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Original Article

Physiotherapy Section

Prevalence of Core Weakness in Bank Employees

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ABSTRACT

Introduction: Adults working in full time sedentary jobs spend 75% of their job time sitting, in terms of total time of sedentary behaviour of individuals. This population is at a greater risk of sedentary behaviour, due to elevation in the prevalence of sedentary office work and leisure time habits, resulting in 9-11 hours of total sitting time per day. Some of the occupations have adapted a sedentary behaviour, they demand long hours of being in one position. Adults adapt to faulty postures due to prolonged hours of work leading to muscular imbalances which highly contribute to the increased risk of musculoskeletal disorders. These disorders mainly occur due to weakening of the "core" musculature i.e. the central musculature of the body. This in turn may lead to excessive load on the lumbar spine, back, poor endurance of muscles, muscle imbalance and lower extremity disorders.

Aim: To find out the prevalence of core weakness in bank employees with respect to their gender, age and Body Mass Index (BMI).

Materials and Methods: A total of 99 healthy bank employees (67 males and 32 females), who were physically inactive for 6-8 hours daily and exercising for less than 2 hours per week, with their age between 20-50 years, were selected for the assessment of their core for finding its weakness. To find whether the bank employees had core weakness, outcome assessment was done by using a Chattanooga Pressure Stabilizer™.

Results: In this study, statistically significant difference was noted within individuals with normal BMI (18.5-24.99 Kg/m^2), whereas with respect to the age and gender, no statistically significant difference was noted.

Conclusion: The prevalence of core weakness in bank employees was found to be 72.73%; majority of core weakness was found within the age group of 45-50 years (23.6%) which was relatively higher than other age groups. Prevalence of core weakness was found to be more in male population (65.3%) and in individuals with normal BMI (52.8%).

Keywords: Core muscles, Core stability, Low back pain, Physical activity, Pressure biofeedback, Sedentary work

INTRODUCTION

Sedentary lifestyle has been increasing, as physical activity has been decreasing due to the rapid growth in technology in the last couple of decades. Minimising human movements and muscular activity have had a dual effect on human behaviour causing the people to move less and sit more [1,2].

Over the past decade, a number of developed nations showed high prevalence of physical inactivity among individuals having diabetes, obesity and practicing sedentary lifestyle, etc., [3-6]. Prevalence of physical inactivity in various parts of India was found to be Chandigarh (66.8%), Jharkhand (34.9%), Maharashtra (55.2%) and Tamil Nadu (60%) and the estimated number of inactive individuals in India would be 392 million [3]. In another study that was conducted in Puducherry, prevalence of physical inactivity was found to be 49.7% (n=283) and in adults with adequate physical activity level, it was 50.3% (n=286) [4].

Adults working in full time sedentary jobs spend 75% of their job time sitting, in terms of total time of sedentary behaviour of individuals; Work and non-work time contributed 36.5 hours & 38.7 hours per week respectively [5,7] resulting in 9-11 hours of total sitting time per day [6].

Some of the occupations demands long hours of being in one position. Core weakness can be defined as the weakness of the central musculature of the body which includes the abdominal and back muscles, due to lack of physical inactivity and adaptation of faulty postures during prolonged hours of work. There are muscular imbalances that highly contribute to the increased risk of musculoskeletal disorders associated with low back pain [8-12]. This in turn may lead to excessive loading on the lumbar spine, back, poor endurance of muscles, muscle imbalance and lower extremity disorders [13]. Traditionally core stability can be referred to the active component including the local/deep muscles that provide segmental stability (e.g., transversus abdominis, lumbar multifidus) and/or the global/superficial muscles (e.g., retus abdominis, erector spinae) that enable torque/trunk movement and also assist in stability in more physically demanding activities.

For assessing the core strength certain tools and methods are available which include Plank test, Metabolic Equivalents (MET), Electromyography (EMG), Modified Sphygmomanometer Test (MST), Pressure Biofeedback Unit (PBU) etc., [3,14-17].

Moreover, till date no study has been conducted to assess the core strength among bank employees lacking maximal physical activity. As it is said precaution is better than cure, it is important to find out the prevalence of core weakness in bank employees, so as to help the bank employees from losing the working hours, taking leaves and avoiding other musculoskeletal disorders caused due to core weakness.

MATERIALS AND METHODS

This cross-sectional study was conducted at the Physiotherapy department of Krishna Hospital and Research Centre in Karad city. The data was collected from 10th April to 30th April 2018. The study population of 99 individuals was the banking employees of various banks who were selected by purposive sampling method.

Sample size and sampling: A sample size of 99 was calculated by the statistician assuming the 55.2% prevalence of physical inactivity with 15% relative precision, 95 confidence and 20% attrition rate based on ICMR-INDIAB study, Maharashtra status [3]. Data was

collected and the overall procedure was supervised by the faculty incharge. The proforma was checked by faculty incharge for quality assurance.

Inclusion Criteria

1) Age group between 20-50 years; 2) Healthy individuals but physically inactive for 6-8 hours daily, exercising for less than 2 hours per week; 3) Both genders; 4) Subjects willing to participate in the study.

Exclusion Criteria

1) Individuals with any history of spine pathology or fracture; 2) abdominal or spine surgery; 3) LBP for more than 3 months or present LBP; 4) individuals involved in gym or exercising regularly for 2-4 hours per day.

Outcome Measure

Outcome assessment was done by using Chattanooga Pressure Stabilizer™ with subjects positioned on the plinth in crook lying position with the placement of Pressure Biofeedback Unit (PBU) under the lumbar spine at L3 level, right below the umbilicus and it was inflated to 40 mmHg. The intra-rater and inter-rater reliability of PBU for measurement of Transverse abdominis were (ICC>0.98) and (ICC>0.99) with 95% confidence interval which was found to be excellent. The inflated pressure for beginners is 40 mmHg whereas for athletes its 70 mmHg [16,17]. It has been documented that core stability assessment with hip flexion or knee extension/flexion, the 90° position has the best reliability (ICC, 0.94) or (ICC, 0.77) of the assessor as compared to the other joint positions [18,19]. Individuals were instructed to "Take a breath in and as you exhale, gently draw your navel in towards your spine". Individuals were asked to maintain abdominal contraction for as long as they could but weren't made aware that they had to contract it for at least 10 seconds of duration while maintaining a pressure of 40 mmHg on the Pressure gauge. Five practice repetitions with verbal and tactile feedback made prior to recording the data to correct errors. All the samples weren't allowed to look at the PBU gauge at any time [16].

Core Weakness will be considered more in bank employees who were not be able to maintain the pressure at or above 40 mmHg. According to duration it will be considered more in bank employees who were not be able to maintain the contraction for 10 more seconds.

Ethical clearance was obtained from the Institutional Ethical Committee of KIMSDU. Individuals were approached and those fulfilling the inclusion criteria were selected. The procedure was explained and written informed consent was taken from those willing to participate. Demographic information of the subjects was taken. The individuals were explained about the purpose of the study. Also, they were informed about the procedure. Each of them was assessed for the Core weakness using a PBU. Data was recorded. Statistical analysis using SPSS (version 22.0) was done in relation to distribution of the age, gender, BMI as well as holding of pressure and duration of the PBU.

RESULTS

Association between gender and core weakness by Pearson Chi-Square test, was found to be (0.695) and p-value (0.405) which was not significant [Table/Fig-1]. The p-value found with Fisher's-exact test was (0.475) as this p-value was >0.05 it was found to be not significant [Table/Fig-1]. Association between age and core weakness by Pearson Chi-Square test, it was found to be (4.258) with 5 degree of freedom and p-value of (0.513) which was not significant [Table/Fig-1]. The p-value found with Linear by Linear Association was (0.482) as this p-value was >0.05 it was found to be not significant [Table/Fig-1] and association between BMI and core weakness by Pearson Chi-Square test, it was found to be 58.247 and p-value of (0.679) which was not significant [Table/Fig-1]. The p-value found with Linear by linear association was (0.033) as this p-value was <0.05 it was found to be significant [Table/Fig-1]. The

	Pearson chi-square			Fisher's-exact test			Linear by linear association		
Category	Value	df	p-value	Value	df	p-value	Value	df	p-value
Gender	0.695	1	0.405 (NS)	-	-	0.475 (NS)	-	-	-
Age	4.258	5	0.513 (NS)	-	-	-	4.487	5	0.482 (NS)
BMI	58.247	64	0.679 (NS)	-	-	-	4.535	1	0.033 (S)

[Table/Fig-1]: Association of core weakness with gender, age and BMI.

		Duration			
Pressure	<10	Percentage	≥10	Percentage	Chi-Square p-value
<40	13	27.1%	24	100%	>0.05(NS)
≥40	35	72.9%	0	0	
Total	48	100%	24	100%	

[Table/Fig-2]: Cross tabulation of pressure against duration.
NS*-Not Significant

p-value for cross tabulation of pressure against duration was >0.05 hence it was found to be not significant [Table/Fig-2].

DISCUSSION

In this study, among the 99 selected bank employees, prevalence of core weakness was present in 72 bank employees which was found to be 72.73% [Table/Fig-3]. Another cross-sectional study was done to find the prevalence of high Sedentary Behaviour (SB) among 42,469 individuals of six countries, aged >18 years. The prevalence of high SB was found to be China (9%), Ghana (6.4%), India (5.2%), Mexico (3.9%), Russia (17.7%), South Africa (4.6%). This data from the World Health Organization's Study on Global Ageing and Adult Health was analysed to find an overall prevalence of high sedentary behaviour to be 8.3% [20]. Core weakness was found to be more prevalent in males rather than females [Table/Fig-4]. A reason for this may be that females are involved in all the household activities which make them more physically active than the males during their non-working hours [3]. A study reviewed prevalence of physical inactivity among adults was estimated to be 31.1%. Physical inactivity was

	Core Weakness	Percentage
Present	72	72.73 %
Absent	27	27.27%
Total	99	100%

[Table/Fig-3]: Prevalence of core weakness.

Gender	Presence of Core Weakness	Percentage
Male	47	65.3%
Female	25	34.7%
Total	72	100%

[Table/Fig-4]: Prevalence of core weakness according to gender.

more prevalent among males (22.4%) than females (14.4%), although this difference was not statistically significant. These individuals were found to carry out activities such as gardening and farming [21].

It was clear that out of these 72 bank employees, core weakness was found to be more prevalent in the age group of 45-50 years and the least was seen in the age group of 20-25 years [Table/Fig-5]. The cause due to which core weakness was found in Bank employees in the age group of 45-50 years might be that, as these individuals are ageing their muscles fibers and muscle mass reduces, so they tend to get easily fatigued on carrying out any activity; hence they are less

physically active. On the other hand the bank employees within the age group of 20-25 years are still young, energetic and are more active than the individuals above the age of 40 years. The other reason for core weakness might be aging process leading to muscle strength loss in individuals above of age of 40 years (40.9%) [22]. Global recommendations given on physical activity suggests that moderate to vigorous physical activity is necessary for each age group, re-evaluation of exercise habits and its intensity are required [23].

Age Group	Presence of Core Weakness	Percentage	Mean±SD
20-25	05	6.9%	24.2±0.83
25-30	15	20.8%	27.86±1.12
30-35	11	15.3%	33.27±1.48
35-40	12	16.7%	37.83±1.33
40-45	12	16.7%	49.92±1.16
45-50	17	23.6%	48±1.65
Total	72	100%	37.17±8.30

[Table/Fig-5]: Prevalence of core weakness according to age.

BMI	Presence of Core Weakness	Percentage	Mean±SD
Under Weight	01	1.3%	16.65±0.91
Normal Weight	38	52.8%	22.14±1.74
Over Weight	31	43.1%	26.75±1.18
Class I Obese	02	2.8%	30.85±1.06
Total	72	100%	23.88±3.03

[Table/Fig-6]: Prevalence of core weakness according to BMI.

Majority of core weakness was also noted in bank employees with a normal BMI and minimum was seen in those who were underweight [Table/Fig-6]. In accordance with the BMI a higher level of total physical activity is required to lower its values [13].

People mostly focus on staying active by walking, jogging or running, nobody really focuses on the core muscle strength which is necessary for the stability required to maintain the posture while carrying out the activities [8]. The knowledge of physical activity and exercise is already known among many people, but the population of people exercising regularly is small and the amount of physical activity practiced during leisure time decreases day by day. It's difficult for the people to continuously uphold the habit of performing high amounts of physical activity for greater extends of time [23]. The rate of exercise is low due to employment and natural environment. It was reported that approximately half of the people discontinue exercising and performing physical activity regularly within 3-6 months of starting [24]. Physical activity above moderate intensity is beneficial for the health. Walking and running are basic kinds of aerobic exercises, can be performed anytime and anyplace, at one's own pace with no special skills required. But, low intensity regular walking isn't enough for weight loss though they reduce risk factors such as metabolic syndrome and cardiovascular diseases [25,26]. Running is useful but is considered difficult so people don't even attempt it [27].

This study shows that core weakness was noted in Bank employees but the results were not statistically significant due to the limitations such as the small sample size but the power of the study was 80% with 95% of confidence interval. The sample size was calculated and found to be sufficient by the statistician, as per the present geographical area. But it was found to be more prevalent on assessing the core muscles; which makes it completely necessary to focus on the core muscle strengthening programs for these individuals, associated with suggestions for postural correction in order to maintain the stability of core of the body and a normal spinal alignment.

LIMITATION

The study group size was small; hence study results cannot be generalised for the entire population. The accessibility to the banks and the transport system wasn't proper as this area is still developing to be a proper urban city, hence yes the geographical location was found to be a limitation. Short duration of study was another limitation.

RECOMMENDATIONS

Similar study can be done in different sedentary occupations. Comparative study can be done between the sedentary workers belonging to different professions. Studies with inclusion of individuals with musculoskeletal disorders or complaints. Future researches must include details of leisure time of the individual. The overall physical activities during the day should also be considered in the upcoming research studies. Comparative studies can be done with different postures suitable for core muscle assessment with the Pressure biofeedback unit.

CONCLUSION

On the basis of the results of the study, it was concluded that core weakness in bank employees which was found to be 72.73%; Association of core weakness with age was found within the age group of 45-50 years (23.6%) which was relatively higher than other age groups. Association of core weakness with gender was found to be higher in male population (65.3%) and in individuals with normal BMI (52.8%). Statistically significant difference was noted in individuals with normal BMI, whereas no statistically significant difference was noted with respect to the age and gender.

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REFERENCES

[1] Kulandaivelan S, Chaturvedi R, Moolchandani H. Efficacy of progressive core strengthening exercise on functional endurance tests and hypertrophy of multifidus, transverses abdominis in healthy female subjects with low core endurance. J of Exercise Science and Physiotherapy. 2014;10(2):114.
[2] Owen N, Sparling PB, Healy GN, Dunstan DW, Matthews CE. Sedentary behaviour: Emerging evidence for a new health risk. InMayo Clinic Proceedings. Elsevier. 2010;85(12):1138-41.
[3] Anjana RM , Pradeepa R, Das AK, Deepa M, Bhansali A, Joshi SR, et al. Physical activity and inactivity patterns in India-results from the ICMR-INDIAB study (Phase-1) [ICMR-INDIAB]. International Journal of Behavioural Nutrition and Physical Activity. 2014;11(1):26.
[4] Newtonraj A, Murugan N, Singh Z, Chauhan RC, Velavan A, Mani M. Factors associated with physical inactivity among adult urban population of puducherry, india: a population based cross-sectional study. Journal of Clinical and Diagnostic Research: JCDR. 2017;11(5):LC15.
[5] Parry S, Straker L. The contribution of office work to sedentary behaviour associated risk. BMC Public Health. 2013;13(1):296.
[6] Pesola AJ, Laukkanen A, Heikkinen R, Sipilä S, Sääkslahti A, Finni T. Accelerometer-assessed sedentary work, leisure time and cardio-metabolic biomarkers during one year: Effectiveness of a cluster randomized controlled trial in parents with a sedentary occupation and young children. PloS One. 2017;12(8):e0183299.
[7] Carr LJ, Karvinen K, Peavler M, Smith R, Cangelosi K. Multicomponent intervention to reduce daily sedentary time: A randomized controlled trial. BMJ Open. 2013;3(10):3261.
[8] Hoogenboom BJ, Voight ML, Prentice WE editors. Musculoskeletal Interventions; techniques for therapeutic exercise. McGraw Hill 2014.
[9] Mehta RS, Nagrale S, Dabadghav R, Rairikar S, Shayam A, Sancheti P. Assessment of lumbar lordosis and lumbar core strength in information technology professionals. Asian Spine Journal. 2016;10(3):495-500.
[10] Anderson A, Hoffman J, Johnson B, Simonson A, Urquhart L. Core strength testing: developing normative data for three clinical tests. Retrieved from Sophia, the St. Catherine University repository website: https://sophia.stkate.edu/dpt_papers/32
[11] Martínez-González MÁ, Martinez JA, Hu FB, Gibney MJ, Kearney J. Physical inactivity, sedentary lifestyle and obesity in the European Union. International Journal of Obesity. 1999;23(11):1192.

[12] Chang WD, Lin HY, Lai PT. Core strength training for patients with chronic low back pain. Journal of Physical Therapy Science. 2015;27(3):619-22.
[13] Rathore M, Trivedi S, Abraham J, Sinha MB. Anatomical correlation of core muscle activation in different yogic postures. International Journal of Yoga. 2017;10(2):59.
[14] Strand SL, Hjelm J, Shoepe TC, Fajardo MA. Norms for an isometric muscle endurance test. Journal of human kinetics. 2014;40(1):93-102.
[15] Park DJ, Lee SK. What is a suitable pressure for the abdominal drawing-in maneuver in the supine position using a pressure biofeedback unit? Journal of Physical Therapy Science. 2013;25(5):527-30.
[16] Grooms DR, Grindstaff TL, Croy T, Hart JM, Saliba SA. Clinimetric analysis of pressure biofeedback and transversus abdominis function in individuals with stabilization classification low back pain. Journal of Orthopaedic & Sports Physical Therapy. 2013;43(3):184-93.
[17] Aguiar LT, Lara EM, Martins JC, Teixeira-Salmela, LF, Quintino LF, Cristo PP, et al. Modified sphygmomanometer test for the assessment of strength of the trunk, upper and lower limbs muscles in subjects with subacute stroke: reliability and validity. European journal of physical and rehabilitation medicine. 2016;52(5):637-49.
[18] Jung DE, Kim K, Lee SK. Comparison of muscle activities using a pressure biofeedback unit during abdominal muscle training performed by normal adults in the standing and supine positions. Journal of Physical Therapy Science. 2014;26(2):191-93.
[19] Azevedo DC, Lauria AC, Pereira AR, Andrade GT, Ferreira ML, Ferreira PH, Van Dillen L. Intraexaminer and interexaminer reliability of pressure biofeedback unit for assessing lumbopelvic stability during 6 lower limb movement tests. Journal of Manipulative and Physiological Therapeutics. 2013;36(1):33-43.
[20] Koyanagi A, Stubbs B, Vancampfort D. Correlates of sedentary behaviour in the general population: A cross-sectional study using nationally representative data from six low-and middle-income countries. PloS One. 2018;(8):e0202222.
[21] Lucena JR, Coimbra CE, da Silva CM, Welch JR. Prevalence of physical inactivity and associated socioeconomic indicators in indigenous Xavante communities in Central Brazil. BMC Nutrition. 2016;2(1):37.
[22] Keller K, Engelhardt M. Strength and muscle mass loss with aging process. Age and strength loss. Muscles, ligaments and tendons journal. 2013;3(4):346.
[23] Araki M, Hatamoto Y, Takae R, Jackowska M, Tanaka H. Turns in Jogging Increase Energy Expenditure: Proposed Home Exercise for Sedentary People. J Nov Physiother. 2017;7:360
[24] Souza LA, Martins JC, Moura JB, Teixeira-Salmela LF, De Paula FV, Faria CD. Assessment of muscular strength with the modified sphygmomanometer test: what is the best method and source of outcome values?. Brazilian journal of physical therapy. 2014;18(2):191-200.
[25] Batacan RB, Duncan MJ, Dalbo VJ, Tucker PS, Fenning AS. Effects of light intensity activity on CVD risk factors: a systematic review of intervention studies. BioMed Research International. 2015;2015:596367.
[26] Laursen AH, Kristiansen OP, Marott JL, Schnohr P, Prescott E. Intensity versus duration of physical activity: implications for the metabolic syndrome. A prospective cohort study. BMJ Open. 2012;2(5):e001711.
[27] Dishman RK, Sallis JF. Determinants and interventions for physical activity and exercise. Exercise, fitness, and health: A consensus of current knowledge. Champaign, IL: Human Kinetics. 1994;16:75-102.

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