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Prevalence of acute low back pain with risk of long-term disability and its correlates among medical students: A cross-sectional study

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Abstract:

BACKGROUND: Low back pain (LBP) is responsible for the highest number of years lived with disability globally. There is a paucity of data regarding the same among medical students. So, this study was planned to estimate the prevalence of acute LBP having a high propensity to develop into chronic one as well as to determine associated correlates among medical students.

MATERIALS AND METHODS: This cross-sectional study was conducted among 300 medical students at a tertiary hospital using an Acute Low Back Pain Screening Questionnaire (ALBPSQ) to identify individuals with LBP and having a high risk of developing a long-term disability. ALBPSQ is a 21-question-based biopsychosocial screening instrument for identifying patients at risk of chronicity. ALBPSQ scores have been found to be significantly associated with pain and functional disability. Descriptive statistics, bivariate analysis, and multiple binary logistic regression have been performed through SPSS-22 software.

RESULTS: The prevalence of LBP having the propensity to develop into a long-term disability was found to be 14.3% (95% CI: 10.6–18.8). In bivariate analysis, higher age, no exercise, higher screen time, mental stress, studying in bed, abnormal posture, alcohol intake, tobacco use, positive family history, greater screen time per day, and more time spent in a sitting posture are significant with LBP. Stress ((adjusted odds ratio) AOR: 4.37, 95% CI: 1.79–10.68)), abnormally bent standing posture (AOR: 3.6, 95% CI: 1.3–10.6), and positive family of LBP (AOR: 3.6, 95% CI: 1.3–10.1) were found to be independent predictors of LBP among medical students.

CONCLUSION: Among medical students, every 15 out of 100 have a low back problem with chances of long-term disability. These students require early intervention to avoid long-term disability. Abnormal stooping posture, psychological stress, and positive family history of low pain might independently lead to LBP.

Keywords:

Cross-sectional studies, disability evaluation, low back pain, medical, risk factors, students

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Introduction

Approximately 50%–80% of people suffer from low back pain (LBP) at some point in their lives.[1,2] Globally, chronic LBP is the most common cause of disability affecting all age groups and both genders and also leading to the high economic cost.[3] Years lost due to disability due to LBP in 2017 globally were found to be 53,645.9 which is the highest among all diseases. According to the Global Burden of Disease 2019 study, globally, there were 223.5 million estimated cases of LBP and 63.7 million LBP-related disability-adjusted life years. The incidence in male subjects was

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lower than that in female subjects. In an Indian study among the adult population, lifetime, point, one-year and age-standardized lifetime prevalence were 57%, 32%, 48% and 59%, respectively.[4] Occupation is a strong predictor of LBP.[5] Few epidemiological studies suggest about high point prevalence of LBP among medical students ranging from 10% to 32.5%.[6-8] A certain percentage of LBP gets converted into chronic LBP leading to disability.[9] The main risk factors for LBP are gender (female), older age, increased body mass index (BMI), positive history of over-exertional back trauma, bending the neck forward for a long period, carrying heavy weight, awkward posture, standing for long hours, lack of physical exercise, smoking with more than 11 cigarettes per day.[10-14] However, all these factors have not been collectively studied by medical students. This group of individuals are of special concern since they require special attention to prevent the future development of disability. No study in eastern India has measured the percentage of acute LBP, which is having higher propensity to later develop into chronic LBP and long-term disability. This study helps in identifying medical students having LBP with the propensity to develop a disability. Therefore, this study was planned to estimate the prevalence of acute LBP having a high propensity to develop into chronic LBP and disability as well as to determine associated correlates of LBP.

Material and Methods

Study settings

The present study was conducted at an institute of national importance under the Ministry of Health and Family Welfare, Government of India in eastern India with 42 specialized departments and 960 beds available for all types of emergency and high-risk cases. This institute focuses on medical education, patient treatment, and medical research. The first batch of medical students Bachelor of Medicine and Bachelor of Surgery, MBBS were enrolled in 2012 with an admission of 100 students every year.

Study participants

The study participants included all the eligible medical students studying in the first, second, third, and final year MBBS at this institute. The study participants belong to different parts of India since this is a national institution, and admission occurs through centralized counselling. Medical students who had spinal trauma or underwent spinal surgery or significant MRI and those who did not consent to participate in the study were excluded from the study.

Study design and duration

The present study was an analytical cross-sectional study using a self-administered questionnaire. Data collection was started in April 2021 and continued till October 2021.

Sampling strategy and sample size

The sampling strategy adopted for the study was simple random sampling. This involved the first formation of a sampling frame which is a list of all eligible participants. The sampling frame was prepared from a list of students in each batch. The sample size for the present study was done with the help of Statulator, an online software efficient in sample size determination.[15] Adequate sample size required for the present study was found to be 312 assuming a prevalence of 33% from a previous study, a finite population size of 400, and an expected response rate of 85% with 10% relative precision and 95% confidence interval.[6] But we included all the eligible students in the study.

Data collection tool

A semi-structured, pre-validated, self-administered questionnaire was developed. This tool was used to develop an online data collection tool through the medium of Google Forms. Use of Google Forms ensured cleanly validated and precise data collection. The items were in the English language. The forms were encrypted with consent and those who gave consent were only able to fill the forms subsequently. The study tool was divided into three sections. Section A comprised sociodemographic details of the students like age, gender, and residence. Section B comprised lifestyle attributes related to students like physical activity, yoga and meditation, presence of stress at college, various habits including the use of tobacco, alcohol, coffee/tea consumption, various body postures maintained during different tasks in the day, screen time, sleep duration, travelling habits, lifting heavy backpacks, and family history of LBP. Section C constituted items related to the LBP. An acute LBP screening questionnaire was used to identify individuals with LBP who have a high risk of developing long-term disability.[9] This screening tool is endorsed by the New Zealand guidelines group. This screening tool consisted of 21 questions. A total of 18 items are on a number rating scale from 1 to 10. The minimum and maximum scores for each question were 1 and 10, respectively. The highest possible score can be 210. Scores greater than 105 help in identifying individuals suffering from an acute LBP with high chances of developing a long-term disability and thus needing modification in the management of their LBP problem. This questionnaire was pretested among 10 nursing students. An optimal cut-off score of 72 was used for predicting future sick leave, with a sensitivity of 77% and a specificity of 62%. Internal consistency of the items on LBP was obtained through Cronbach's alpha coefficient (0.90). This questionnaire could correctly screen 86% of those who will have work off between

1 and 30 days. Demographic variables, day-to-day activities-related variables, and anthropometric measurements were collected. Self-reported weight and height measurements by study participants have been used to calculate BMI. Few operational definitions have been used. An acute LBP has been defined as LBP of less than four weeks and chronic LBP when pain persists for more than 12 weeks. While characterizing day-to-day activities, regular has been defined as activities done daily, and occasionally has been defined as activities done one to two times per week.

Study procedure

Eligible participants from each MBBS batch were gathered together. They were sensitized about the purpose of the study. Written informed consent was first obtained from all the eligible participants. Then, emails were sent to each participant containing the link for the Google Form which was created to collect the data for the study. All the study participants used their smartphones to access the questionnaire. All the students filled out the questionnaire between 15 and 20 min. Then, students were advised to seek professional help from the Department of Orthopedics and Physical medicine and rehabilitation, All India Institute of Medical Sciences, Patna. Lastly, an Information Education Communication material about self-care, prevention, and management of LBP developed in the form of a booklet was distributed among the participants. Those study participants who were not available on the first day were contacted individually through telephone and were asked for a suitable time for conducting the survey. Later data were collected from them.

Data management and statistical analysis plan

The data which were collected through Google Forms were downloaded in MS excel format. These data were then transferred into Statistical Software SPSS version 22 for analysis. First descriptive statistics were calculated through the software. Categorical variables like the proportion of LBP were presented as frequency and percentages. Continuous variables were first assessed for their normality by Q-Q plots. The continuous variables if followed normality were presented as mean and standard deviation and if they followed non-normality were presented as median and interquartile range. Then, bivariate analysis was done using the Chi-squared test or Fisher's exact test in case of a categorical variable and independent *t*-test or Mann-Whitney U test in case of a quantitative variable. A *P* value of less than 0.05 was considered significant. Lastly, to identify independent predictors of LBP, a multivariable binary logistic regression was performed. AOR and CI were calculated. In the final model, variables which had a significant relationship ($P < 0.05$) in the bivariable analysis and sufficient frequency of greater than five in each cell and normally distributed in the case of quantitative variables were included.

Ethical consideration

The study was approved by the Institutional Ethics Committee, AIIMS Patna with the reference number AIIMS/Pat/IEC/2021/759. All study participants signed a written informed consent before the start of data collection. The study participants were informed about being voluntary participants and also informed that they were free to withdraw from the study at any time. They were also informed that the confidentiality of their data will be maintained and will be used for research purposes only.

Results

Sociodemographic and behavioral characteristics of study participants

A total of 300 participants were included in this analysis (response rate: 96.2%). Males constituted approximately two-thirds of the study population (70.3%). The mean (SD) age group of the study participants were found to be 20.1 (±2.4) years as shown in Table 1. Students from the first, second, third, and fourth years were 28%, 17%, 29% and 26%, respectively. Almost half (48%) of the study participants reported that they occasionally perform physical exercise followed by 34.7% of study participants who regularly perform physical exercise. When asked about performing yoga asanas, almost two-thirds of study participants (66.7) reported that they had never performed yoga asanas. One-fourth of the study participants (27.3%) fell into the overweight category according to the calculated BMI. Median screen time (interquartile range) was found to be 6 (4–8) hours per day. The mean (SD) sleep duration was 7.1 (1.2) hours per day. Nearly one in two (45.7) felt stressed in medical college.

Prevalence of LBP among students

The last one-year LBP prevalence among medical students was found to be 14.3% (95% CI: 10.6–18.8) as shown in Table 2**.** The prevalence of LBP was slightly lower in females (13.5%) as compared to males (14.7%). With the increase in age, there is an overall increase in the prevalence of LBP in both the male and female categories [Table 2**].**

Some of the specific items of the screening questionnaire used for LBP are shown in Figure 1. Around 56 (18.7%) students completely disagreed with the statement that physical activity makes the pain worse and 89 (29.8%) somewhat and completely agreed with this. Only 23 (7.7%) completely agreed with the statement that an increase in pain is an indicator that they should stop the work till the pain decreases. More than half (171, 57%) of the students disagreed that they should not do their normal work because of pain. [Figure 1].

Table 1: Association of LBP among medical students with sociodemographic and lifestyle variables (*n*=300)

Variable	Categories	Total (*n*=300)	Low back pain, *n* (%)		*P***
			Present *n*=43 (14.3%)	Absent *n*=257 (85.7%)	
Gender	Female	89 (29.7)	12 (13.5)	77 (86.5)	0.785
	Male	211 (70.3)	31 (14.7)	180 (85.3)	
Age in years, mean±SD		20.1±2.4	21.7±3.7	20.8±2.1	0.047*
Year of medical education	First year	84 (28.0)	8 (9.5)	76 (90.5)	0.171
	Second year	51 (17.0)	8 (15.7)	43 (84.3)	
	Third year	87 (29.0)	18 (20.7)	69 (79.3)	
	Fourth year	78 (26.0)	9 (11.5)	69 (88.5)	
Physical exercise	Never	51 (17.0)	14 (27.5)	37 (72.5)	0.003*
	Occasional	145 (48.3)	12 (8.3)	133 (91.7)	
	Regular	104 (34.7)	17 (16.3)	87 (83.7)	
Yoga	Never	200 (66.7)	32 (16.0)	168 (84.0)	0.257
	Occasional	85 (28.3)	8 (9.4)	77 (90.6)	
	Regular	15 (5.0)	3 (20.0)	12 (80.0)	
BMI category#	Underweight	26 (8.7)	2 (7.7)	24 (92.3)	0.574
	Normal	184 (61.3)	25 (13.6)	159 (86.4)	
	Overweight	82 (27.3)	15 (18.3)	67 (81.7)	
	Obese	8 (2.7)	1 (12.5)	7 (87.5)	
Screen time in hours, median (IQR)		6 (4-8)	7 (5-10)	6 (6-8)	0.047*
Sleep duration in hours, Mean±SD		7.1±1.2	7.4±1.8	7.1±1.0	0.210
Mental stress in the workplace	Yes	137 (45.7)	35 (25.5)	102 (74.5)	<0.001*
	No	163 (54.3)	8 (4.9)	155 (95.1)	
Usual place of study	Bed	61 (20.3)	13 (21.3)	48 (78.7)	0.037*
	Both	136 (45.3)	12 (8.8)	124 (91.2)	
	Table	103 (34.3)	18 (17.5)	85 (82.5)	
Body posture while studying	Abnormal	63 (21.0)	10 (15.9)	53 (84.1)	0.695
	Normal	237 (79.0)	33 (13.9)	204 (86.1)	
Body posture while standing	Abnormal	17 (9.0)	12 (44.4)	15 (55.6)	<0.001*
	Normal	273 (91.0)	31 (11.4)	242 (88.6)	
Body posture while doing an online class	Abnormal	98 (32.7)	19 (19.4)	79 (80.6)	0.082
	Normal	202 (67.3)	24 (11.9)	178 (88.1)	
Body posture while eating	Abnormal	27 (9.0)	8 (29.6)	19 (70.4)	0.017*
	Normal	273 (91.0)	35 (12.8)	238 (87.2)	
Alcohol intake	Never	274 (91.3)	33 (12.0)	241 (88.0)	<0.001*
	Ever	26 (8.7)	10 (38.5)	16 (61.5)	
Tobacco use	Never	281 (93.7)	36 (12.8)	245 (87.2)	0.013*
	Occasional	13 (4.3)	4 (30.8)	9 (69.2)	
	Regular	6 (2.0)	3 (50.0)	3 (50.0)	
Tea/Coffee consumption	Never	42 (14.0)	6 (14.3)	36 (85.7)	0.962
	Occasional	148 (49.3)	22 (14.9)	126 (85.1)	
	Regular	110 (36.7)	15 (13.6)	95 (86.4)	
Aerated Beverage	Never	103 (34.3)	13 (12.6)	90 (87.4)	0.722
	Occasional	170 (56.7)	25 (14.7)	145 (85.3)	
	Regular	27 (9.0)	5 (18.5)	22 (81.5)	
Family history of low backache	No	192 (64.0)	18 (9.4)	174 (90.6)	0.001*
	Yes	108 (36.0)	25 (23.1)	83 (76.9)	
The habit of heavy backpack	Never	77 (25.7)	10 (13.0)	67 (87.0)	0.127
	Occasional	193 (64.3)	25 (13.0)	168 (87.0)	
	Regular	30 (10.0)	8 (26.7)	22 (73.3)	
Laptop use	Never	56 (18.7)	6 (10.7)	50 (89.3)	0.197
	Occasional	153 (51.0)	19 (12.4)	134 (87.6)	
	Regular	91 (30.3)	18 (19.8)	73 (80.2)	

Contd...

Table 1: Contd...

Variable	Categories	Total (*n*=300)	Low back pain, *n* (%)		*P***
			Present *n*=43 (14.3%)	Absent *n*=257 (85.7%)	
Travel by public transport	Never	37 (23.3)	7 (18.9)	30 (81.1)	0.247
	Occasional	237 (79.0)	30 (12.7)	207 (87.3)	
	Regular	26 (8.7)	6 (23.1)	20 (76.9)	
Self-driving frequency	Never	136 (45.3)	14 (10.3)	122 (89.7)	0.149
	Occasional	121 (40.3)	20 (16.5)	101 (83.5)	
	Regular	43 (14.3)	9 (20.9)	34 (79.1)	
Mode of travel	Car	30 (10.0)	5 (16.7)	25 (83.3)	0.189
	Motorcycle	74 (24.7)	15 (20.3)	59 (79.7)	
	Walking	196 (65.3)	23 (11.7)	173 (88.3)	
Time spent in sitting posture	Sitting and moving equally	179 (59.7)	19 (10.6)	160 (89.4)	0.025*
	Sitting most of the time	121 (40.3)	24 (19.8)	97 (80.2)	
High heel in shoe wear	No	277 (92.3)	40 (14.4)	237 (85.6)	0.854
	Yes	23 (7.7)	3 (13.0)	20 (87.0)	

*P<0.05 is statistically significant; **P by Chi-squared test/Fischer's exact test/independent t-test/Mann-Whitney U test; #BMI calculated by using self-reported height (m) and weight (kg) by using formulae weight (kg)/height (m)^2

Table 2: Prevalence of LBP among medical students (*n*=300)

Age group (years)	Prevalence of LBP in males		Prevalence of LBP in females		Overall Prevalence of LBP	
	n	% (95% CI)	*n*	% (95% CI)	*n*	% (95% CI)
≤19	6	12.0 (4.5-24.3)	1	4.2 (0.1-21.1)	7	9.5 (3.9-18.5)
20-21	11	13.8 (7.1-23.3)	5	16.1 (5.5-33.7)	16	14.4 (8.5-22.4)
22-23	11	17.7 (9.2-29.5)	5	17.9 (9.7-53.5)	16	17.8 (10.5-27.3)
24-25	3	20.0 (4.3-48.1)	0	0.0 (0.0-84.2)	3	17.6 (3.8-43.4)
≥26	0	0.0 (0.0-60.2)	1	25.0 (0.6-80.6)	1	12.5 (0.3-52.7)
Overall	31	14.7 (10.2-20.2)	12	13.5 (7.2-22.4)	43	14.3 (10.6-18.8)

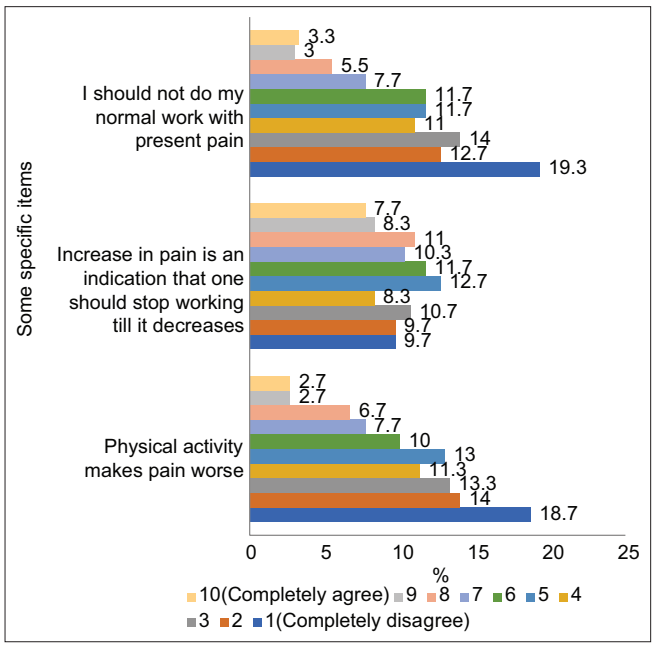

Figure 1: Some specific items of the low back ache screening questionnaire (*n* = 300)

Bivariate analysis of associated risk factors with LBP in students

The mean age of students having LBP was higher (21.7 years) as compared to students not having LBP (20.1 years) and this difference was found to be statistically significant. Males had a slightly higher prevalence (14.7%) as compared to females (13.5%). However, this difference was statistically not significant as shown in Table 1. Medical students who never performed exercise had a higher LBP prevalence (27.5%) as compared to those who performed exercise occasionally and regularly (8.3%, 16.3%) which was found to be significant. Other variables which were found to be statistically significant with LBP occurrence were screen time duration per day, mental stress, usual place of study, body posture while standing, body posture while eating, alcohol intake, tobacco use, family history of LBP, mobile use, and time spent in sitting posture [Table 1].

Multivariable analysis to find independent risk factors of LBP

A multivariable binary logistic regression model was applied to find independent predictors of LBP among medical students and to remove the effect of confounders. The predictive capacity of the model was found to be 29.9% (Negelkerke R^2 = 0.299) as shown in Table 3. This model was found to fit with the Hosmer-Lemeshow test P value of 0.151. The occasional exercise was found to be protective against LBP with an AOR of 0.323 (0.12–0.84). Stress was found to be a significant predictor of LBP with an AOR of 4.37 (1.79–10.68). Abnormal bent standing posture is also a predictor of LBP with an AOR of 3.6 (1.3–10.1). Positive family history of LBP was also

Table 3: Multivariable binary logistic regression model to find out the predictors of LBP among medical students (*n*=300)

Characteristics	*B*	AOR (95% CI)	*P*
Age	0.047	1.048 (.901-1.220)	0.542
Exercise			
Occasional-Never	-1.132	0.323 (0.124-0.837)	0.020
Regular-Never	-0.162	0.850 (0.335-2.162)	0.734
Stress			
Yes-No	1.474	4.367 (1.786-10.681)	0.001
Study place			
Table/Bed	0.223	1.250 (0.490-3.188)	0.640
Both bed and table/bed	-0.785	0.456 (0.171-1.216)	0.117
Standing body posture			0.015
Normal	1.282	1	
Abnormal		3.605 (1.287-10.098)	
Posture at the time of eating			0.915
Normal	-0.60	1	
Abnormal		0.942 (0.312-2.843)	
Family history of low backache			0.015
Yes/No	0.926	2.525 (1.200-5.313)	
Time spent while sitting			0.331
Sitting and moving equally/Sitting most of the time	-0.377	0.686 (0.321-1.467)	
Constant	-3.410	0.033	0.045
Hosmer Lemeshow test (Chi-squared, Sig)	11.994 (0.151)		
Negelkerke R^2	0.299		

found to significantly predict LBP occurrence with an AOR of 2.5 (1.2–1.5). [Table 3].

Discussion

This study was conducted among 300 medical undergraduates in the eastern part of India with the objectives of estimating LBP prevalence with risk of long-time disability, its associated risk factors, and predictors among medical students. One-year prevalence of LBP among medical undergraduates was found to be 14%. Prevalence was slightly higher in males as compared to females. Abnormal bent standing posture, psychological stress, positive family history of LBP, and insufficient physical activity were found to be independent predictors of LBP by the multivariable logistic regression model.

In our study, we found that about 15 medical graduates out of 100 have LBP which might be disabling for a long time. Only one study, in the Indian context among medical graduates, is available so far from the capital region which reported one-year prevalence and point prevalence of LBP to be 47.5% and 32.5%, respectively.[6] Other studies from different parts of the world among medical undergraduates found a point prevalence of LBP ranging from 9.2% to 30%.[8,13,16-18] Another study from Austria among Medical undergraduates found a 12-month prevalence of LBP of subacute and chronic LBP to be affecting almost half of the participants (53.4%).[19] The difference in prevalence rates of LBP might have arisen due to different operational definitions of LBP used in various studies. In our study, we used an acute LBP screening questionnaire for the identification of LBP. This scale focuses on identifying those cases of acute LBP which have high chances of developing into chronic pain and disability. These cases require early modification in treatment management to prevent disability. A systematic review suggests atrophy of hip muscles present in cases of LBP.[20] The atrophy of hip muscles due to avoidance of movements in an acute LBP case to avoid pain is probably the reason for the gradual development of disability.

In our study, abnormal bent standing posture is an independent predictor of LBP among medical students. Our findings are in agreement with previous study findings among medical students.[6,13,17,21] Another study among computer users suggests waist pain decreased significantly after educating participants on practicing correct body posture.[22] This finding suggests that posture-improving exercise might help alleviate LBP among medical students. However, the temporality of association between abnormal bent posture and LBP should be established with a cohort study with a robust sample size.

Psychological stress was found to be independently associated with LBP among medical students in the study. Our study findings were in line with previous studies on medical students.[6,13] However, one study among medical students in Saudi Arabia did not show a significant relationship between psychological stress and LBP. Another study among health care workers reported that lack of job satisfaction was associated

with LBP.[20,23] These findings suggest the presence of psychosocial components in LBP occurrence. Hence, medical students suffering from LBP will be benefited from counselling sessions.

Positive family history of LBP was found to be associated with LBP in our study. Our findings are in line with another study among medical students.[6] Most studies among medical students have not studied positive family history as an exposure variable. Our findings might suggest that a fraction of LBP cases may be due to diseases like ankylosing spondylitis which presents with back pain and runs in families.

Interestingly, occasional physical activity has been a protective factor in contrast to inactive for LBP in our study. Such a significant relationship was not seen with regular physical activity as compared to being inactive. We could not collect data regarding which form of sports or exercise the students are engaged in. We also could not collect data on whether their exercise sessions were preceded by warm-ups and followed up by cool-down exercises. These pre- and post-exercise sessions have been found to reduce sports-related trauma.[24,25] Other studies have a positive effect of exercise on LBP.[26,27] So, vigorous exercise without pre- and post-exercise cooling sessions might lead to strain in the lumbar area resulting in higher LBP incidence. To understand the full relationship between physical activity and LBP, future research with detailed exercise information is suggested.

This study has a few strengths. First, a sufficient sample allows for the generalizability of findings to medical students. Second, it is the first study from eastern India presenting LBP prevalence in medical students. Third, through the use of a multivariable logistic regression model, we could find predictors of LBP among medical students. However, this study also has a few limitations. First, being a cross-sectional design, we are not sure about the temporality of association. Second, all data collected in the study were self-reported, so the data might suffer from social desirability bias. Third, a few independent variables like physical activity could not be studied in much depth, including intensity, total duration, and habit of doing warm-up and cool-down exercises. Seeing the effect of doing warm-up and exercises on LBP is a scope of future research.

Conclusions

Fifteen out of every hundred medical undergraduates have a low back problem which requires modification in treatment management to avoid long-term disability. Abnormal stooping posture, psychological stress, and positive family history of low pain might independently lead to LBP. Physical activity is protective against the disease. Screening of LBP among medical students is recommended. Low back pain prevalence can be decreased by posture-correcting exercises, stress-coping mechanisms, and health education regarding the importance of physical activity in alleviating LBP. The initiative of promotion of yoga and health education at the most peripheral level of health and wellness centers by the Government of India might reduce the burden of LBP having the propensity to develop into disability.

Abbreviations

LBP- low back pain.

ALBPSQ- Acute low back pain screening Questionaire.

AOR- Adjusted Odd's Ratio.

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Conflicts of interest

There are no conflicts of interest.

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