

# Research Paper: The Relationship Between the Spine Curvature Disorders and the Resting Habits of University Students



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## ABSTRACT

**Purpose:** Considering the role of spine in protecting the body alignment and various body activities, this study aims to examine the relationship between the spine curvature disorders and resting habits among the students of the University of Social Welfare and Rehabilitation Sciences.

**Methods:** In this correlational study, a total of 108 students of Tehran University of Social Welfare and Rehabilitation Sciences, aged 18 to 29 years, were selected through simple random sampling method. Their curvatures of their spines were measured by scoliometer and a flexible ruler, and their resting habits were assessed through the Resting Habits questionnaire. The obtained data were analyzed by performing Kolmogorov-Smirnov, linear regression, Pearson, Spearman, Mann-Whitney, and Independent t statistical tests using SPSS V. 22.

**Results:** There was no significant relationship between the resting habits of the study participants with their degrees of lordosis ( $P=0.858$ ,  $r=0.574$ ) and degree of scoliosis ( $P=0.603$ ,  $r=0.857$ ). However, there was a significant relationship between lordosis and gender ( $P<0.001$ ) and age ( $P<0.022$ ,  $r=0.22$ ) in a way that the spine curvature disorders were more prevalent in girls and older students than boys and younger ones.

**Conclusion:** In this study, the resting habits were not identified as risk factor for abnormal spine curvatures in the younger ages. However, bad resting habits at older ages and in females can be risk factors for lordosis.

## 1. Introduction

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pine is the main axis of the human body and plays an important role in protection, maintaining, and support of the body during the performance of activities. This

column as the very important part of the body skeletal system transfers the forces exerted on the body in the standing and vertical stance to the lower organs [1].

The vertical and correct posture of this column strengthens the feeling of health in the person and re-

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sults in a capacity to better perform the daily activities. In other words, a healthy spine with correct alignment enhances the motional ability of the person in carrying out activities. With a quality and painless performance of activities, the feeling of satisfaction in performing works and as a result participation increases [2].

Based on numerous research reports, many students in Iran universities suffer from various physical problems [1, 3-6], which support the existence of high prevalence of spine disorders of which most instructors, parents, or even the students themselves are less aware. Behruzi in a study on the rate of scoliosis among students of Arak City showed that the prevalence of scoliosis among all students is 1.52%, among the girls 1.52% and among the boys 3.21% [4]. In another study, Mahdavezhad reported on the very high prevalence of spine abnormalities among the male students of the University of Isfahan [5]. An investigation in the rate of positional abnormalities of blind male students showed that 80% of these students between the ages of 8 to 12 years have some kind of spine and limbs abnormalities [3]. Also a systematic review on the prevalence of scoliosis among students and adolescents in 2015 showed that the prevalence of scoliosis was between 0.19% to 11.03% which is relatively high [6]. Furthermore in a study, Ghorbanpoor investigated the prevalence of spine curvature disorders among female students in Tehran City. His results revealed 38% scoliosis, 27% hyperlordosis, and 30.2% hypolordosis among female students of Tehran [1]. Considering the high prevalence of spine abnormalities among university and high school students, it seems important to find the cause and treatment of these positional abnormalities.

The spinal column is correct and optimum when there is a balance between body muscles and skeleton. In general, the function of this structure depends on simultaneous function of active structures (such as muscles), inactive ones (such as ligaments) and associated nerves. Individuals with proper muscular strength, resilience and flexibility are less exposed to spine abnormalities. On the contrary, poor movements, lack of activity, and improper postural habits in long term would result in imbalance in muscle strength and resilience. Accordingly, muscles will fail to protect and maintain the natural body stance, and eventually the individual will be exposed to physical disorders resulting from deformities in the natural shape of bones and development of positional abnormalities and incorrect postural habits [7].

Daily habitual postures can enormously affect the spinal column. In an ideal and standard posture, the lowest amount of stress and strain is exerted on the body that

results in the highest body efficiency. While, bad posture exerts extranormal stress and strain on bones, joints, ligaments, and muscles and decreases the individual's efficiency [8, 9]. Also, bad habits and long term incorrect life patterns put the body under so pressure that can disrupt the optimal body function [10]. Incorrect daily positions and habits will result in musculoskeletal damages and the resultant aches [8]. In addition, bad habits will result in increase in postural problems and decline in individual's self-confidence [9]. Outcomes of incorrect body position and habits are so grave that negatively affect physical, psychological, social, and economical dimensions [2]. Many studies have shown that abnormal postures (which impose themselves on the spine) would cause sprain, increase or decrease the spine curvatures, reduce efficiency, and exacerbate pain [11]. Also, based on studies, the increase or decrease in lumbar curvatures are the causes of many lumbar pains [12]. Considering the high prevalence of spinal abnormalities, their impact on all life dimensions and the importance of the young and educated people, we should look for factors affecting the development of spinal abnormalities so that by reducing these factors the high prevalence of spinal disorders and its subsequent complications can be avoided.

So far many studies have been conducted regarding the prevalence of spinal abnormalities and its relationship with lumbar pain, body mass, working positions in both workers and clerks, and the nurses' quality of life [1, 2, 4-6, 11-13]. However, no study has been conducted on the relationship of the spinal curvatures with resting habits of university students such as sitting position, carrying bag, sleeping, sleeping mattress, sleeping pillow, and especially in the students of the school of rehabilitation who try to acquire information about correct positions and habits in the daily life. By considering the stated issues, it is assumed that there is a significant relationship between the resting habits of the students and the curvature disorders of their spine. Therefore, this study aims to investigate the connection between the spinal curvature disorders and resting habits among students of the University of Social Welfare and Rehabilitation Sciences. It is hoped that through determining the correct habits and positions for students and providing more information to them and implementing these habitual positions in correctional practices, the spinal curvatures can be reduced or prevent the progression of these structural curvatures in the main body column.

## 2. Materials and Methods

The present study is a correlational study and was conducted at the University of Social Welfare and Re-

habilitation Sciences of Tehran City. Considering the objectives of the research, all university students of Social Welfare and Rehabilitation Sciences in the academic year 2010, aged 18 to 29 years, without any obvious orthopedic problems, or engaging in professional sports were eligible to take part in the study. Of them, a total of 108 students were selected through simple random sampling method. Prior to execution of the study the repeatability of the data was examined.

After recruiting the samples, the necessary explanations regarding the study was presented. Then, the study data were collected through interview and by filling out questionnaires and doing the related tests. In this way, information regarding the abnormal curvatures of the spine (including scoliosis and lordosis) and resting habits were obtained. It should be noted that the male students were assessed at the dormitories of Mazandaran campus of the University of Social Welfare and Rehabilitation Sciences and female students at the dormitories of Ashrafi Isfahani campus of that university. Also, the Ethics Committee of the university confirmed and approved the study.

### Study instruments

#### Scoliometer

For measuring the degree of scoliosis, we used scoliometer (checked plate). The checked plate is a frame measuring 171×57 cm that has a movable and graded mica sheet with dimensions of 57×40 cm; this plate has been latticed at intervals of 5 mm from the length and width, and its middle is marked horizontally and vertically by a plumb line (base line). This device has been used in many studies to identify the abnormal curvature of the spine [1]. To measure the angle of deviation of scoliosis on the scoliometer, a conveyer (a graded device) was used, and a marker was used to mark on the spinous processes in order to prevent visual error in their comparison to match with the base line of the checked plate. Also, a full length mirror with dimensions of 113.5×42 cm was used to provide feedback to the study participants in order to preserve the correct alignment when measuring the spine curves [1, 2].

#### Resting Habits Checklist

The checklist included 13 questions regarding the special habits of the participants during studying, sleeping, sitting, carrying a bag, type of the used bag, shoe, mattress, and pillow, and so on. Each question had 2 to 6 options in response considering the question posed. This checklist had been drawn up through studying various

sources and using previous research studies and consulting with the specialists in various fields and has been used in many studies [14-16].

#### Flexible ruler

A flexible ruler with the length of 35.5 cm and graded in mm increments. This device was used to determine the level of the lumbar curvature of the spine. In previous studies, this device has been used for measuring the lumbar curve [2].

The collected data were entered in SPSS.V22 and examined through statistical methods of Kolmogorov-Smirnov, linear regression, Pearson, Spearman, Mann-Whitney and Independent t test.

### 3. Results

The Kolmogorov-Smirnov test was used to evaluate the distribution of quantitative variables in order to compare them with the normal theoretical distribution. The results showed that the prevailing distribution of variables follow the normal distribution. Of 108 study participants, 63 were females and 45 were males. Table 1 presents descriptive values related to height, weight, body mass index, age, and the degree of lordosis and scoliosis.

The mean degrees of scoliosis and lordosis were higher in female students compared with the male students, and with regard to the degree of lordosis, this difference was significant (Table 2).

The correlation between the spine curvature disorders with gender and age were investigated by the Pearson and Spearman tests that showed a significant association between lordosis and age ( $P<0.022$ ,  $r=0.22$ ), while this relationship between scoliosis and age was not significant ( $P=0.373$ ,  $r=0.096$ ). With regard to gender, the amount of spinal curvature in women was more than in men; this relationship regarding lordosis was significant ( $P=0.013$ ), but insignificant with regard to scoliosis ( $P=0.209$ ).

Also, the comparison of mean values showed that the individuals who sleep on their left sides had the least degree of lordosis and those who sleep in a prone position had the least degree of scoliosis. Also, those, who used knapsack, blanket on the floor for sleeping, pillow with medium height and sit on the ground with stretched legs or with their two knees bended with straight spine, had lower lordosis and scoliosis. On the other hand, those who write in their notebook at their desk with bending

**Table 1.** Descriptive values of study variables; height, weight, body mass index, age, the degree of lordosis and scoliosis

Variable	Mean	SD
Age, y	21.25	2.197
Height, cm	166.86	9.152
Weight, kg	62.37	11.781
Body mass index kg/m <sup>2</sup>	29.71	2.81
Degree of scoliosis	9.99	8.21
Degree of lordosis	37.72	12.44

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**Table 2.** Comparison of the mean degree of scoliosis and lordosis in female and male students

Variable	Gender	Mean	SD	Significance <sup>1</sup>
Degree of lordosis	Females	40.03	14.39	0.013*
	Males	34.49	8.14	
Variable	Gender	Mean	Sum of squares	Significance <sup>2</sup>
Degrees of Scoliosis	Females	47.19	2973	0.209
	Males	39.69	1032	

1. Independent samples t Test; 2. Mann-Whitney U test; \* P<0.095

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posture had the highest degrees of lordosis and scoliosis. However, the results of linear regression test showed that the relationship model between degree of scoliosis and lordosis does not fit with the resting habits, and they are not risk factors for spine curvature disorders (Table 3).

#### 4. Discussion

Results of the present study showed a significant relationship between lordosis and age and gender in a way that the prevalence of lordosis among girls and older student was higher. These results are consistent with the results of many other studies. Most studies have found a significant association between the spine curvature disorders and age and gender and the amount of these abnormal curvatures has been reported as being higher among girls and older people [6, 16]. The reason for the

significant relationship between the spine curvature disorders and gender can be described as such, that probably this difference is due to anthropometric physiological parameters such as different height, length of arm and other body parts, different muscular power between the two genders, different hormone levels between two genders, differences in the genetic predisposition toward spinal disorders, also restrictions related to exercise and sports activities in females as compared to males [17, 18]. Also, it seems obvious that in a population who do not engage in professional sports, with increase in age, the time spent in inappropriate habitual positions become longer that can further alter the muscle's tissue features and increase spinal deviations [7]. Also, the incidence of catching other illnesses, orthopedic problems, psychological stress, sleep disorders, and musculoskel-

**Table 3.** The relationship between the spine curvatures and positions related to lifestyle

Variable	Multiple Correlation Coefficient	Coefficient of Determination	Modified Correlation Coefficient	Test Statistic	Sig.
Degree of scoliosis	0.555	0.308	-0.551	0.857	0.603
Degree of lordosis	0.410	0.168	-0.124	0.574	0.858

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etal disorders would also rise by higher ages that can be a factor affecting on the spine curvature disorders [19, 20].

The present study also showed that the best habitual positions for students in their study lives that would create the least amount of spine curvature disorders are the sitting position with straight spine, carrying their personal effects with both hands or using in a backpack, sleeping on the floor by using a blanket and using a pillow with medium height when sleeping. In all these positions, the amount of forces exerted on the spine in the anteroposterior and mediolateral directions is balanced and the stance of the spine is vertical and symmetric as much as possible. Therefore, the possibility of spine curvature disorders decreases because in all daily habitual positions what is important is to keep the spine posture, as much as possible, upright and symmetric to reduce the deviations. Also, a suitably firm mattress (not too soft to allow too much rotation and displacement of the spine, and not too stiff to cause pressure sores) decreases the likelihood of spine curvature disorders [15, 16].

This study showed that individuals who sleep more on their sides have the lowest degree of lordosis. This finding has been supported by many studies that sleeping on one's side reduces the lumbar pain [12, 21, 22]. One of the factors involved in development of lordosis and as a result lumbar pain is the change in the functional pattern of the trunk surface and deep muscles due to long term habitual positions. By sleeping on the side, the functional patterns of the trunk surface and deep muscles would change in favor of reducing lordosis and consequently lumbar pain [12, 21, 22]. The present study also showed that those who sleep in a prone position have the least degree of scoliosis. Considering that scoliosis is mostly a lateral deviation in the spine, it seems that when a person sleeps on his stomach, the lateral displacement of the spine and as a result the scoliosis is less likely to happen. Many of the stabilizing exercises of the spine increase the stability of the spine and as a result reduction in scoliosis. For example, McKenzie exercises are also performed in a prone position lying on the stomach [23]. However, no significant relationship was found between the spine curvature disorders and the daily resting habits of the students. To provide a logical explanation for the lack of significant relationship, this issue can be examined from the following basic topics:

First, the study participants were young; their average age was 21.5 years old. As many studies reported that inappropriate positions in the long term will result in muscular changes [7], it can be concluded that this lack of significance is due to the young age of the study

participants and their short term staying in resting habits. Also, the present study shows that the prevalence of spine curvature disorders in these people is less than those who suffer from orthopedic problems (those who had severe orthopedic problems were not included in the study). Therefore, no significant relationship was found in the statistical tests due to the lower intensity in spine deviations. Also, several studies have shown that many risk factors exist besides daily resting habits such as pain [19], age, gender, longer working experience [2], bone density, and family history [6] that can also affect spine curvature disorders, and the lack of controlling these factors is one of the limitations of the present study. Therefore, it is recommended that future studies be conducted in populations with higher average age and with controlling the affecting factors such as bone density, family history, and working experience.

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### Conflict of Interest

The authors declared no conflicts of interest.

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