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RESEARCH ARTICLE

CORRELATION OF BODY MASS INDEX, POSTURE AND WORKING HOURS OF ADMINISTRATIVE WORKERS WITH OR WITHOUT LOW BACK PAIN- AN OBSERVATIONAL STUDY

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ABSTRACT

Background and Objectives: Low back pain can be defined as pain localized below the line of the twelfth rib and above the inferior gluteal fold, with or without leg pain. Nearly 76% of Computer professionals from India reported some kind of musculoskeletal discomfort in various epidemiological studies. This present study is aimed to investigate if there was a correlation between BMI, posture and working hours of administrative workers in being a risk factor for low back pain.

Methodology: Administrative workers who use computer for their daily work were considered for the study. Out of the 100 participants 26 were male participants and 74 were female participants. Demographic data like age, BMI, working hours was recorded in data collection sheets. Postural assessment was done in sitting and standing by observational and plumb line method respectively. Low back pain intensity was evaluated using visual analogue scale and Modified oswestry disability index. The correlation analysis was done between BMI, posture and working hours of each participant.

Results: No significant correlation was found between body mass index, posture and working hours of administrative workers in being a risk factor for low back pain.

Conclusion: The present study demonstrated that there was no significant correlation between body mass index, posture and working hours of administrative workers in being a risk factor for low back pain. However the present study indicated that increased body mass index and static posture during sitting may result in low back pain

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INTRODUCTION

Low back pain can be defined as pain localized below the line of the twelfth rib and above the inferior gluteal fold, with or without leg pain (Woolf and Pfeger, 2003). Many epidemiological studies limiting the ability to compare and pool data, estimate incidence of any kind of episode of low back pain to range between 1.5% and 36%. The estimated recurrence of low back pain in one year ranges from 24% to 80%.The prevalence of low back pain ranges from 1.0% to 58.1% (mean: 18.1%; median: 15.0%), and one year prevalence ranges from 0.8% to 82.5% (mean: 38.1%; median: 37.4%) (Woolf and Pfeger, 2003; Hoy *et al.,* 2010). Work-related Musculoskeletal Disorders are increasing in Computer users throughout the world. There is a significant rise in the use of computers for office work in the past two decades. Nearly 76% of Computer professionals from India reported some kind of musculoskeletal discomfort in various epidemiological studies (Talwar *et al.,* 2009). Several risk factors are associated which contribute to work related Musculoskeletal Disorders in workers who use a computer on a daily basis. WHO classifies two major categories for risk of low back pain (World Health Organization, 1985). They are Occupational and Non occupational/personal risk factors. The occupational factors include, repetition, force, awkward/static postures, duration of exposure and vibration which are the major risk factors. Other factors include age, physical fitness, smoking, excess body weight and strength of back and abdominal muscles.[1]Psychological factors which add to the risk of low back pain are anxiety, depression and emotional instability. Approximately 85–95% of cases, the exact root cause of the pain is unclear (Hoy *et al.,* 2010). Low back pain is often worse with prolonged walking, standing, and sitting (Woolf and Pfeger, 2003; Hoy *et al.,* 2010; Talwar *et al.,* 2009). In sitting posture, intra discal pressures is higher when compared to a standing or supine posture. This may cause low back pain in the long run (Johanning, 2000). Classification of Body Mass Index according to World Health Organization states people to be underweight with a BMI of <18.50, normal 18.5-24.99, overweight 25.00-29.99 and obese 30 and above (World Health Organization, 2000). Studies have shown to have a positive association between BMI and low back pain. Higher BMI has shown higher risk for low back pain (HeuchI

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et al., 2010). Sedentary lifestyle is also the cause for obesity which in turn leads to musculoskeletal issues such as low back pain (Kim *et al.,* 2015). Low Back pain also occurs due to sprains and strains in the back as a result of static or an awkward posture. Multiple musculoskeletal injuries have demonstrated to evolve from inactivity and static postures (Charpe, 2009). Posture is the normal attitude attained by the body during rest or activity. Most of the administrative workers have to sit for long hours during their work. Sitting for prolonged duration can lead to many postural changes in sitting (Chen *et al.,* 2009). Prolonged sitting in poorly designed chairs with inadequate lumbar support can lead to muscle fatigue of the back and abdomen. According to a study IT Professionals are exposed to the different risk factors associated with low back pain and hence, they are prone to work related Musculoskeletal Discomfort (Wahlström, 2005). Therefore, the workers involved in the administration have high prevalence of Work-related Musculoskeletal Disorders that may be associated with work style as one of the risk factors for developing musculoskeletal discomfort (Sharan *et al.,* 2011).

Low back pain is considered to be related with sitting postural changes and there is a positive relationship between discomfort and the frequency of postural changes during computer work. Physical Inactivity, Inferior fitness and nutrition levels, stress, depressive mood, cognitive functioning are the Psychosocial risk factors at work for LBP. Perceived high pressure on time and workload, low job control, job dissatisfaction, monotonous work, and low support from co workers and management appear to independently increase the risk of low back pain. Occupational risk factors for Low Back pain includes reasons like static muscle load and flexed curvature of the lumbar spine, as both are involved in seated work tasks (Bernard and Putz-Anderson, 1988; Wilder *et al.,* 1988). Computer workers are highly susceptible to the development of musculoskeletal symptoms, with prevalence as high as 50% (Gerr *et al.,* 2001). Work-related physical risk factors such as poor posture, Work related psycho-social factors and Occupational risk factors (Bernard and Putz-Anderson). It is important to identify these risk factors and their correlation ship as a cause for low back pain in order to reduce their prevalence.

MATERIALS AND METHODS

Subjects

Data was collected from administrative workers in a tertiary hospital and educational institutions Study design was a non experimental study. Convenience sampling was used in the study with a final sample size of 100 (n=100). Only administrative workers who use computers as part of their daily work were taken into considerations. Age of the participants was between 25-60 years. Participants with any spinal injuries, pregnancy and abnormalities were excluded from the study. The demographic data such as gender, age, BMI, waist hp ratio, working hours were recorded in data collection sheets.

Methods of postural assessment: Postural assessment was done in saggital view for sitting and standing by observational method and plumb line method respectively. In sitting posture the cervical, thoracic and lumbar regions were observed for postural deviations (Fig. No 1).

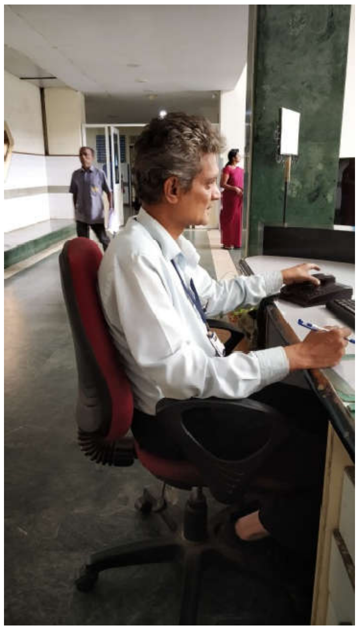

Fig. 1.

In standing posture plumb line was used to assess cervical, thoracic and lumbar postural deviations with regard to the plumb line (Fig. 2).

Fig. 2.

Visual analogue scale and Modified Oswestry disability index was used to evaluate the intensity of pain (Takala *et al.,* 2010; Griegel-Morris *et al.,* 1992).

RESULTS

In the present study 69.2% male participants and 52.7% female participants experienced LBP during the duration of the study. The distribution of demographic data on the participants is inferred in Table no.1

Table 1. Demographic data of all the subjects in the study

Particulars	Male	Female
Gender (percentage value)	26%	74%
Age	34.5 ±5.96	31.2 ±5.71
Height	161.1±7.45	157.4 ±5.43
Weight	65.2 ±8.70	57.3 ±8.04
BMI	25.36±3.39	23.16 ±2.52
WaistHipRatio	0.89 ±0.09	0.79 ±0.04
Duration of work (hours/day)	7.98 ±0.20	
Duration of rest (hours/day)	1.01 ±0.07	

Table 2. Correlation analysis of BMI of all the participants with all outcome variables in the study with or without low back pain

Variable 1	Variable 2	r value	p value	Association between Var1 & Var2
BMI	Duration of work	-0.02	0.453	Negative & very weak
	Duration of rest	0.09	0.378	Positive & very weak
	Cervical - ANTERIOR [STANDING]	-0.45	0.043*	Negative & moderate
	Cervical -THROUGH [STANDING]	-0.47	0.041*	Negative & moderate
	Thoracic – ANTERIOR [STANDING]	-0.15	0.243	Negative & weak
	Thoracic – THROUGH [STANDING]	-0.28	0.147	Negative & weak
	Thoracic – POSTERIOR [STANDING]	-0.33	0.157	Negative & weak
	Lumbar – ANTERIOR [STANDING]	0.33	0.157	Positive & weak
	Lumbar – THROUGH [STANDING]	0.21	0.241	Positive & weak
	Lumbar – POSTERIOR [STANDING]	0.34	0.346	Positive & weak
	Cervical - FOWARD NECK [SITTING]	-0.41	0.046*	Negative & moderate
	Cervical - NEUTRAL [SITTING]	-0.44	0.039*	Negative & moderate
	Thoracic - INCREASED KYPHOSIS [SITTING]	-0.22	0.241	Negative & weak
	Thoracic - KYPHOSIS [SITTING]	-0.40	0.041*	Negative & moderate
	Lumbar - DECREASED LORDOSIS [SITTING]	0.02	0.453	Positive & very weak
	Lumbar- INCREASED LORDOSIS [SITTING]	-0.10	0.355	Negative & weak
	Lumbar- LORDOSIS [SITTING]	-0.29	0.255	Negative & weak

*Significant at 5% level [p < 0.05]

Statistical analysis

Correlation of BMI with working hours and rest time.

The correlation of BMI with duration of work was not significant as the r value was -0.02, which indicates a negative correlation. The p value was 0.453which indicated a very weak and negative correlation. Correlation of BMI with rest showed a positive correlation with the r value 0.09 and the p value was 0.378 which indicated a positive and weak correlation between BMI and rest time.

Correlation of BMI with standing posture

The correlation of BMI with the cervical region anterior to the plumb line was negative and moderate as the r value was -0.45 and the p value was0.043. The Correlation of BMI with cervical region passing through the plumb line was also negative and moderate with the r value being calculated as -0.47 and p value being 0.041. The correlation of BMI with thoracic region was negative and weak with the following r and p values. The correlation of BMI with thoracic region anterior to the plumb line showed r value of 0.15 and p value of 0.243. The thoracic region through the plumb line showed r value of 0.28 and p value of 0.147. Thoracic region posterior to the plumb line showed r value of 0.33 and p value of 0.157. The correlation of BMI with lumbar region was positive and weak with the following values. The correlation of BMI with lumbar region anterior to the plumb line showed r value of 0.33 and p value of 0.157. The lumbar region passing through the plumb line showed r value of 0.21 and the p value of 0.241. The lumbar region posterior to the plumb line showed r value of 0.34 and the p value of 0.346

The correlation of BMI with sitting posture

The correlation of BMI with cervical forward neck posture was negative and moderate correlation with the r value calculated as -0.41 and the p value calculated as 0.046. Similarly the cervical region in neutral position showed negative and moderate correlation with r value -0.44 and p value 0.039. The correlation of BMI with increased thoracic kyphosis in sitting was negative and weak with r value calculated as -0.22 and p value 0.241. The correlation of BMI with thoracic kyphosis was negative and moderate with r value -0.40 and p value 0.041. Correlation of BMI with decreased lumbar lordorsis was positive and very weak with the r value calculated as 0.02 and the p value calculated as 0.453. The correlation of BMI with increased lumbar lordosis was negative and weak with r value calculated as -0.10 and p value 0.355. The correlation of BMI with lumbar lordosis was negative and weak with r value of -0.29 and p value of 0.255. The correlation analysis is summarised in table No.2

DISCUSSION

The present study evaluated the correlation of BMI, posture and working hours of administrative workers with or without LBP in 100 administrative workers. The results of the present study did not show any significant correlation between BMI, posture and working hours of administrative workers, which suggests that correlation of BMI, posture and working hours may not be a strong indicator for the cause of the presence of In this study 44% of the administrative workers reported LBP. Out of the 44%, the total percentage of male participants who complained of LBP was 69.2% while 52.7% of female participants complained of LBP during the duration of the study. Similarly in a study conducted by P Shahul Hameed, to study the study work related low back pain in IT workers who use the computer as their daily working tool found 54% male employees and 42% female employees who reported LBP. The mean percentage was 51%. The study concluded that low back pain is a major musculoskeletal disorder among IT professional including those using video display terminals for their work.[2] In the present study the correlation of BMI with posture for low back pain was weak. Majority of the participants with low back pain had foward neck and increased thoracic kyphosis. Similarly in a study conducted by. Lis AM to study the association of siting with occupational LBP stated that sustained awkward sitting posture such as a slouched posture or sitting with rounded and protracted shoulders can result in higher intra discal pressure and may be injurious to spinal postural health. Hence, awkward postures while sitting has been described as possible risk factors for the presence of LBP (Lis *et al.,* 2007). The negative correlation between sitting posture and BMI could be due to the fact that most of the administrative workers were provided with proper office chairs for sitting. The chairs could be adjusted for height and lumbar support which could be beneficial in providing better comfort while sitting and thus reducing awkward positions sustained during long hours of sitting. Also the subjects are free to move in between their working hours and are not confined to one position continuously. In the present study there was no significant relationship between BMI and postural changes in standing. Mitchell T, evaluated the regional changes in the lumbar spinal posture and influence of LBP found no relation found between BMI and regional postural changes in the spine (Mitchell *et al.,* 2008). A meta-analysis conducted to find the association between obesity and low back pain, assessed the association between overweight/obesity and low back pain. Ninety-five studies were reviewed and 33 included in the meta-analyses. In cross-sectional studies, obesity was associated with increased prevalence of low back pain in the past 12 months. The study concluded that obese individuals with increased BMI have a higher risk to develop low back pain (Shiri *et al.,* 2009).

In the present study suggest that there in more prevalence of low back pain in individuals with higher BMI values compared to others. The present study the average working time of the participants with low back pain was calculated to be 7.98 hours per day. The average rest time was calculated to be 1.01 hours per day. Similarly in a study conducted b Tyson A.C, studied the effects of prolonged sitting on the passive flexion stiffness of the lumbar spine suggested that changes in the passive flexion stiffness of the lumbar spine may increase the risk of low back injury after prolonged sitting and may contribute to low back pain in sitting (Beach *et al.,* 2005). In the present study the long duration of sitting during working hours could contribute to the postural changes in the participants which may lead to low back pain. The visual analogue scale (VAS) is a simple and frequently used method for the assessment of variations in intensity of pain. In clinical practice the percentage of pain relief, assessed by VAS, is often considered as a measure of the efficacy of treatment.[29] In the present study the VAS was taken to measure the intensity of LBP in the participants complaining of LBP. The pain intensity was calculated at rest as well as during activity/movement. The average score at rest was 2.0 out of 10, similarly the average score during activity was 2.62 out of 10. The VAS scale was taken horizontally as suggested by a study done to evaluate the Visual Analouge scale in chronic low back pain individuals in different settings. The horizontal position is more reliable than the vertical orientation as suggested by the study (Ogon *et al.,* 1996). The MODQ scale was used to evaluate the intensity of low back pain in the present study. According to a study which compares the MODQ scale to the Quebec Back Pain disability scale suggested that MODQ is superior to the Quebec back pain disability scale. The study suggested that MODQ scale is more responsive than Quebec back pain disability scale.[36] In the present study, the average MODQ score for participants with low back pain was 14.88%. This indicated minimal disability caused due to low back pain

Conclusion

The present study conclude that there is no significant correlation between BMI, posture and working hours of administrative workers with or without low back pain. The study also suggested that with increased BMI and inappropriate sitting posture during working hours could be a risk factor for low back pain.

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