

Original Research Article

Variations in anthropometry and physical characteristics of staff with low back pain working in tertiary hospital

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ABSTRACT

Background: Several links were searched to know the variations in anthropometry and physical characteristics of staff with low back pain (LBP) working in tertiary hospital. Controversy exists between the association of these characteristics with LBP. The study was conducted to understand the relation between physical characteristics and LBP in the south Indian population.

Methods: Ethical approval was obtained from the institutional health research ethical committee. A survey was conducted using a proforma and it was circulated among the staff and doctors in the tertiary care hospital. The validated questionnaires were framed to collect all the physical characteristics and anthropometry of the respondents and history of LBP. The distribution of the parameters are calculated either as mean±two standard deviation, or as count and percentage. The tests used for comparison is the t test and for association is the chi square (χ^2) test. A p value less than or equal to 0.5 is considered as statistically significant. The data was analysed using the microsoft excel and the minitab (17) software.

Results: The study showed significant positive association of back pain with increase in weight of the subjects, history of back trauma, spinal injections and lifting heavy weights (p value<0.01). There was no significant association of LBP with variables like history of menstrual irregularities and mode of transport.

Conclusions: There is a positive association between LBP with anthropometric features like weight of the patient and also physical characteristics like history of back trauma, spinal injections and lifting heavy weights.

Keywords: Anthropometry, Health workers, Low back pain

INTRODUCTION

Low back pain (LBP) is a recurrent cause of disability and in a developing country like India, the majority of the population engage in hard physical labour for earning means of living and suffer musculoskeletal pain in some phase of their life. Lack of awareness leads to negligence of pain as many regard pain as normal of life which ultimately cause more damage to the site involved. In a hospital, health care workers experience LBP due to constant work pressure and hence leading to absenteeism

and loss of work hours. Ergonomics and work circumstances of an individual are also found to have an association with low back pain. Safe and effective practices could lead to a decrease in the prevalence of low back pain.

This study was done to ascertain certain risk factors such body weight, back trauma, ergonomic conditions such as mode of transport, lifting of heavy weights for LBP, particularly the doctors and staff in a tertiary care hospital.

Approximately 80% of the population will experience back problems at some point in their lifetime.¹ There are many factors that are linked to the evolution of LBP that include anthropometry and physical characteristics like nature of work and techniques of weight lifting.² Other risk factors include poor work practices and fitness, overuse of joint or body parts and also bad posture. Hence awareness and prevention of low back pain and evaluation of the underlying causes is therefore important.³

Increase in body weight and obesity has been a major risk factor for development of back pain and this can be attributed to the increased strain on the weight bearing spinal elements. Female sex and duration of work for more than 10 years were also found to predict the occurrence of LBP.¹

Specific causes may not usually be identified in most people who present with LBP. Some people have a well understood pathological cause like fractures, infection or malignancy. Usually low back pain is presented among people of low socioeconomic status with physically demanding jobs or having several comorbidities and also in smokers and obese individuals. Though in some cases it could be self-limiting, it can cause recurrence in some that lead to persistent and disabling symptoms. These symptoms could be aggravated with psychological distress also.⁴

Nurses and doctors are one of the most important health care professionals that work in the frontline and they are exposed to various tasks in their routine work that causes LBP. This may reduce the productivity at work as well as the overall healthcare quality that the clients receive. There could also be additional burden like sick leave, reduced performance, low job satisfaction, high medical expenditure and also occupational disability.⁵ 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.⁶ Study done by Masset et al also suggest the relation of LBP trunk imbalance, changes in body weight and lifting heavy weights.⁷ Leboeuf et al suggest in their study that body weight should be considered a possible weak risk indicator.⁸ In a study by Rahman Shiri et al the association between obesity and the prevalence of LBP is more for women. This could be due to associated changes in pain sensitivity and hormone-related. Low back pain may lead to physical inactivity leading to increased adiposity. Obesity and low back pain could also be independent comorbid characteristics that share common risk factors.⁹ Smoking could be a weak risk indicator with statistically significant positive association in very large sample sizes.¹⁰

In a study by Attar SM back and leg complaints have been positively associated with prolonged work hours.

Workloads along with physical and psychological stress have been associated not only with pain but also with injuries.¹¹ Handling of physical loads seem to put them at risk for development back pain into chronic debility leading to sickness absence.¹² According to Hoogendoorn et al rotation and flexion of the trunk with weight lifting at work are common risk factors for low back pain, especially at higher levels of exposure.¹³ Marras et al has identified a pathway between psychosocial stress, personality traits and spine loading. This may explain how these characteristics increase the risk of LBP.¹⁴ In a study by Nottidge T E et al female gender, body mass index ≥ 25 kg/m², increasing age and frequently adopting a bending posture has been significantly associated with LBP.¹⁵

In another study by Ready A E et al 22% of participants sustained injuries during the study. There was no significant difference between injured and not-injured groups considering lifestyle characteristics and fitness.¹⁶ 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.¹⁷

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.¹⁸ One study has shown around 50% of participants who had hypothyroidism was suffering from back pain which may point towards a causal association.¹⁹

LBP can often be seen in women with menstrual irregularities although a definitive association has not been established yet.²⁰ In a study by Serranheira F et al suggests that there is an association between demanding jobs that need high physical exertion, LBP and sickness leave from work. Hence it is important that structured periodic assessment and prevention programs in occupational health services are often required. Healthcare professionals show significantly high risk of work related musculoskeletal problems including back pain that increases significantly with age. So a need for effective intervention strategies that includes active involvement of workers is necessary to improve the process as well as organization of work thereby promoting a good working environment.²¹

Aim

The aim of this study was to estimate the variations in anthropometric measurements and physical characteristics among the staff (doctors and nurses) with LBP working in a tertiary care hospital.

Objectives

The objective of the study was to measure the anthropometric features like height and weight of the staff

with low back pain and find an association, to identify association between physical characteristics like comorbidities, menstrual irregularities (in women), history of back trauma, spinal surgery and spinal injections with occurrence of back pain and to identify association between activities of daily living like lifting heavy weights, mode of conveyance with occurrence of back pain.

METHODS

The study was an observational study. Ethical approval was obtained from the institutional health research ethical committee. The study was conducted from January 2018 to March 2018, using proforma in the form of questionnaires which had open ended and closed ended questions. The questionnaire was given to all doctors and nurses of the Believers church medical college hospital, Thiruvalla. The proforma was validated by circulated among five doctors and five nurses including experts.

The validated questionnaires were framed to collect all the physical characteristics and anthropometry of the respondents and history of back pain. Questions were open end and closed end with a yes/no response pattern with details when required.

Inclusion criteria

Doctors and nurses working in tertiary care hospital for not less than two years were included in the study.

Exclusion criteria

Subjects having no systemic disease including cancer and subjects having long term treatments related to neuromuscular disorders were excluded in the study.

The minimum sample size required for an alpha level of 0.05 and power 0.8 for two categories for an effect size 0.2 using chi square was 197. A total of 387 nurses and doctors were randomly selected for the study, of them, 183 were with low back pain and 204 were without LBP.

The distribution of the parameters are calculated either as mean±2 standard deviation (2 SD), or as count and percentage. The tests used for comparison is the t test and for association is the chi square (χ^2) test. A p value less than or equal to 0.5 is considered as statistically significant. The data was analysed using the microsoft excel and the minitab (17) software.

RESULTS

22 patients of AO-41-A3, AO-41C2, AO-41-C3 were proximal. There were a total of 387 subjects participated in the study, in which 183 (47.3%) were having LBP and the 204 (52.7%) did not have the history of back pain. There were a total of 337 female subjects and 95 male subjects. Among the female subjects 138 (47.3%) had back

pain and 154 (52.7%) did not have any history of LBP. In male subjects 45 (47.4%) had back pain and 50 (52.6%) did not have any history of LBP. The ratio of subjects with back pain was the same (47%) in both genders in the study group (Figure 1).

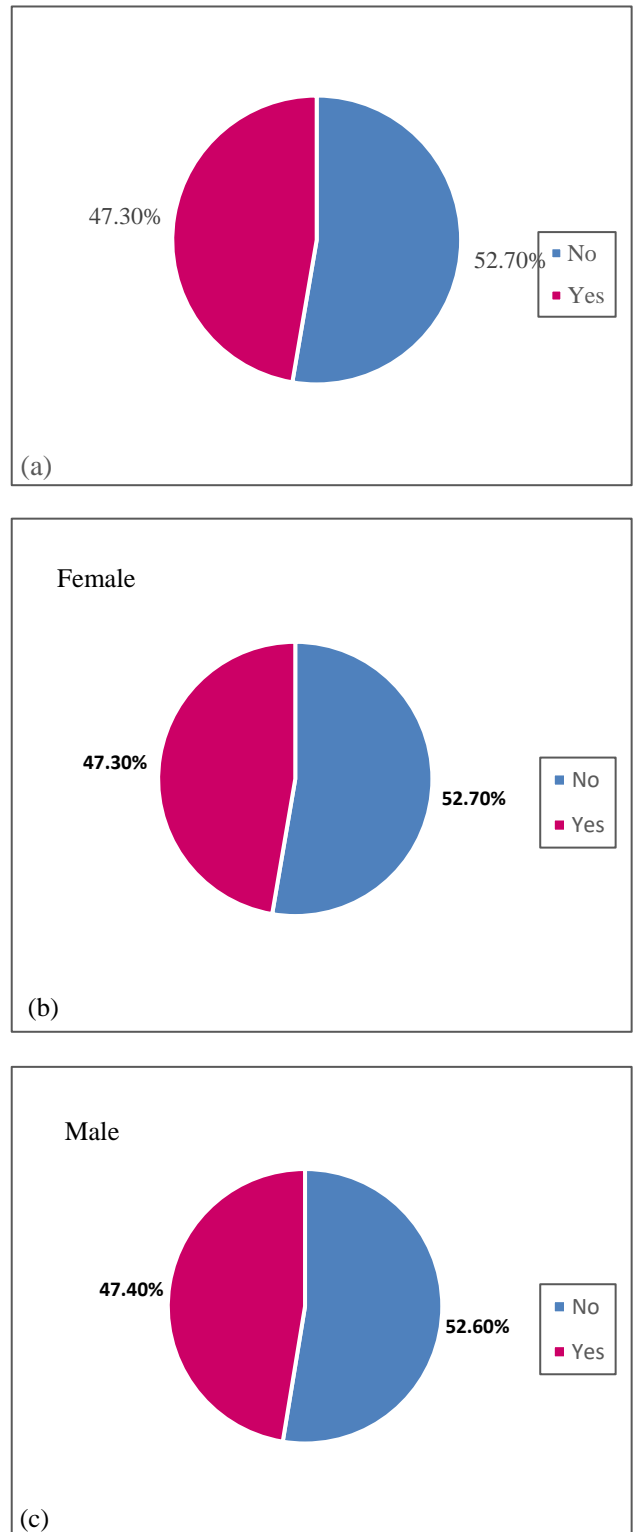


Figure 1: History of back pain (a) distribution of back pain; (b and c) gender wise distribution of back pain

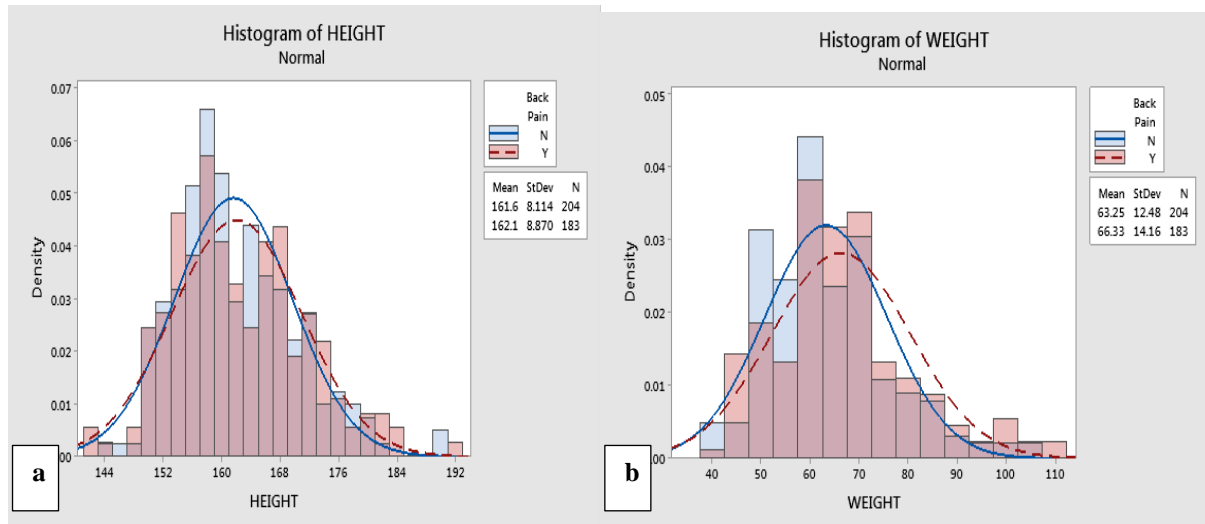


Figure 2: Distribution of height and weight of the subjects with and without LBP; (a) histogram of height of subjects; (b) histogram of weight of subjects.

Table 1: Female participants having menstrual irregularities and back pain.

Parameters	Back pain (no)	Back pain (yes)	Total
Menstrual irregularities (no)	132	110	242
Menstrual irregularities (yes)	19	25	44
Total	151	135	286

Table 2: The distribution of specific comorbidities.

Parameters	DM (%)	Hypertension (%)	Hypothyroid (%)	Others
No	9 (22)	12 (29.3)	11 (26.8)	9 (22)
Yes	7 (18.4)	14 (36.8)	13 (34.2)	4 (10.5)
All	16 (20.3)	26 (32.9)	24 (30.4)	13 (16.5)

Table 3: Distribution of back pain in subjects with comorbidities.

Parameters	Low back pain (no)	Low back pain (yes)	All
Comorbidities	171	150	321
Comorbidities	33	33	66
Total	204	183	387

Table 4: Mode of transport used.

Mode of Transport	Back pain: No	Back pain: Yes	All	χ^2	P
2 wheelers	No	128	280	1.005	0.316
	Yes	52	107		
4 wheelers	No	127	262	0.458	0.499
	Yes	69	125		
Walking	No	160	342	0.299	0.585
	Yes	22	45		
Public transport	No	126	268	0.026	0.872
	Yes	62	119		

Note: The test used the chi square test of association (Pearson).

Table 5: History of back trauma, spinal surgery or injections.

Parameters		Back pain: No	Back pain: Yes	All	χ^2	P
Back trauma	No	202	163	365	17.807	<0.01
	Yes	2	20	22		
Spinal surgery	No	201	178	379	0.758	0.384
	Yes	3	5	8		
Spinal injections	No	180	138	318	10.831	<0.01
	Yes	24	45	69		

Note: The test used the chi square test of association (Pearson).

Table 6: Duration of pain in the study subjects.

Duration of back pain	Count (%)
<6 months	76 (42)
6-12 months	28 (15)
>12 months	79 (43)

Table 7: Associated radiating pain and numbness of lower limb.

Parameters		Back pain: No	Back pain: Yes	All	χ^2	P
Associated radiating pain	No	192	92	284	94.944	<0.01
	Yes	12	91	103		
Numbness of the lower limb	No	200	134	334	50.258	<0.01
	Yes	4	49	53		

Note: The test used the chi square test of association (Pearson).

Table 8: History of lifting weights.

Parameters		Back pain: No	Back pain: Yes	All	χ^2	P
History lifting Weight	No	100	43	143	26.972	<0.01
	Yes	104	140	244		

Note: The test used the chi square test of association (Pearson).

Histogram of height of subjects with (162±8.1, n=183) and without (162±8.9 cm, n=204) back pain showed no statistical difference (t=-0.51, p=0.610) (Figure 2a). Histogram of weight of subjects with (n=183) and without (n=204) back pain showed a statistically significant higher weight in subjects with back pain (66.3±14.1) than those without back pain (63.3±12.5) (t=-2.25, p<0.05) Figure 2a). Chi square analysis (X=1.5, p=0.226) shows that the association between menstrual irregularities and presence of back pain in female subjects (n=286) is not statistically significant (Table 1).

Among the 387 participants 47.2% had comorbidities. 20.3% had diabetes mellitus 7 out of the 16 people with diabetes mellitus had back pain. 32.9% of total subjects had hypertension and out of them 36.8% had back pain. 30.4% had hypothyroidism and in that 13 out of 24 subjects with hypothyroidism had back pain (Table 2 and 3). There was no significant association of mode of transport on back pain was noted when individual mode of transport used were considered (Table 4). There was no significant association of spinal surgery on back pain, however the back trauma and the spinal injections had a

highly significant association with LBP when considered individually (Table 5).

There was a highly significant association of radiating pain and numbness of the lower limbs in subjects with LBP (Table 7). The history of lifting weight had a highly significant association with back pain (Table 8).

DISCUSION

Among musculoskeletal disorders in healthcare professionals, LBP is usually the most frequent symptom which is reported and the prevalence usually increases with age.²² Two third of the subjects (65.7%) were having LBP in the study done by Attar SM in 2014. The current study showed 47.3% of subjects who reported a history of back pain.¹¹ This could be due to the progressive degenerative changes and subsequent fibrosis in the disc and surrounding soft tissues that leads to a mechanical back pain super added by the external mechanical forces on improper positions and techniques of lifting weights.

Leboeuf in 2000 and Shiri R et al in 2010 reported a significant positive correlation of LBP with body weight in 33 percent of the study subjects.^{8,9} Similar findings found in this study could be due to the increased axial loading and central obesity with deposition of fat around the abdominal circumference that could actually lead to increased lordosis and increased axial loading around the lumbar vertebrae.

Smith et al in a study on Japanese nurses for a 12 month duration reported that the reproductive symptoms and menstrual disorders may influence LBP, however the direct relation could not be established as these may also be related to the area of posting and daily activities. The current study also could not establish such a direct correlation between menstrual irregularities and LBP (Table 1). 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.¹⁷ 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. Comparatively a higher number of subjects with comorbidities like HTN and hypothyroidism had LBP in the current study groups. Of the 387 participants, 17.05% had comorbidities and half of them had back pain. 46.7% of the 321 subjects with no comorbidities had back pain (Table 2 and 3). Though work related stress and anxiety could be suggested, it is unclear regarding the causal relationship between hypertension and pain sensitivity. This may be the reason why an association was not found in hypertensive patients with back pain in this study. Hypothyroidism may give rise to increased BMI and myopathy. These may be the contributing factors for patients to develop back pain though a direct causal association could not be found.

27.6% of the subjects used 2 wheelers as their mode of transport. 51.4% had back pain and the p value is 0.316 which is not statistically significant. Among the total participants 32.2% used 4 wheelers and out of them 44.8% complained of back pain (p=0.499). Out of 387 subjects, 11.62% used walking as the mode of transportation and 51.11% of them had back pain and the others did not have back pain (p=0.585). 30.7% of the participants used public transport. Among them, 47.89% had back pain (p=0.872). These are similar to the study done by Boukerma et al where they have found no significant influence on the occurrence of LBP regarding mode of transport (Table 4)²³

This characteristic may be more significant in subjects who spend more time traveling.

Alnaami et al has reported a higher incidence of back pain among healthcare workers who had a history of over exertion or back trauma.²⁴ In our study 5.6% of the subjects had a history of back trauma and 90.9% of them had LBP. The p<0.01 which is statistically significant. This could be due to the subsequent bony and soft tissue injury and subsequent changes related to the back pain. Post traumatic post-surgical immobilization is also another cause for back pain after trauma and spinal injections. 44.6% of the subjects who did not have a history of back trauma had back pain. Out of 387 participants, 2.06% had a history of spinal surgery out of which 62.5% had back pain.(p=0.384). 46.9 percent of the participants who did not have a history of spinal surgery had LBP. Among the total subjects 17.8% had a history of spinal injections and out of which 65.2% had LBP. The p<0.01 which is statistically significant. Though the finding seems interesting, detailed objective assessment may have to be done to confirm this association. 43.3% of the subjects who did not have a history of spinal injections had LBP (Table 5).

43 percent of the subjects had duration of pain more than 12 months, 15 percent had duration between 6-12 months 42 percent had duration less than 6 months (Table 6). Among the total subjects 26.6% had associated radiating pain and in that 88.3% had back pain. Out of 387 participants 13.6% had numbness of the lower limb and out of them 92.4% had back pain (Table 7). Both the findings have significant association. Loss of normal kypholordotic posture and increased spinal loading in the thoracolumbar spine and shift of forces to the sacroiliac joints could lead to the generation of spinal pain areas and tender points. Among the total participants, 63.04% had a history of lifting heavy weights and out of them 57.3% had back pain. The incidence here is much higher compared to the study done by Awosan et al 2017 which is 20.6%.¹ A statistically significant association has been found in this study also.

Anthropometry and physical characteristics play a significant role in identifying the causative factors for LBP in healthcare workers. Periodic and proper training to improve ergonomics and psychological health is often necessary.²⁵ Healthy posture and proper techniques for patient transfer in the workplace should be reiterated by hands on skill training to prevent disabling back pain that may reduce work efficiency. Work modification and healthy physical activity remains to be important key solutions in reducing and preventing back pain in healthcare providers.

Considering the positive association in certain determinants, it is imperative that variations in anthropometry and physical characteristics may be a significant predictor in the occurrence of back pain. A larger sample size could give a clearer picture of the

various risk factors that may be attributed in the causation of back pain.

Limitations

Since the questionnaire was mainly close ended and open ended questions with a yes/no pattern, an enumerated one to one interview of the participant could not be taken and hence detailed history of back pain such as intensity, pattern and location of back pain, evaluation and detailed assessment of site of back pain and deficits and evaluation of work ergonomics could not be described.

CONCLUSION

According to the study, the association between LBP and gender differences did not significantly influence the association with back pain. Weight of participants was positively associated with LBP, whereas height was not a major risk factor. Menstrual irregularities in female subjects were not significantly associated with LBP. Comorbidities such as hypertension and hypothyroidism are related with LBP. Though not statistically significant, subjects who used 2 wheelers and walking as their mode of transport had positive correlation with LBP. Statistically significant association with back pain was found in patients who had a history of back trauma or spinal injections. History of lifting weights was also significantly associated with LBP.

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Ethical approval: The study was approved by the institutional ethics committee

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