Section: Miscellaneous

Original Research Article

# LOW BACK PAIN CORRELATION WITH ANTHROPOMETRIC MEASUREMENTS AND CO MORBIDITIES

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## Abstract

**Background:** Low back pain has become a public health issue with remarkable social and economic implications. **Objectives:** To evaluate the relationship between low back pain (LBP) and selected anthropometric Parameters and Co morbidities in general working population. **Materials and Methods:** The study was an observational study of case-control type in a specific group of subjects as working population conducted in Patna Medical College under (AKU), Patna (Bankers, Bus drivers, Delivery boys and female participants) in which anamnestic data (the life prevalence of LBP) were included and anthropometric measurements were carried out. Comorbidities were also seen. All subjects were men with a similar workload and the same educational level and additional female participants. Other characteristics regarding the socio-economic status have not been assessed, however taking into consideration the one stated above very similar socio-economic status can be expected. The study included 160 (40 each section) subjects who were available at the time of carrying out the inquiry and the measurements. SPSS was used for analysis. **Result:** The average age of the subjects were 44.2 years (SD 5.6 years), the youngest was 21 and the oldest was 56 years old. The specific groups who were selected for study includes general population of female participants with bankers, bus drivers and delivery boys each group includes 40 participants. Among them (19%) had no LBP and around 81% had LBP? Among co morbidities diabetes was most common and seen on 25 participants followed by Hypertension in 17. The small values of the factors of correlation point out that in the observed group age has no greater (linear) impact on anthropometric parameters, making a comparison of the value of these parameters possible between two groups differing in age structure. There was no positive correlation seen in patients having comorbidities and LBP which clearly suggest that mode of transport, sitting posture, anthropometric measurements are more specific reasons for LBP in our specific groups. Female with menstrual irregularities (30 participants out of 40) shows a positive correlation (r=0.10) which suggest hormonal association with LBP. Statistical analysis showed that no statistically significant difference was found between the investigated groups in any of the observed anthropometric parameters (all p>0.05). **Conclusion:** The chosen subject sample showed that nutritional status, body build, constitution and muscular development are not associated with the incidence of low back pain except BMI.

## INTRODUCTION

Low back pain (LBP) represents one of the most frequent health complaints of modern man. In numerous professional papers dealing with low back pain, we repeatedly find statements on 60–90% life prevalence and a 5% yearly incidence.[1] LBP belongs in the category of diseases induced by multiple factors. The factors affecting the development of the disease are numerous and they are divided into two large groups: external or exogenous (representing physical and psyhosocial factors) and internal or endogenous (representing genotypical and phenotypical factors).[2] The most


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frequently studied factor was nutritional status. The most often observed criterion was- Body Mass Index – the relation between body weight and the square of the height (in the further text abbreviated BMI).[3] Guideline recommendations of the American Heart Association give the following BMI values for the degree of nutrition (however, they are derived from the comprehension of the risk of occurring cardiovascular diseases): BMI <18.5 kg/m2 indicates undernutrition, BMI 18.5–24.9 kg/m2 indicates normal values, BMI 25.0–30.0 kg/m2 indicates hypernutrition, BMI 30.0 kg/m2 or more indicates obesity, BMI 40.0 kg/m2 or more indicates extreme obesity.[4] Rarely other parameters of nutritional status were observed. The American Heart Association guidelines were also taken into consideration, which determine a waist circumference of over 88 cm in women and over 102 cm in men as a risk indicator for developing cardiovascular diseases. Spine injury in the healthcare workers is also a major problem with not much clear cut strategies for control. Client handling could be one of the major reasons for back pain in these professions. Host variables like demography, anthropometry, history of LBP, history of lifting weights also play a major role in development of back pain.[4] Workloads along with physical and psychological stress have been associated not only with pain but also with injuries.

LBP can be associated with various comorbidities like diabetes mellitus. In the study done by Eivazi et al low back pain could be a common problem in patients with comorbidities like diabetes mellitus and it affects functional abilities.[11] Studies have found similar factors that may have causal association with hypertension in LBP also. Multidisciplinary lifestyle interventions could be aimed to reduce not just hypertension but low back pain also.[12] One study has shown around 50% of participants who had hypothyroidism was suffering from back pain which may point towards a causal association. Low back pain has become a public health issue with posture and center of gravity causing muscle and remarkable social and economic implications so this study was planned to determine correlation of LBP with Anthropometric measurements and co morbidities.

## MATERIALS AND METHODS

The study was planned as an observational study of case-control type in a specific group of subjects a specific group of subjects as working population conducted in Patna Medical College under (AKU), Patna (Bankers, Bus drivers, Delivery boys, Female participants) in which anamnestic data (the life prevalence of LBP) were included and anthropometric measurements were carried out. All subjects were men with a similar workload and the same educational level and additional female participants were included. Other characteristics regarding the socio-economic status have not been assessed, however taking into consideration the one stated above very similar socio-economic status can be expected. The study included 160 subjects (40 each section) who were available at the time of carrying out the inquiry and the measurements. An independent non-medical educated personnel officer at each group made a list of those who later came for examinations and measurements. Only inclusion criteria were individuals working all men and female participants above 30 years. Any history of spinal injury, trauma are excluded. The study had to give an answer to the question of whether differences existed in the size of anthropometric parameters between those subjects whose history contained no mention of low back problems and those reporting such problems. With regard to this question, two subgroups were formed from the entire group of subjects: Group NO and Group YES. Group NO consisted of 30 subjects giving a negative answer to the question about previous LBP – NO LOW BACK PROBLEMS. Group YES contained those subjects whose answer to the question regarding anamnestic low back problems was 3 times or more so there were 130 subjects with RECURRENT LOW BACK PROBLEMS (Group YES).

**Methodology**

The following anthropometric measurements were carried out; the main criterion of choice was simplicity and therefore clinical applicability: body height, body weight, percentage of body fat (measured by impedance scales »Tanita TBF 515«), shoulder width, circumference of thorax and abdomen, and circumference of right upper arm in contracted and relaxed m. biceps brachii. Using these data, the following guideline anthropologic indexes stated in the literature were calculated.4

1. Quetelet's index (devenport-kaup's adaptation)- Quetelet's index (QI) represents a measure of nutrition status. It is calculated according to a formula:

QI = BW/BH2, where BW means body weight (g) and BH body height (cm)

2. Relative body weight- Relative body weight (RBW) is another possibility to describe a nutritional status and uses the following formula:

RBW = (ABW / IBW) 100,where ABW means measured body weight (kg) and IBW ideal body weight

3. Muscle index- Muscle index (MI) is an orientation method about someone's muscle development. It is calculated according to a formula

MI = ((CCB – CRB) / CRB) 100, where CCB means circumference of the upper arm during an isometric contraction of muscle biceps brachi at 90° of elbow flexion (cm) and CRB circumference of the upper arm in relaxed position of muscle biceps brachii at 90° of elbow flexion (cm). Values between 5–12 are normal, values under 5 represent obese subjects with


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weak muscles and values over 12 represent people with strong muscles.

4. Lorenz's constitutional index- Lorenz's constitutional index (LKI) gives information about body's components with a following formula

LCI = CT – CA – 14, where CT means circumference of thorax (cm) and CA circumference of abdomen (cm). If a calculated value is a positive, than an increase in a body mass goes on the account of muscles and bones. On contrary, if it's a negative then the adipose tissue is responsible for an increased body mass.

Written informed consent and individual history for co morbidity was also taken.

**Statistical Analysis**

Data so obtained were subjected to statistical analysis. Results were evaluated for the best modality through which benign and malignant lesions can be differentiated. Data analysis was done by SPSS software ® version 22.0. Descriptive statistical analysis, which included frequency and percentages, was used to characterize the data. Chi-square test was used for association between factors and $p < 0.05$ was considered statistically significant.

## RESULTS

The average age of the subjects was 44.2 years (SD 5.6 years), the youngest was 21 and the oldest was 56 years old. The average length of service amounted to 4.4 years (SD 6.0 yrs), the shortest was 5 years and the longest 36 years.

**Table 1: Distribution of Groups as per LBP and Comorbities**

| Groups | NO LBP (N=30) | YES LBP (N=130) | Diabetes | HTN | Hypothyroid |
|---|---|---|---|---|---|
| Bankers | 05 | 35 | 12 | 16 | 03 |
| Bus drivers | 05 | 35 | 04 | 01 | 00 |
| Delivery boys | 10 | 30 | 02 | 00 | 03 |
| Females participants | 10 | 30 | 07 | 00 | 06 |

As per table 1 the specific groups who were selected for study includes general population of female participants with bankers, bus drivers and delivery boys each group includes 40 participants. Among them (19%) had no LBP and around 81% had LBP? Among co morbidities diabetes was most common and seen on 25 participants followed by Hypertension in 17.

**Table 2: Correlation between Age and Arthropometric parameters**

| Arthropometric parameters | Correlation Factor (r) |
|---|---|
| Quetelet's index | 0.20 |
| Percentage of fat | 0.16 |
| Relative BW | 0.04 |
| Lorenz's constit. Index | -0.12 |
| Muscle index | -0.14 |

As per table 2 the relationships between age and individual parameters were analyzed using correlation tests, which showed low values of the coefficient of correlation. The small values of the factors of correlation point out that in the observed group age has no greater (linear) impact on anthropometric parameters, making a comparison of the value of these parameters possible between two groups differing in age structure.

**Table 3: Distribution and Correlation of LBP with Comorbidities**

| Comorbidities | Group NO (30) | Group YES (130) | Correlation factor (r) |
|---|---|---|---|
| Diabetes | 05 | 20 | -0.11 |
| Hypertension | 07 | 10 | -0.21 |
| Hypothyroidism | 06 | 06 | -0.31 |
| Menstrual irregularities | 12 | 18 | 0.10 |

As per table 3 there was no positive correlation seen in patients having comorbidities and LBP which clearly suggest that mode of transport, sitting posture, anthropometric measurements are more specific reasons for LBP in our specific groups. Female with menstrual irregularities (30 participants out of 40) shows a positive correlation (r=0.10) which suggest hormonal association with LBP.

**Table 4: Comparison of Anthropometric parameters in both groups**

| Arthropometric parameters | Group NO (30) | Group YES (130) | P-value |
|---|---|---|---|
| Quetelet's index | 2.67 | 2.71 | 0.34 |
| Percentage of fat | 25.43 | 26.34 | 0.11 |
| Relative BW | 114.20 | 114.50 | 0.33 |
| Lorenz's constit. Index | -7.10 | -7.31 | 0.21 |
| Muscle index | 8.78 | 8.58 | 0.18 |


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As per table 4 Comparison of the average values of individual observed parameters in the group of subjects without low back complaints and in the one reporting recurrent problems of this kind is shown. Statistical analysis showed that no statistically significant difference was found between the investigated groups in any of the observed anthropometric parameters (all p>0.05).

**Table 5: Association between BMI and Lower Back Pain**

| Arthropometric parameters (BMI) | Group NO (30) | Group YES (90) | P-value |
|---|---|---|---|
| Underweight | 5 | 10 | 0.34 |
| Normal Weight | 15 | 25 | 0.10 |
| Overweight | 6 | 34 | 0.04* |
| Obesity | 4 | 21 | 0.01* |

As per table 5 out of 160 participants, 55 should significant association of lower back pain who are overweight and obese. This shows that weight plays a significant role in lower back pain. Around 35 also had lower back pain belonged to underweight and normal weight category but it was not significant.

## DISCUSSION

The study was planned as an observational study of case-control type in a specific group of subjects a specific group of subjects as working population (Bankers, Bus drivers, Delivery boys, Female participants) in which anamnestic data (the life prevalence of LBP) were included and anthropometric measurements were carried out. All subjects were men with a similar workload and the same educational level and additional female participants were included. Other characteristics regarding the socio-economic status have not been assessed, however taking into consideration the one stated above very similar socio-economic status can be expected. The study included 160 subjects (40 each section) who were available at the time of carrying out the inquiry and the measurements. Group NO and Group YES. Group NO consisted of 30 subjects giving a negative answer to the question about previous LBP – NO LOW BACK PROBLEMS. Group YES contained those subjects whose answer to the question regarding anamnestic low back problems was 3 times or more so there were 130 subjects with RECURRENT LOW BACK PROBLEMS (Group YES). These results, although obtained on a smaller sample of a closed circle of subjects, all of which were males, support the findings of researchers.[1-3,4-8] who did not establish an association between the degree of nutrition and the occurrence of LBP in larger studies. From the viewpoint of LBP prevalence, it seems that this disease occurs with equal frequency in individuals with very different physical properties. The direct association of low back pain with menstrual irregularities may not bring about a causal relationship. But still patients who experience premenstrual symptoms such as dysmenorrhoea or any pelvic abnormalities such as pelvic inflammatory disease (PID), malignancies or even pregnancy also complain of associated back pain. The study findings could not establish the influence of any of the comorbidities in the presence of LBP in the study subjects, however there are studies done by Evazi et al that showed a positive association between diabetes and low back and was also significantly associated with functional disability.[11] Long term change in the macro and microvascular network in diabetes mellitus could be attributed to the increased vertebral and disc degeneration that may later be presented as back pain. Hypothyroidism may give rise to increased BMI and myopathy.[12] these may be the contributing factors for patients to develop back pain though a direct causal association could not be found.

LBP may occur in the very tall or very short, in fat as well as lean people, in those with more and in those with less muscular development, and in people of different body build. So from the viewpoint of prevention and treatment of LBP, there is no expert-confirmed demand for a decrease in excess BW. So far, in the field of pathology of the locomotor system, only an association with the occurrence of degenerative changes in the knee joints has been proved.[7,8]

LBP duration was higher among overweight and obese drivers as compared to underweight and normal weight. These findings were associated with study Deyo and Wintein.[9] and Bener.[10] were duration of LBP is moderately associated with Obesity. A sufficient number of other medical arguments exists designating obesity as a serious disease and an urgent medical and social problem. Previous studies.[3,4,5] shows sex has no influence on LBP so this study was stuck only on males patients.

## CONCLUSION

According to the study, the association between LBP and anthropometric parameters did not significantly influence the association with back pain except with overweight and Obesity and female with menstrual irregularities. Weight of participants was positively associated with LBP, whereas height was not a major risk factor. Menstrual irregularities in female subjects were significantly associated with LBP. Comorbidities such as hypertension and hypothyroidism are related with LBP though not statistically significant. The present study analyzes the physical anthropometric factors of individual.


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The results demonstrate that in chosen sample of subjects there were no significant differences in the values of observed anthropometric parameters except BMI and calculated indexes between the two group subjects with and without anamnesis of low back pain.

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