exposure	Exposed prevalence	Reference prevalence	Difference, percentage points
Age 45–60 years	51.9%	30.3%	21.6
Obesity	53.3%	35.6%	17.8
Frequent occupational lifting	55.0%	32.5%	22.5
Low leisure-time activity	48.6%	32.5%	16.1
Frequent perceived stress	54.5%	31.6%	23.0

Differences are calculated before rounding.

Participant-Attributed Triggers

Among the 120 respondents reporting symptoms, lifting and prolonged sitting are commonly selected as perceived triggers.

Table 4. Provisional perceived triggers among symptomatic respondents

Reported trigger	Frequency	Percentage of 120
Lifting or carrying loads	48	40.0
Prolonged sitting	42	35.0
Repeated bending	36	30.0
Household activities	30	25.0
No identifiable trigger	40	33.3

Multiple activity responses are allowed; “no identifiable trigger” is apart from the listed activities. Thus, the percentages sum up to more than 100% in total.

Discussion

The analysis reveals a multifactorial pattern instead of singling out one risk factor. Being older, obese, a job-related lifter, having little leisure time activity, and experiencing frequent stress are linked with symptoms. The role of sex, sitting time, and smoking remains unclear for this population.

The lifting link fits into the findings of Coenen et al. [5]. Still, this survey uses an oversimplified criterion without assessing the accumulated workload, load position, rest period, and changes in employment after the onset of symptoms. If there is an association, it calls for an occupational evaluation rather than claiming that lifting causes harm.

The obesity coefficient corresponds with the general relationship summarized by Shiri et al. [6]. Yet, obese people may differ in various features which may affect the symptoms. Hence, no isolation of the effect of body weight is possible without adjustment or longitudinal study. Also, such explanations should not put the blame on personal features.

The absence of leisure-time activity is associated with pain, but it is possible that reverse causality occurs. People with symptoms may have lower activity levels. Therefore, the result should be interpreted along with prospective findings [8] instead of proving the causality of inactivity.

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The stress association presents a similar issue. Perceived stress at the time of the interview could occur after pain, before pain, or have common determinants like workload and disrupted sleep. The study by Pinheiro et al. relates to depression [10]; it applies to the psychological domain generally but does not validate the current stress variable alone.

The sitting association illustrates the contrast between perceived triggers and epidemiologic association. Thirty-five percent of individuals who experience lower back pain report aggravation from sitting, although sitting duration is not associated with pain in the entire simulated sample. Both of these findings can hold true; aggravation in an activity does not mean that it causes symptom onset.

As with smoking, the nonsignificant result of an imprecise positive estimate does not discredit previous meta-analytic findings [7]. With only 50 current smokers in the simulated sample, the confidence interval can allow for both little association and a greater relative increase in risk.

Lastly, unadjusted odds ratios are not risk ratios. In the case of lifting, the odds ratio is 2.54 while the displayed prevalence is 55.0% vs 32.5%. “2.54 times the risk” would incorrectly describe this relationship.

Practical implications

A finished study with these results would warrant a comprehensive examination of work requirements, activities, body composition, and psychosocial status. However, it would not suggest a single posture or lifestyle factor as the cause of an individual's pain.

Prevention planning would be based on intervention science, such as that of exercise programs [11], while continuing pain would call for a clinical evaluation as dictated by the principles of comprehensive care [12].

Limitations

All numerical results are simulated and thus provide no evidence of the real-life situation in any community.

Any cross-sectional survey would be vulnerable to recall bias, nonresponse bias, misclassification of exposure, and reverse causation. Current exposures may not reflect pre-symptomatic behaviour. Wide cut-offs decrease information about exposures and the stress question is not diagnostic.

Without multivariable analysis, the independence of associations cannot be determined. Without medical imaging and examination, it is impossible to confirm the specific cause of pain. Multiple comparisons increase the risk of chance findings.

Conclusion

Back pain studies should consider causes of the condition, associated exposures, and patient-reported triggers. The suggested survey approach considers all these factors in a consistent manner and selects questions that deserve further study. Observations are needed to calculate the prevalence, determine the adjusted relationship, and examine the effect of changes in modifiable exposures on future symptoms.

Ethics Approval and Informed Consent

No human-participant research was carried out in preparation of this draft. Its implementation requires institutional approval, informed consent, protected data storage, and adequate clinical referral procedures.

Funding and Competing Interests

Funding sources and competing interests must be stated in the actual study context.

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