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The study on hamstring flexibility and lumbar spine mobility in dental professionals

Samiksha Rathod and Deepali Hande

Abstract

Background: A reduction in hamstring flexibility and lumbar spine mobility can be induced by a lack of regular exercise and difficult postures exposed at work due to an individual's profession. It can also be expressed as a result of incorrect posture during dental practice, which can be corrected by performing frequent exercises. Reduced hamstring flexibility leads to decreased lumbar spine mobility, which can be a contributing reason to low back pain and lumbar degeneration

Introduction: Dental professions require constant static posture due to which they are at a risk of hamstring tightness which further adversely affects lumbar spine mobility which leads to lower back pain, bad posture, imbalances of muscles, and knee pain. There have been many ideologies regarding the presence of hamstring flexibility in various professions but due to lack of study regarding the prevalence of hamstring flexibility and lumbar spine mobility in dental professions, this research is being conducted in order to evaluate if reduced hamstring flexibility affects lumbar spine mobility in dentists whose job protocol involves prolonged sitting.

Methodology: The study was conducted in a Rural Dental College and Hospital for the dental practitioners who have work experience of 2 or more than 2 years as per inclusion criteria. Convenient sampling was done for 50 individuals. The hamstring flexibility was measured using the Finger to Toe test and lumbar spine mobility was measured using Schober's test.

Result: It is observational type of descriptive study, there were 50 participants in this study (34 females and 16 males, average age = 28.78 (SD = 6.39) years, average years of experience = 5.42 (SD = 4.84)), average BMI = 23.8 (SD = 3.33), average finger to toe test score = 11.34 (SD = 9.12) and average Schober's test score = 4.54 (SD = 0.67) were documented. To assess hamstring flexibility, finger to toe test was used and to assess lumbar spine mobility, Schober's test was used. It was found that reduced hamstring flexibility leads to decrease in lumbar spine mobility. Also, no association was found between years of experience with hamstring flexibility and lumbar spine mobility.

Conclusion: The study concluded that a strong negative correlation was found between hamstring flexibility and lumbar flexion range of motion. It was discovered that reduced hamstring flexibility can result in reduced lumbar spine range of motion in dental professionals.

Keywords: Hamstring flexibility, lumbar spine mobility, dental professionals, dentists, exercise

Introduction

The hamstrings are muscles that allow the hip to extend and the leg to flex. The hamstrings play an essential role in the complex gait cycle during walking, which includes kinetic energy absorption and knee and hip joint protection. During the swing period of walking, the hamstrings limits the tibia's forward motion. Hamstring contraction and quadriceps contraction, which is an antagonist muscle of the hamstrings, have a complicated interplay [2]. Flexibility is the capacity of a joint or series of joints to move through an unrestricted, pain free range of motion. Although flexibility differs greatly between individuals certain minimum ranges are required to sustain joint and total body health. Many variables affect the loss of normal joint flexibility including injury, inactivity or a lack of stretching. The range of motion will be influenced by the mobility of the soft tissues that surround the joint. Muscles, ligaments, tendons, joint capsules, and skin are examples of soft structures. Stretching insufficiently, especially when combined with activity, can result in fatigue-induced soft tissue shortening over time [1].

Reduced Hamstring flexibility is caused due to hamstring muscle tightness which not only reduces range of motion but also leads to a variety of musculoskeletal issues.

Hamstring Muscle tightness is described as when the knee extension angle exceeds 20 degrees. There are several ways to assess hamstring flexibility, including the Active Flexion (AFE) test, and the finger to toe test. The straight leg lift test is commonly used to assess hamstring tightness, but it is less specific to the hamstring muscle due to pelvic movement. As a result, the straight leg raise test is appropriate for measuring hamstrings tightness to some degree ^[15].

The lower back serves numerous essential functions including supporting and stabilizing the upper body, allowing truncal movements, protecting the spinal cord and cauda equina, and controlling leg movements. When viewed from the side, the lumbar spine has a concave lordotic curve, which aids in weight distribution and stress reduction on the lower back. An increase or reduction in this lordosis may cause lower back pain. Lower back discomfort can be caused by a variety of components in the lumbar spine, including nerve roots exiting the spine, facet joints, intervertebral discs, vertebral bones, and spinal muscles. Stress on the lumbar spine can induce a variety of lumbar spinal illnesses, including muscle problems, disc degeneration and herniation, spondylolisthesis, osteoarthritis, spinal stenosis, etc. These conditions in long term may limit lumbar spine mobility.

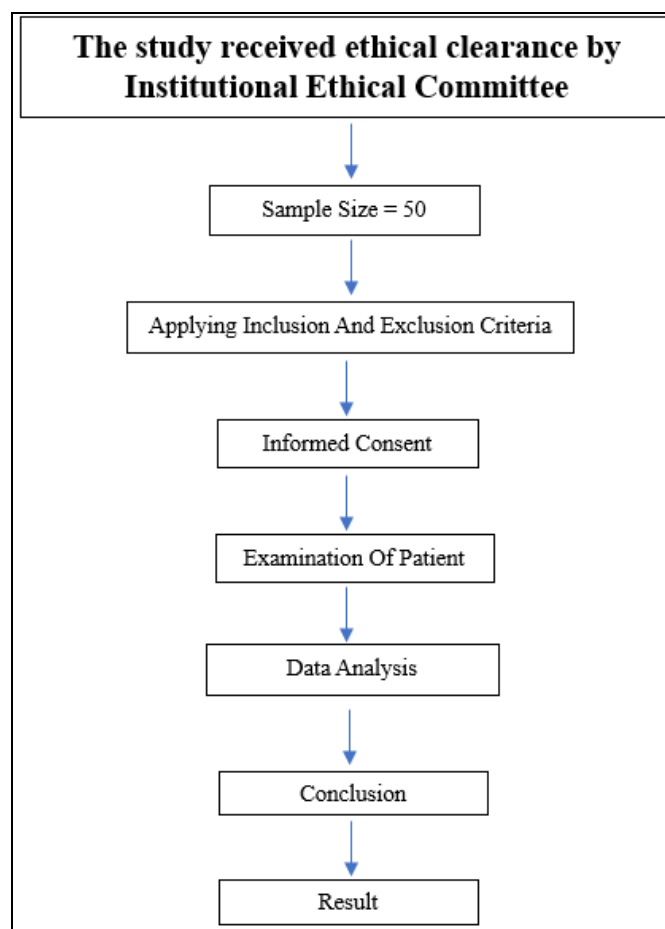
A decrease in hamstring flexibility and lumbar spine mobility can be caused by a lack of regular exercise and awkward postures exposed at work as a result of an individual's employment. It can also be manifested as a result of awkward posture during dental practice, which can be controlled by

doing regular exercises. Increased hamstring stiffness could be a contributing cause to low back injuries. Hamstring tightness causes decreased lumbar spine mobility, which can contribute to low back discomfort and lumbar degeneration. Several clinical studies have found that hamstring tightness has a greater effect on lumbar pelvic rhythm. The limitation of lumbar spine movement due to hamstring stiffness or postural asymmetry can result in compensatory lumbar spine movement patterns. This puts more strain on the lumbar spinal soft tissues and increases the likelihood of low back discomfort. The other examination does not include a precise probe of lumbar spine mobility and hamstring tightness among dental practitioners ^[8].

Dentistry requires significant concentration and precision. Most dentists frequently treat patients in a static sitting position while the patient is in supine position. As there is a limited space available in the patient's mouth, dental treatment requires the dentist to be in a very inflexible work posture. Research indicates that dentists are more likely to suffer from musculoskeletal disorders ^[5].

Prevalence of hamstring tightness affecting lumbar spine mobility is increasing day by day. Previously few studies were done on effect of hamstring flexibility on lumbar spine mobility. It will show the effect of hamstring flexibility on lumbar spine mobility, if study is found appropriate.

Method



The procedure of data collection involves certain steps in which, after the study design was decided, the sample pool (designated sample size) was drawn, where the inclusion-exclusion criteria was applied, from which the participants were derived. An Informed Consent was taken from every

participant before participation in the complete study.

The data analysis included assessment for hamstring flexibility and lumbar spine mobility of all participants. Inch tape was used to evaluate hamstring tightness and lumbar spine flexion range, and the results were statistically analyzed

for correlation.

The study involves 50 dental professionals of which 34 were female and 16 were male participants, who work for more than two hours a day. The hamstring tightness was assessed using finger to toe test. Participants were asked to flex forward without bending their knees and distance was measured between the longest finger i.e., middle finger and toe. The distance was measured using a inch tape. This distance was used to detect the presence of hamstring tightness. The lumbar spine range was assessed using Schober's test.

The lumbar flexion range was measured by instructing the participant to position in standing and attempt to touch their great toe with fingers by flexing their lumbar spine with knees extended.

The data analysis summarized the collected data; analytical and logical reasoning determined the patterns and inter-relationships between the participants, promoting the derivation of conclusion.

To develop a conclusion, the outcome measure was determined by deriving the Finger to test results and Schober's test results; the entire data was configured and analyzed via percentage and statistical presentation augmenting the conclusion/inference which was been drawn.

Materials and Methods

A comparative prospective study was conducted at Department of Community Physiotherapy, Dr. A. P. J. Abdul Kalam College of Physiotherapy, Pravara Institute of Medical Sciences, Loni and received ethical clearance from the institute (ref no. Dr. APJAKCOPT/BPT/UG/2023/69). It was conducted for duration of 6 months. Total of 50 participants had participated in the study.

The inclusion criteria follow 1. Dental Professionals aged between 18-25 years. 2. Experience of and above 2 years. 3. Both males and females are included. 4. The participant should be willing to participate

Regarding exclusion criteria 1. Trauma history and any kind of musculoskeletal surgery in the lower limbs or spine. 2. Presence of postural asymmetries. 3. PIVD 4. People who are not willing to participate ths. Total 50 participants were included and written informed consent was taken then baseline data and assessment were done.

Outcome Variables

1. Finger to Toe Test

It was assessed by using inch tape For assessment of hamstring tightness Position of the participants: standing with arms at rest and feet joined together. Position of the therapist: Standing on one side of the participant Instructions: Participants were asked to bend forwards in an attempt to touch their toes with their fingers without bending the knee.

2.Schober's Test

It was assessed by using inch tape For assessment of lumbar spine mobility Position of the participants: standing with arms at rest and feet joined together. Position of the therapist: Standing on behind the participant Instructions: Participants were asked to bend forwards in an attempt to touch their toes with their fingers without bending the knee.

Result

Demographics -A total of 50 participants were selected according to selection criteria.

Table 1: Mean And Standard Deviation Score

	Mean	Standard Deviation
Age	6.44	28.78
Bmi	3.33	23.8
Work Experience	4.85	5.42
Finger To Toe	9.12	11.34
Schober's Test	4.54	0.67

It shows the mean value and standard deviation of age, BMI, years of experience, Finger to Toe test and Schober's test.

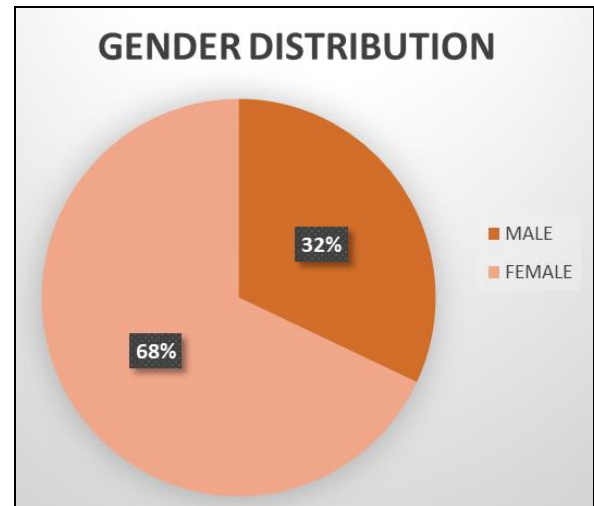


Fig 1: Gender distribution among participant

Table 1: Demographic distribution of participants

Demographic characteristics	
Gender	Participants
Male	16
Female	34

This study included a total of 50 participants out of which 32% (16) of the participants were males and 68% (34) were females as shown in chart 1. All of this participant are dental professionals in Rural Dental Hospital, PIMS, Loni.

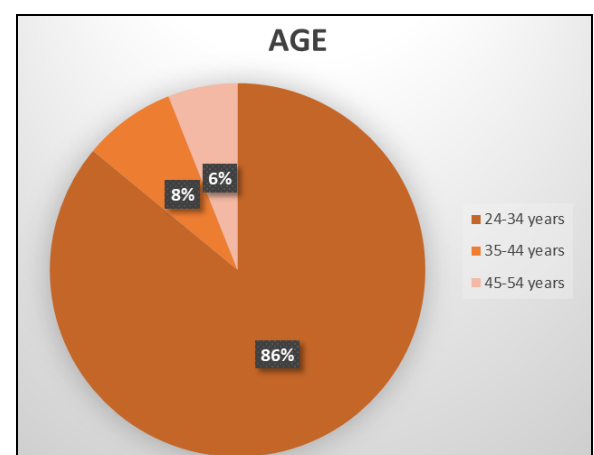


Fig 2: Age distribution among participants

Table 2: Demographic distribution of participants

Demographic characteristics	
Age	Participants
24-34 Years	43
35-44 Years	4
45-54 Years	3

This study included a total of 50 participants out of which 86% (43) of the participants were between 24-34 years, 8% (4 participants) were between 35-44 years and 6% (3 participants) were 45-54 years as shown in fig.2.

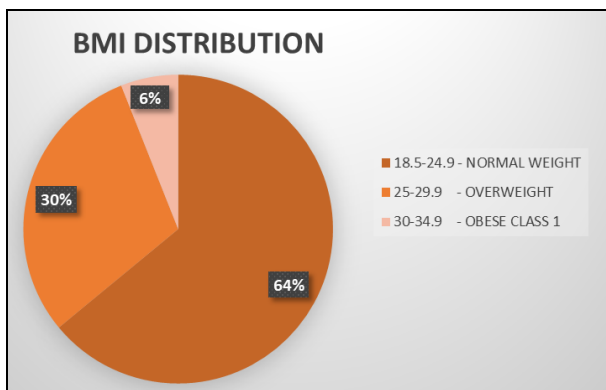


Fig 3: BMI distribution among participants

Table 3: Tabular representation of BMI

BMI	Participants
<18.5 Under weight	0
18.5-24.9 Normal Weight	32
25-29.9 Overweight	15
30-34.9 Obese Class I	3
35-39.9 Obese Class Ii	0
>40 Obese Class Iii	0

This study included a total of 50 participants which were further categorized according to their Body Mass Index (BMI), 64% (42 participants) have BMI between range 18.5-24.9 i.e., normal weight, 30% (15 participants) have BMI between range 25-29.9 i.e., overweight, 6% (3 participants) have BMI between range 30-34.9 i.e., obese class I

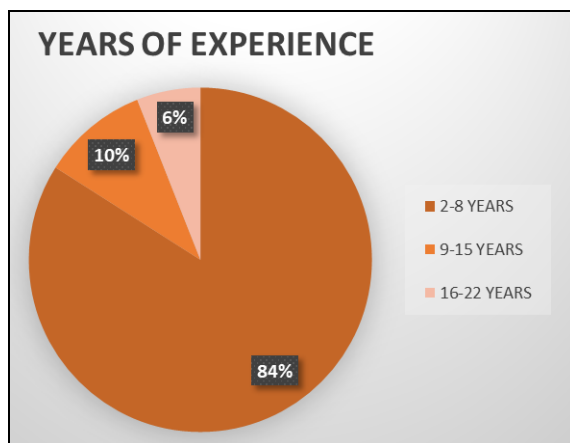


Fig 4: Distribution of participants according to their years of experience

Table 4: Tabular representation of years of experience

Years of Experience	No. of Participants
2-8 Years	42
9-15 Years	5
16-22 Years	3

This study included a total of 50 participants which were further categorized according to their years of experience, 84% (42 participants) have work experience of 2-8 years, 10% (5 participants) have 9-15 years of work experience, 6% (3 participants) have years of experience of 16-22 years.

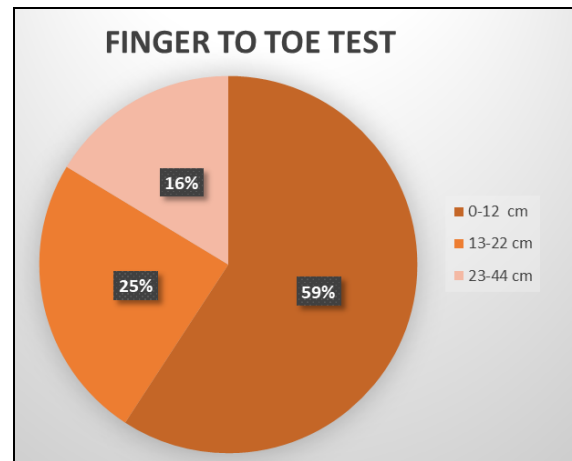


Fig 5: Distribution of participants according to their Finger to Toe Test.

Table 5: Tabular representation of Finger to Toe

Finger to Toe	Participants
0-12 cm	29
13-22 cm	12
23-34 cm	8

Finger to Toe test was used as an outcome measure to assess if the participants had hamstring tightness. The test was done by asking the participant to flex forward without bending the knees in an attempt to touch the toe. The distance from the longest finger i.e., middle finger to toe was measured. The above chart shows that 58% (29 participants) ranged between 0-12 cm, 24% (12 participants) ranged between 13-22 cm and 18% (8 participants) ranged between 23-34 cm.

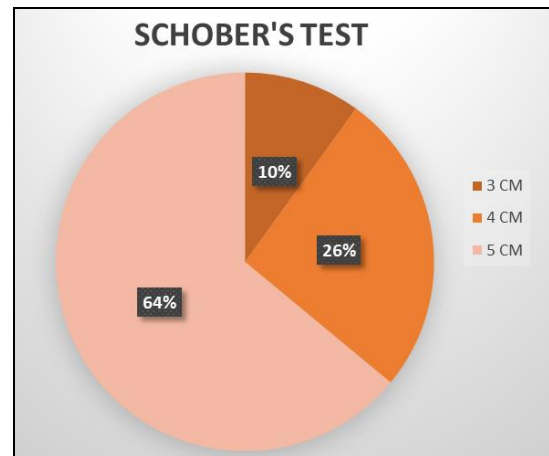


Fig 6: Distribution of participants according to their Schober's Test.

Table 6: Tabular representation of Schober's Test

Schober's TEST	Participants
3 cm	5
4 cm	13
5 cm	32

Schober's Test was used as an outcome measure to assess if the participants 7 spine range was affected. The above chart shows that 10% (5 participants) had decreased lumbar spine range of motion by 2 cm measuring 3 cm, 26% (13 participants) had decreased range of motion by 1 cm measuring 4 cm and 64% (32 participants) had normal range of motion measuring 5 cm.

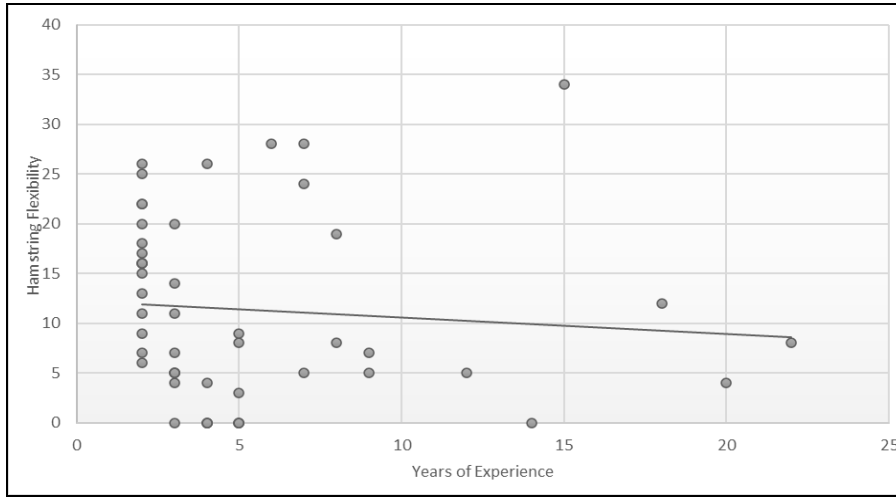


Fig 7: The scatter plot with fit line of correlation between years of experience and hamstring flexibility

The above figure shows no association correlation between years of experience and hamstring flexibility. The mean value of years of experience is 5.42 and mean value of hamstring

flexibility is 28.8. The correlation coefficient of years of experience and hamstring flexibility is analyzed to be $r = -0.1$.

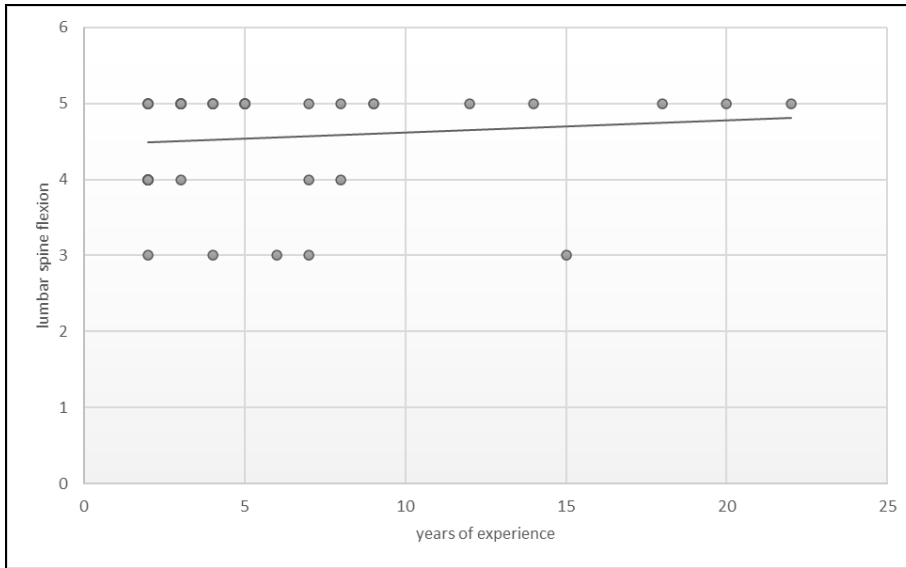


Fig 8: The scatter plot with fit line of correlation between years of experience and lumbar spine flexion

The above figure shows no association correlation between years of experience and lumbar spine flexion. The mean value of mean value of lumbar spine flexion is and mean value of

years of experience is 5.42. The correlation coefficient of years of experience and hamstring flexibility is analyzed to be $r = 0.1$.

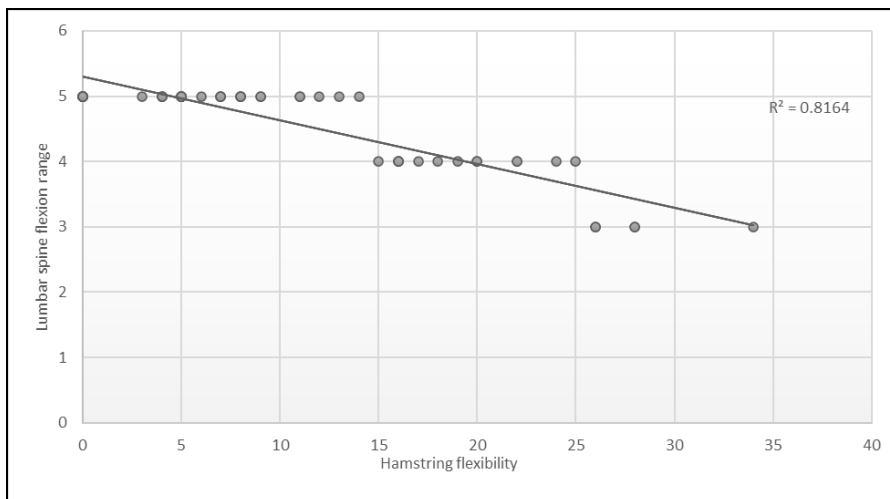


Fig 9: The scatter plot with fit line of correlation between hamstring flexibility and lumbar spine flexion range

The above figure shows the strongly negative correlation between hamstring flexibility and lumbar spine mobility. The mean value of lumbar spine flexion range is 4.54 cm and mean value of hamstring tightness is 28.8. The correlation coefficient of lumbar spine mobility and hamstring tightness is analyzed to be $r = -0.9$.

Discussion

The current study has explained the various factors that could affect hamstring flexibility and lumbar spine mobility among dental professionals such as age, gender, years of experience and duration of working hours. The age group selected for survey was above 24 years. This study included 50 participants out of which 32% male and 68% female.

According to the inclusion criteria participants with 2 years or more than 2 years were included and were categorized according to their years of experience, 84% (42 participants) have work experience of 2-8 years, 10% (5 participants) have 9-15 years of work experience, 6% (3 participants) have years of experience of 16-22 years. This study shows that reduced hamstring flexibility can cause decrease in lumbar spine mobility.

The findings of the study suggest the existence of strongly negative correlation between the hamstring flexibility and lumbar spine flexion range. The findings suggest the considerable observation of hamstring flexibility and lumbar spine flexion range in dental practitioners which can act as an alarm to indicate the need for their low back care. It was also found that there is no association of participants years of experience with hamstring flexibility and lumbar spine mobility.

In a study, Muhammad Sharif Waqas *et al.* reported on the basis of data analysis that hamstrings flexibility was decreased. It was also discovered that people who spent 8 hours a day sitting and did not participate in many extracurricular activities were more likely to suffer. It has been found that extended sitting is a major cause of impaired hamstring flexibility and can be avoided by using ergonomically designed seats. By using proper postural alignment and taking frequent rest breaks while prolonged sitting.

In another study, author Michael Scott Braman *et al.* reported that short hamstrings can lead to decrease in anterior pelvic tilt during forward bend but it was also found that tight hamstrings did not affect pelvic tilt or lumbar lordosis in standing posture.

The past research reported by Game Kankanamage Kanishka *et al.* clarifies that prolonged sitting is a contributory factor in hamstring muscle tightness. Similarly, in our study, participants with prolonged working hours were more prone to reduced hamstring flexibility. In a study, Jabbar M *et al.* analyzes that as the age advances the chances of hamstring muscle tightness also increases. Similarly in our study, as the age progresses it can affect the hamstring flexibility. In another study Gaowgzeh RA *et al.* has reported that no correlation

was found between years of experience and the incidence of back pain. However, dentists who do not maintain proper posture are more likely to experience back pain.

In a study reported by Ohlendorf D *et al.* when treating patients, the dentists head, and trunk region was anteriorly tilted while the back is bent to the right. Awkward situations are a big part of a dentist's job. This primarily refers to static positions of the trunk and head as opposed to "office work."

In this study, Batool F *et al.* found that individuals from various professions complained of chronic back discomfort and strained hamstring muscles. Housewives are typically affected by this illness. Back pain and hamstring stiffness were normal side effects of the typical lifestyle. Lifting, walking, and other daily activities impact their hamstring muscles, causing back pain.

In a study, Abida Perveen *et al.* reports that patients with chronic low back pain reported tighter hamstring muscles than those with severe neck discomfort. Hamstring tightness was common among individuals with chronic neck and low-back pain, but not significantly so.




In an examination, Neeta J. Vyas *et al.* reported on a study that found those with chronic low back pain experience tight hamstrings. Untreated hamstring tightness can lead to chronic low back pain (LBP). The current study found that hamstring tightness reduces lumbar spine mobility.

S. Divyashri *et al.* suggested that dental practitioners are more likely to have hamstring tightness, which can limit lumbar spine motion and cause low back pain. Dental practitioners are more likely to have hamstring tightness, which can limit lumbar spine motion and cause low back pain. There was low positive correlation between the hamstring tightness and lumbar spine mobility. However, on the contrary our study showed strongly negative correlation between hamstring flexibility and lumbar spine range of motion.

In an examination, Bhagyashree K. Koli *et al.* reported a study on hamstring tightness wherein right lower limb was more affected than left lower limb that in both male and females.

In an examination, N M Allam *et al.* reported a study where it was found that Straight leg raising and AKE of the dominant leg were much more flexible than the non-dominant legs, also there was no relationship between the level of hamstring tightness and LBP in female students.

Reduced lumbar spine mobility can cause lumbar derangement, disruptions in pelvic rhythm, flattening of the curvature, alterations in the lumbosacral angle, and permanent degenerative changes of the vertebrae. To prevent tension on the lumbar spine, do frequent flexibility exercises and avoid awkward postures during dental operations. To reduce the risk of work-related musculoskeletal disorders among dentists, work postures should be enhanced. The physical therapist's involvement is crucial, and relaxing and stretching exercises during work breaks in the dentists' work schedules are mandatory.

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Ref. No. PIMS/DR.APJAKCOPT/IEC/2023/360		Date: 06 /04/2023
To, Samiksha Suresh Rathod, IVBPT/Intern. Dr. APJ Abdul Kalam College of Physiotherapy		
The institutional Ethical committee in its meeting held on 2 nd March 2023 has reviewed and discussed your research proposal.		
Registration No:	Dr.APJAKCOPT/BPT/UG/2023/56	
Title of study:	"A STUDY ON LUMBAR SPINE MOBILITY AND HAMSTRING FLEXIBILITY IN DENTAL PROFESSIONALS."	
Decision of committee	Approved	
Approved period	07/04/2023 to 07/04/2024	
Committee's recommendation:	N/A	
Please Note: <ul style="list-style-type: none"> > The research is to be carried out in line with the information provided in the forms submitted by the candidate > Inform IEC immediately in case of any Adverse events and serious adverse events > Inform IEC immediately in case of any change in study procedure/ Protocol, site and investigator > This permission is only for period mentioned above. Six months/ final reports are to be submitted to IEC > Members of IEC have right to monitor the progress with prior intimation 		
Signature, Secretary IEC for UG & PG Research, DR. APJ ABDUL KALAM COPT, PIMSDU		
		

Conclusion

The present study concludes that a strong negative correlation among was found between hamstring flexibility and lumbar flexion range of motion. It was discovered that reduced hamstring flexibility can result in reduced lumbar spine range of motion in dentistry practitioners. Study indicates that dental practitioners may experience reduced hamstring flexibility, which may affect lumbar spine mobility and lead to degenerative changes. To prevent low back discomfort in dental practitioners, avoiding uncomfortable positions and practicing frequent stretching exercises are must.

Declaration

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 Conflit of Interest – None
 Ethical Approval – Approved

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