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Original Research Article

A COMPARATIVE STUDY TO DIFFRENTIATE THE BACK EXTENSOR ENDURANCE BETWEEN SMOKERS AND NON-SMOKERS WITH AND WITHOUT LOW BACK PAIN USING SORENSON TEST

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ABSTRACT

Background: The two major public health concerns that have enormous socio-economic as well as public health impact are smoking and LBP.

Aim: To compare the effects of smoking on back extensor endurance.

Methodology: 200, 100 smokers and 100 non-smokers, all males were taken within the age group of 30-50 years, and who have been smoking for the last 10 years or more. People with mechanical LBP and spinal pathology were excluded. These 200 subjects were included and divided into two groups. A(n=100 smokers)B (n=100 non-smokers).With adequate explanation and demonstration Seronson test was carried out to see the back extensor endurance time in two groups of subject. Data was obtained and smoking- index was correlated subsequently. BMI,VAS, SORENSON TEST. Were the outcome measures used.

Results: 67 smokers and 31 non-smokers had low backache. The Sorenson time was significantly reduced in smokers with a mean endurance time of 44.89 and 96.39 in non-smokers. BMI is negatively related to Sorenson time and prolonged cough is a risk factor for low backache and also a dose- response relationship is found between the number of cigarettes / day and pain intensity.

Conclusion: The back extensor endurance is reduced in smokers irrespective of backache. Increased BMI and cough is also associated with disabling low backache. Smoking index is positively related to back pain.

KEY WORDS: Smoking Index, Sorenson Test, Low Backache.

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BACKGROUND

The two major public health concern that have an enormous socio-economic as well as health impact are smoking and low back pain [1]. A well-known risk factor for cardiovascular diseases like myocardial infarction, hypertension, stroke and pulmonary diseases like chronic bronchitis and emphysema is cigarette smoking [1]. In addition cigarette smoking is a risk factor for lumbago [1]. Reduce quality of life, sickness absence,loss of worker productivity and high healthcare cost are associated with low back ache [2]. Disabling low back ache is strongly associated with current smokers [2].

The strength and endurance have severely been impacted by prolong smoking [3]. The number of cigarette per day and incidence of low back ache shows a dose response relationship [2,4]. There is a relation to the cumulative dose of smoking and reduction in skeletal muscle function fatigue [5].

Increased Body mass index is said to be a risk factor for low back pain because as the BMI increases the risk of degenerative changes in the spine increases leading to low backache [5]. The tobacco content in cigarette named as nicotine induces perivertebral malnutrition including the vertebral bodies and the intervertebral disc is directly linked to smoking and low back pain [1]. There is progressive deterioration of the skeletal muscle fatigue resistance because of long term smoking [5]. The back is more susceptible to mechanical stress due to malnutrition of the intervertebral disc [1]. The malnutrition theory was supported on the basis that cigarette smoking leads to vasoconstriction, arterial artheromatous changes,or both,hence reduce blood supply to the perivertebral structures [1,5,6]. A reduced oxygen content to the blood results into diminished oxygen delivery leading to muscle fatigue [5]. The origination of back pain can be from many spinal structures including the facet joints,ligaments,intervertebral disc,nerve roots,vertebral bodies and paravertebral muscles [3]. The direct role in the etiology of low back pain is tissue malnutrition because of tissue hypoxia associated with nicotine induced vasoconstriction leading to chronic lack of vertebral blood supply [1].

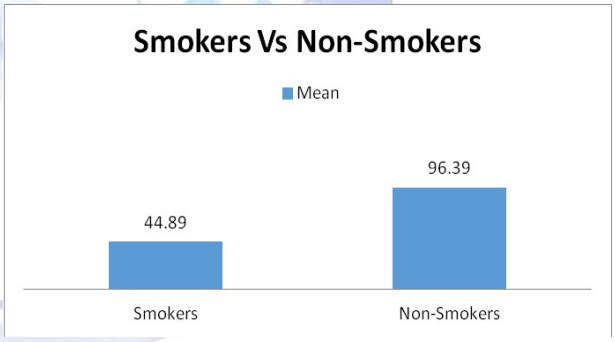
METHODOLOGY

A convenient sampling was done with 200 males, 100 smokers and 100 non-smokers were included from work-place, housing societies after taking into consideration both inclusion and exclusion criteria. Inclusion criteria included Males, Age group- 30-50 years, smoking for the last 10 years or more whereas exclusion criteria included People with mechanical LBP and spinal pathology. The data taken in the assessment form included:- Name, Age, Weight, Height, Smoking status which included years smoked and the number of cigarette smoked in a day, Back pain history which included the duration of back pain in years and the intensity of back pain through visual analogue scale. Individuals were explained and informed about the study and the Sorenson test to be performed.

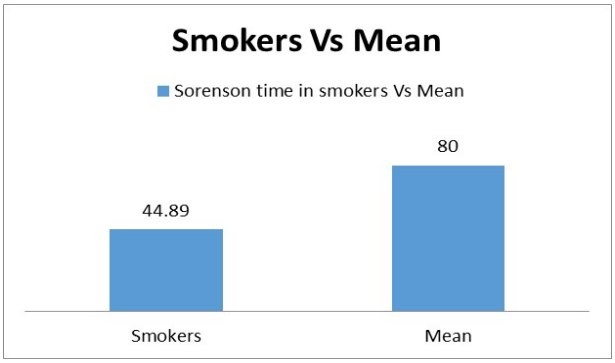
Sorenson test: This method is the most frequently investigated and reported in the literature. It test isometric back endurance; it measures how long (to a maximum of 240 seconds) the subject can keep the trunk unsupported (from the upper border of iliac crest)horizontal while prone on the examination table. During this test, the buttocks and legs are fixed to the table by 3 wide canvas straps and the arms are folded across the chest. The subject is asked to maintain the horizontal position until he can no longer control the posture or has no more tolerance for the procedure or until symptoms of fatigue are reached. For men the mean endurance time is 84 to 195 seconds.

STATISTICAL ANALYSIS AND RESULT

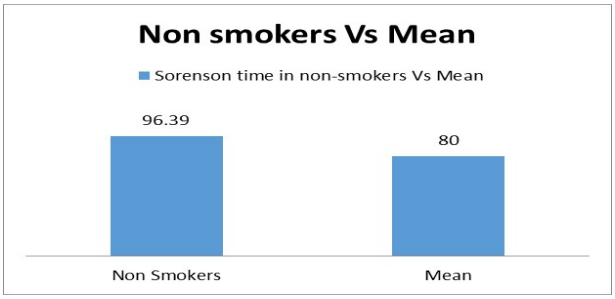
Graph 1: Comparison in the mean endurance time between smokers and non-smokers.



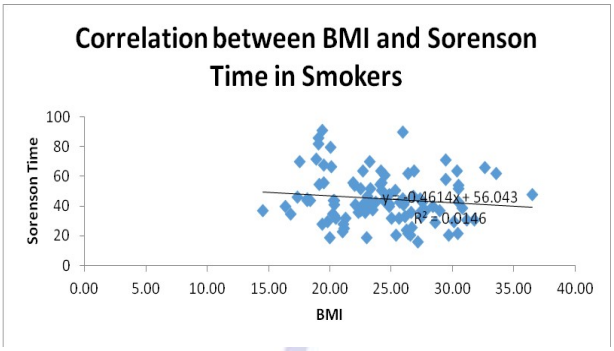
Graph 2: Sorenson time in smokers vs normal meanvalue of sorenson time in males.



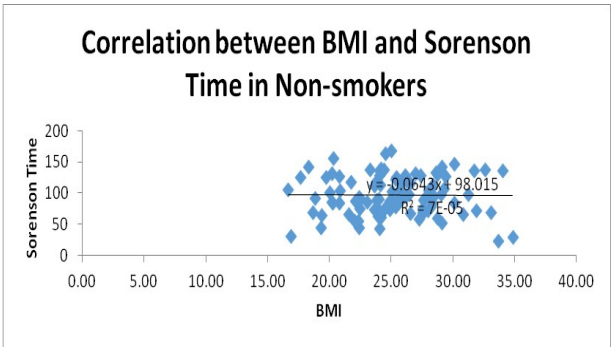
Graph 3: Sorenson time in non-smokers vs normal meanvalue of sorenson time in males.



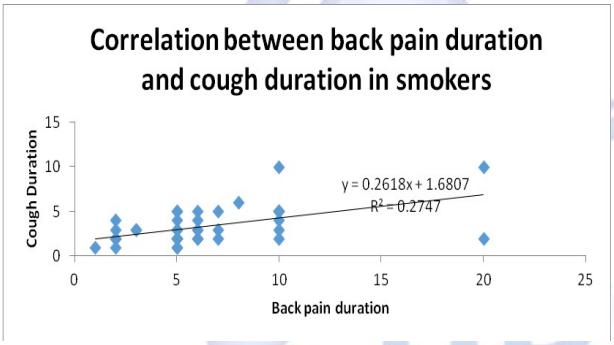
Graph 4: Correlation between body mass index and sorenson time in smokers.



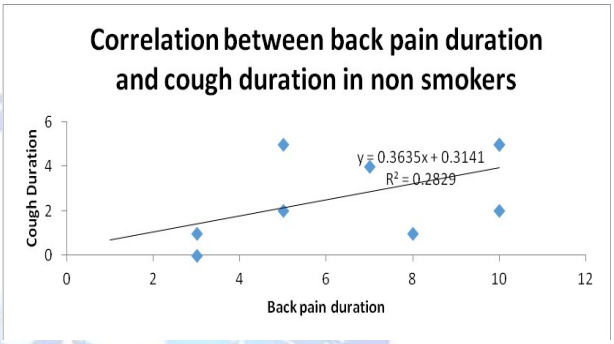
Graph 5: Correlation between body mass index and sorenson time in non-smokers.



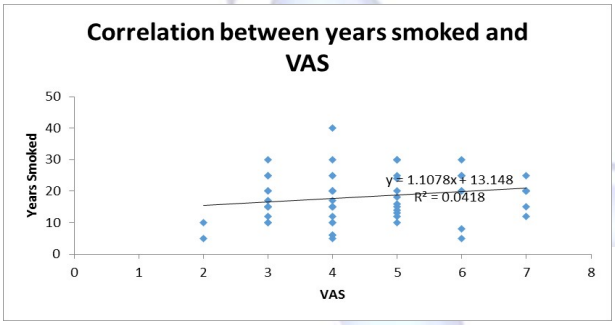
Graph 6: Correlation between the number of years coughed and back pain in smokers.



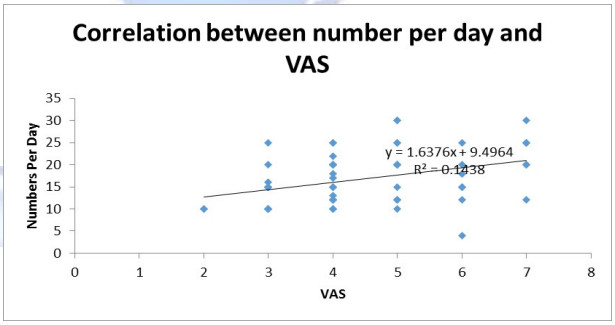
Graph 7: Correlation between the number of years coughed and back pain in non-smokers.



Graph 8: Correlation between the numbers of years smoked and VAS.



Graph 9: Correlation between the number of cigarettes per day and vas.



Graph 1 shows the comparison in the mean endurance time between smokers and non-smokers impression. The t-test was done for the comparison of the Sorenson time in 100 smokers and 100 non-smokers and the P value was found out to be 4.5 X $10^{31,}$ which is significant, and the mean endurance for smokers is 44.89 and non-smokers is 96.39, hence there is a difference in the mean in the Sorenson time in smokers and non-smokers. Therefore it is seen that in smokers the mean endurance time for the back extensors is significantly reduced compared to non-smokers.

Graph 2 shows the sorenson time in smokers vs normal meanvalue of sorenson time in males**.** The Sorenson time in normal males ranges from 80-194 seconds. According to the above graph the Sorenson time mean of 100 smokers is 44.89 which is reduced and hence reduced back extensor endurance in smokers. Thus indicating that The Sorenson time in smokers is less than 80and is reduced according to the normal range and the back extensor endurance is said to be affected.

Graph 3 sorenson time in non-smokers vs normal meanvalue of sorenson time in males. The Sorenson time in normal males ranges from 80-194 seconds. According to the above graph the Sorenson time mean of 100 non- smokers is 96.39 which is within the normal and hence back extensor endurance is not affected in non-smokers. Thus highlighting that The Sorenson time in non-smoke is greater than 80 and so the back extensor endurance is said to be not affected.

Graph 4 shows the correlation between body mass index and sorenson time in smokers. There is a weak negative linear relationship (P = -0.12) between Body Mass Index and Sorenson time in Smokers (seconds). Thus the above graph signifies that as the Body mass index increases the Sorenson time decreases.

Graph 5 shows the correlation between body mass index and sorenson time in non-smokers.There is a weak negative linear relationship (P= -0.12) between Body Mass Index and Sorenson time (seconds) in non-smokers. Thus the above graph signifies that as the Body mass index increases the Sorenson time decreases.

Graph 6 highlights the correlation between the number of years coughed and back pain in smokers. There is a strong positive linear relationship (p= 0.52) between the back pain duration and the cough duration. Thus the above graph signifies that the duration of back pain increases with the duration of cough in smokers

Graph 7 shows correlation between the number of years coughed and back pain in non-smokers. There is a strong positive linear relationship (p= 0.37) between the back pain duration and cough duration in non-smokers which is significant. Thus the above graph signifies that the duration of back pain increases with the number of years coughed in non-smokers

Graph 8 shows the correlation between the numbers of years smoked ans vas. There is a positive linear relationship (p =0.20) between the years smoked and the pain intensity measured on vas. Thus the above graph signifies that pain intensity increases with the smoking years.

Graph 9 indicates correlation between the number of cigarettes per day and vas. Impression-: there is a positive linear relationship (p= 0.32) between the number of cigarettes per day and the pain intensity measured on vas. Thus the above graph signifies that there is a dose dependent relation between smoking and back pain and concludes that the pain intensity increases with number of cigarette per day.

DISCUSSION

The study attempted to compare the back extensor endurance between smokers and non-smokers with and without low back pain. The test to measure the endurance of back extensor was assessed using the Sorenson method. The study included 200 males, 100 smokers and 100 non-smokers.

The prevalence of back pain was more among the smokers group. Amongst 100 smokers 67 smokers complaint of back pain and among 100 non-smokers 31 complaint of back pain.

Graph 1 shows the mean endurance time between smokers and non-smokers and displays that the mean for 100 smokers is 44.89(seconds) and for 100 non-smokers is 96.39(seconds), which means that the back extensor endurance in smokers is significantly reduced and hence can be the reason for low back pain in smokers.

The Sorenson time in smokers is less than 80 i.e.; 44.89 displaying in Graph 2 which says that the this population has reduced back extensor endurance leading to low back pain whereas in Graph 3 the Sorenson time in non-smokers is more than 80 i.e.; 96.39 hence the back endurance is better as compared to the non-smokers and hence the chances of having low back pain is minimal or no.

There is a weak negative linear relationship between Body Mass Index and Sorenson time in smokers as well as non-smokers displaying in Graph 4 and Graph 5 and concludes that as the Body Mass Index increases the Sorenson time of the individual decreases. Increased Body Mass Index increases the risk of degenerative changes in the spine regardless of the smoking status causing low back pain [5]. Cough is said to be the main risk factor for low back pain because of continuous cough there is increase in the intra-abdominal pressure leading to increase in the intra-discal pressure [1]. Cough and low back pain are said to be positively related and concludes that a back pain increases with the number of years coughed displaying in Graph 6 and Graph 7 in both smokers as well as non-smokers. Graph 8 shows a positive linear correlation between the number of years smoked and

the pain intensity measured on Visual analog scale in smokers and concludes that the pain intensity increases with the number of years smoked.A positive linear relationship has also been found between the number of cigarettes per day and pain intensity on Visual analog scale and concludes that the severity of pain increases with the number of cigarettes per day displaying in Graph 9.Smoking increases the level of circulating pro-inflammatory cytokines which signal the central nervous system, leading to amplification of pain [5].

Hence smokers tended to exhibit lower back extensor endurance compared to non-smokers. Further smokers with low back pain show greater level of pain as per the increasing smoking index. Low back pain is also related to increasing Body Mass Index, smokers as well as non-smokers with increased Body Mass Index exhibits low back pain. Low back pain also increases with the prolong coughing and concludes that back pain increases with the number of years coughed. The lumbar extensor muscle plays a key role in maintaining spinal stability by controlling motion and attenuating the associated forces through the lumbopelvic region. Hence impairment in the strength and endurance of lumbar extensors has been proposed to be a risk factor in the etiology of low back pain [1]. Based on the result of the present and other studies, smoking history should be included as part of the routine assessment of patients with back complaints. Smoking history appears to be integral in the risk factor assessment of low back pain as well as other musculoskeletal injuries, in stratifying individuals at risk in back education programs and with respect to smoking related to delay healing in medical and surgical patients with back complaints.

CONCLUSION

In this study, individuals who smoke regardless of their back pain status exhibited lower back extensor endurance .Hence smoking is a risk factor for reduced back extensor endurance and hence low back pain. Increased Body Mass Index and cough is also associated with disabling low backache. Smoking index is also positively associated to the pain intensity for low backache.

Limitations: Limited sample size of 200, Age group was 30-50,

Recommendation: Males between 20-30 of years to be included in the study. Study to be carried out in females also.

Conflicts of interest: None

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