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# Effectiveness of McKenzie approach and segmental spinal stabilization exercises on neck pain in individuals with cervical postural syndrome: An experimental study

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## Abstract:

**BACKGROUND:** This study “Effectiveness of Mckenzie approach and segmental spinal stabilization exercises on neck pain in individuals with cervical postural syndrome: an experimental study” was conducted to study and find the effectiveness of Mckenzie approach and segmental spinal stabilization exercises on reduction of pain, correction of rounded shoulder, and disability. Pain, disability, and rounded shoulders are the major limiting factors as it affects the quality of life and reduces efficiency and social participation.

**MATERIALS AND METHODS:** The study was conducted among 120 individuals with cervical postural syndrome, and fulfilling the inclusion and exclusion criteria was included. The outcome measures were Visual Analogue Scale (VAS), Neck Disability Index (NDI), and Vernier caliper to evaluate pain, functional disability, and rounded shoulder, respectively. Subjects were randomly divided into two groups, Group A and Group B, by using SPSS software. Interventional training was given for 6 weeks to the patients. Group A subjects were given spinal stabilization exercises. Group B subjects were given Mckenzie approach. The statistical analysis was performed using SPSS; pre-test and post-test were used to calculate the results, followed by data presentation and analysis.

**RESULT:** The result showed that at the end of the 6 weeks on comparison between pre- and post-intervention of Group A and Group B, both the techniques were effective, but group B was significantly effective than Group A.

**CONCLUSION:** It was noted that McKenzie approach and segmental spinal stabilization exercises were effective on neck pain in individuals with cervical postural syndrome, but on comparing both techniques, Mckenzie protocol is more beneficial than segmental spinal stabilization exercises. The study accepts the alternate hypothesis that there is significant effect of McKenzie approach and segmental spinal stabilization exercises on neck pain in individuals with cervical postural syndrome.

## Keywords:

Cervical postural syndrome, Mckenzie approach, neck pain, segmental spinal stabilization exercises

## Introduction

Neck pain is a very frequent ailment. Poor posture can induce muscular imbalance, resulting in a defective interaction between various body parts. One of the most common cervical

irregularities that predisposes individuals to pathological diseases like neck pain is forward head posture. “Cervical postural syndrome” is a very common uncomfortable and painful postural complaint characterized by a protruding chin and rounded shoulders.<sup>[1]</sup>

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Neck pain ranks fourth as a cause of years lived with disability and has a 12-month prevalence of 30%–50%.<sup>[2,3]</sup> High level prevalence of cervical pain is associated with a high level of neck flexion as well as static and awkward postures during sitting.<sup>[1]</sup> The prevalence of neck pain is higher in females than in males.<sup>[4]</sup> Neck muscles have an important role in normal mobility and stability of cervical spine. The cervical muscles may be the reason of pain too. Research’s advice that weakness or fatigue of collar muscles may be associated to neck pain. Impairment of Deep Cervical Flexors (DCF) as well as superficial and deep extensors of cervical spine in patients with neck pain is generally accepted.<sup>[5]</sup> Postural neck pains can be treated with long-term exercises that include stretching exercises, positional release, isometric and iso-kinetic strengthening exercises, and postural correction exercises.<sup>[1]</sup>

Neck pain can also be considered by mechanisms as mechanical, neuropathic, or secondary to another reason. Mechanical pain refers to pain originating in the spine or its supporting structures, such as ligaments and muscles which further predisposes to poor posture.<sup>[4,6]</sup> A hyperirritable spot in skeletal muscle that is accompanied by a hypersensitive palpable nodule in a taut band is known as a myofascial trigger point (MTrP), which also may play a significant role in the development of mechanical neck pain.<sup>[7]</sup> Physiotherapy includes, exercise therapy, traction which is used to relieve pressure on the spine, electrotherapy etc. Active or passive physical exercises are designed to strengthen or stabilize the spine that may reduce pain, prevent injuries, and improve

posture and body mechanics. soft cervical collar which is an orthopedic device is used to immobilize the neck. Spinal manipulation where manual therapy is used to maximize painless movement, reduce muscle tightness, improve joint mobility, and correct alignment problems and hot moist pack.<sup>[4]</sup>

Pharmacotherapy treatment includes that systemic nonsteroidal anti-inflammatory drugs (NSAIDs) have been found to be beneficial for spinal pain in general.<sup>[4]</sup> Excessive anterior positioning of the head in relation to a vertical reference line is known as front head posture. Rounded shoulder posture is characterized by acromion protraction in front of the line of gravity, shoulder protraction, and downward rotation, as well as anterior tilt. Rounded shoulder posture can develop incorrectly owing to a lack of physical activity and poor posture habits in daily life. Excessive anterior positioning of the head in relation to a vertical reference line is termed as forward head posture. The acromion protraction in front of the line of gravity, shoulder protraction, downward rotation, and anterior tilt are all characteristics of rounded shoulder posture.<sup>[8]</sup>

The McKenzie technique was announced in Sweden in 1985 and came to be often used in the 1990 as a treatment modality for patients with mechanical problems of the spine. McKenzie exercises, devised by Robin McKenzie,<sup>[9]</sup> also known as diagnostic and mechanical therapy.<sup>[10]</sup> Improvement in symptoms is successively measured in terms of “centralization,” a phenomenon that has been commonly used.<sup>[11]</sup> It combines recurrent end range actions by examination; the classification of direction for exercise is contingent upon the patient’s response to those recurring actions. Posture correction ensuring the maintaining of the correction is a vital characteristic of the McKenzie exercise.<sup>[12]</sup> The McKenzie protocol has been commonly used in low back conditions, which may be employed in the treatment of mechanical neck pain in three syndromes as postural, dysfunction, and derangement. Postural syndrome is caused by mechanical deformation of soft tissue, as a results of certain postural stresses. The treatment is correction of postural. The dysfunction syndrome is caused by adaptive shortening of certain structure due to poor postural habits. The derangement syndrome defined as change in the position of intervertebral discs and alters the position of two adjacent vertebrae. It is treated by neck retraction exercise.<sup>[13]</sup>

**Table 1: Age Distribution**

Age Group	Number of subjects (Group A)	Number of subjects (Group B)	Total
30-35	24	13	37
36-40	21	22	43
41-45	15	25	40

Interpretation: Table 1 represents three age groups, group 1 complies of subjects between 30 and 35 years, which consist of total 37 subjects; group 2 complies of subjects between 36 and 40 years, which consist of total 43 subjects; group 3 complies of subjects between 41 and 45 years, which consist of total 40 subjects

**Table 2: Gender Distribution**

Group	A	B
Gender	Male-36 Female-24	Male-35 Female- 25

Interpretation: Table 2 represents that a total of 120 subjects were taken for the study. Out of 120 subjects, 71 were males and 49 were females

**Table 3: Comparison between pre- and post-test mean scores of VAS (at rest and on activity) between the group A and group B**

	Pre (group A)	Post (group A)	Pre (group B)	Post (group B)	P
At rest	4.44±0.893	2.18±0.688	5.05 0.714	2.36±0.742	<0.001
On activity	6.18±0.625	2.64±0.882	6.34±0.448	2.72±0.945	<0.001

Interpretation: Above table shows comparison of pre- and post-mean values of VAS score between group A and group B. Both the groups were found to be statistically extremely significant (P<0.0001)

**Table 4: Comparison between pre- and post-test mean scores of Vernier caliper (right and left) between the group A and group B**

	Pre (group A)	Post (group A)	Pre (group B)	Post (group B)	P
Right	8.31±0.469	6.11±0.670	8.01±0.436	5.75±0.866	0.0010
Left	8.31±0.474	6.05±0.701	8.02±0.478	5.69±0.816	0.0010

Interpretation: Above table shows a comparison of pre- and post-mean values of Vernier caliper score between group A and group B. Both the groups were found to be statistically extremely significant ( $P < 0.0001$ )

**Table 5: Comparison between pre- and post-test mean scores of NDI between the group A and group B**

Pre (group A)	Post (group A)	Pre (group B)	Post (group B)	P
49±7.876	24±4.643	52±13.021	21±2.046	<0.001

Interpretation: Above table shows comparison of post-mean values of NDI score between group A and group B. Both the groups were found to be statistically extremely significant ( $P < 0.0001$ )

McKenzie method is one of the popular approaches to evaluating and treating patients with neck pain. This method is best known as a classification-based treatment approach, which categorizes patients with neck pain into biomechanical subgroups. In this approach, patients are evaluated using repeated end range cervical movements and postural assessments to identify a specific mechanical classification.<sup>[14]</sup> A key aspect of the McKenzie approach is that the patients receive individualized treatment based upon their clinical presentation. The McKenzie method customs an assessment method, which purposes to identify subgroups of patients among the nonspecific spinal pain population whose complains behave in a parallel way when subjected to mechanical forces within the physical examination.<sup>[10]</sup> The derangement syndrome is the most prevalent treatment classification. This syndrome is characterized by the centralization and peripheralization of symptoms, in response to repeated movements or sustained postures of the lumbar spine within the physical examination.<sup>[15-17]</sup>

Spinal stabilization training has become a popular approach. It has been used for treating patients with musculoskeletal spinal disorders, for preventing injuries, and performance enhancement in athletic and sedentary populations.<sup>[18,19]</sup> The term of spinal stability was first described by Panjabi.<sup>[20]</sup> The physiologic basis of this approach was the activation or reorganization of three anatomical systems that include passive, active, and neural.<sup>[19,21]</sup> The main point of the training was to create awareness and to reform posture, strength, endurance, coordination, and proprioception.<sup>[19,21]</sup>

Cervical stabilization exercises aims to train deep stabilizer muscles of the cervical spine and improve coordination between superficial and deep cervical muscles: axial elongation exercise, craniocervical flexion exercise, cervical extension exercise, and cervico-scapulothoracic strengthening exercises.<sup>[22,23]</sup> Cervical stabilization exercises are often used to decrease

pain, make the most of function, and progress physical impairments for individuals with general neck pain.<sup>[24]</sup> The concept of postural stabilization was characterized by body oscillations and reflected by center of mass horizontal acceleration which continuously changing. It was proved that posture was not a stationary phenomenon, but it could alternate phases by changing postural performance indexes.<sup>[25]</sup> Postural stability was affected by many different conditions such as low back pain,<sup>[26]</sup> chronic neck pain,<sup>[27]</sup> scoliosis,<sup>[28]</sup> and osteoporosis-related kyphosis.<sup>[29]</sup> Furthermore, postural stability was an essential requirement for activities of daily living.<sup>[30]</sup> Muscular and skeletal structures can change into an incorrect shape due to a reduction in physical activity and inappropriate posture habits in daily living.<sup>[8]</sup> Excessive anterior positioning of the head in relation to a vertical reference line is referred to as forward head posture.<sup>[31]</sup> Rounded shoulder posture refers to a posture characterized by acromion protraction in front of the line of gravity, shoulder protraction, and downward rotation as well as anterior tilt.<sup>[8,32,33]</sup> Core stabilization training with the stable behavior of spine could have positive effects on postural control systems, and it could change the overall postural stability.<sup>[34-36]</sup> Cervical spine stabilization training was mentioned here.

For people with neck pain, getting the right treatment is must to a quick recovery. Several studies have been conducted with the goal of treating the disorder using various interventional techniques, with positive outcomes, despite the fact that treating cervical postural syndrome patients has received little attention. As a result, this research aimed to see how effective segmental spinal stabilization exercises and the McKenzie technique are for treating neck discomfort in people who have cervical postural syndrome.

## Materials and Methods

### Study design and setting

The present study was an experimental study (pre- to post-test) that was started after being approved by the Institutional ethical clearance committee of Krishna institute of medical sciences deemed to be university, Karad.

### Study participants and sampling

Intervention was performed for a period of 6 weeks. Patients of all genders ranging in age from 30 to 45 years

experiencing neck pain for more than 90 days, diagnosed with cervical postural syndrome as per Mckenzie's assessment and falling under 4-7 score of Visual analog scale were included. Patients were excluded if they had history of neck/back surgery, recent history of trauma or fracture, congenital disorder of cervical spine, and psychiatric disease or drug abuse. The present research comprised of 120 individuals was randomly divided and assigned into group A and group B with 60 individuals in each by using SPSS software. The study duration was period of one year at Krishna hospital in Physiotherapy outpatient department, Karad.

### Data collection tool and technique

#### Data collection tools

#### Visual Analog Scale (VAS)

It is a measurement tool that seeks to measure a characteristic that believed to range across a continuum of values and cannot easily be directly measured. VAS is a uni-dimensional measure of pain intensity, which has been extensively used in various adult people.<sup>[8]</sup> Validity of VAS measured by intraclass co-relation co score was 0.97 [95% CI = 0.96 to 0.98]

#### Neck Disability Index (NDI)<sup>[37]</sup>

NDI is a disorder-specific functional status survey with 10 items inclusive of pain, personal care, lifting, reading, headaches, concentration, work, driving, sleeping, and recreation. A higher score indicates more patient-rated disability.<sup>[21]</sup> Validity of NDI measured by intra-class co-relation co-score was 0.88 [0.63 to 0.95].

#### Vernier caliper

Instrument for making very accurate linear measurements,<sup>[21]</sup> Vernier calipers were used to measure the distance between the acromion of the shoulder joint and the table surface three times, and the numbers were averaged and used for analysis.<sup>[38]</sup>

### Procedure

The study protocol was presented for approval in front of the Protocol Committee and the Institutional Ethics Committee of KIMSDU, Karad. After finding the suitability of the subjects as per the inclusion and exclusion criteria, the participants were briefed about the nature of the study and the intervention. The informed consent was obtained from the participants who are willing to participate and were recruited for the study. All the subjects were assessed for neck pain using Visual Analog Scale and Neck Disability Index. The subjects were divided into two groups based on inclusion and exclusion criteria. Both the groups were treated with hot moist pack before the treatment.

**Group A:** Segmental spinal stabilization exercises<sup>[5,13,24,39,40]</sup>

**Group B:** McKenzie approach<sup>[13,41]</sup>

- GROUP A (Segmental spinal stabilization exercises):

The participants were given segmental spinal stabilization exercises for strengthening deep (rectus capitis anterior, rectus capitis lateralis, longus capitis, and longus colli) and superficial cervical muscles (splenius capitis, sternocleidomastoid, anterior scalene, and upper trapezius) as this muscles tend to get weaken in neck pain.<sup>[24,42]</sup> Segmental spinal stabilization exercises consisted of axial elongation, cervical extension exercises, cervico-scapulothoracic strengthening, and craniocervical flexion exercises. The participants were asked to perform these exercises for 10 repetitions for 5 sets.

#### Axial elongation exercises

They are performed to correct posture. The participants gently performed chin-in and shoulder retraction while seated, and then elongate the entire spine by imaging a string pulling from the top of the head.

#### Craniocervical flexion and cervical extension exercises

They are performed to retrain the deep cervical flexors and improve postural awareness. The participants were requested to learn the correct craniocervical flexion in a supine position by using a pressure biofeedback unit under supervision before they performed the exercise at home without pressure biofeedback.

#### For the cervical extension exercise

The participants firstly were asked to maintain craniocervical flexion and then lift and hold the head and neck in a prone position.

#### A rowing exercise

The participants were using elastic band to strengthen shoulder extensors and scapular retractors.

#### Y exercise

They are performed with an elastic band, in a standing position to strengthen the lower trapezius muscles.

The participants were asked to maintain chin-in posture and spinal alignment throughout performing these exercises.

- Group B: (McKenzie Approach)

The participants received McKenzie cervical exercises including,

- 1) Head retraction: Hold for 10 secs for 10 repetitions
- 2) Neck extension in supine position: 10 repetitions
- 3) Neck extension in sitting: 10 repetitions
- 4) Left and right lateral bending: 10 repetitions
- 5) Head turning: 10 repetitions
- 6) Neck flexion in sitting: 10 repetitions

## Ethical consideration

This study is the part of the research project and is approved by institutional ethical committee of Krishna Institute of Medical Sciences Deemed to be University, Karad, Maharashtra. The authors maintained all the protocols before performing all the procedures engaged in this study involving human participants in accordance with the ethical standards of the institutional research committee.

## Results

### Age-wise distribution of participants

### Gender-wise distribution of participants

### Outcome measures

Visual Analogue Scale (VAS)

Vernier caliper

Neck Disability Index (NDI)

## Discussion

Cervical postural syndrome is a chronic condition that does not autocorrect because the dysfunction of the proprioceptive system leads to the occurrence of a new body pattern considered by the postural system as ideal and maintaining it in time.<sup>[1]</sup> When the posture or integrity of the cervical spine is compromised, it is easily susceptible to tension, strain, and fatigue.<sup>[43]</sup>

The cervical spine provides musculoskeletal stability and support for the cranium, as well as a flexible, protective column for movement, balance adaptation, and housing of the spinal cord and vertebral artery.<sup>[44]</sup>

Reviews of randomized clinical trials focused on patients with neck pain have shown positive effects of active physiotherapy, electromagnetic therapy, manipulation, and mobilization. However, the information presented in those reviews was based on a very small number of investigations for each treatment modality; thus, it is difficult to utilize the results in a clinical setting.<sup>[41,45,46]</sup>

Normally, the cervical spine is lordotic. Other than flexion and extension movements of the neck that take place in the sagittal plane, protraction, and retraction movements also come into play in this plane. Protraction movement is an outcome of extension of the upper cervical spine and flexion of the lower cervical spine; however, retraction movement results from flexion of the upper cervical spine and extension of the lower cervical spine.<sup>[47]</sup>

The line of gravity (LOG), which defines normal posture, passes through the external auditory meatus, the cervical spine's bodies, the acromion, and is anterior to the thoracic spine.<sup>[48]</sup> The forward head posture (FHP), which is considered to be a deviation from neutral or normal

posture, can result from the cervical spine being held in a protracted position for an extended period of time.<sup>[6,47,49,50]</sup>

To our knowledge, randomized clinical trials involving patients with neck pain and comparing the McKenzie method with other treatment modalities have not been reported in the literature, with the exception of one study on patients with whiplash-associated disorders.<sup>[51]</sup>

Failure of the head to line up with the vertical axis of the body<sup>[52,53]</sup> can result in additional body misalignments, such as rounded shoulders and increased thoracic kyphosis,<sup>[47,54]</sup> which can worsen impairments<sup>[55]</sup> caused by the altered location of the LOG. The result of combining all these postural errors is frequently referred to as "slouched posture"<sup>[56,57]</sup> or "slumped posture."<sup>[52,58]</sup>

This study, "Effectiveness of McKenzie approach and segmental spinal stabilization exercises on neck pain in individuals with Cervical Postural Syndrome," was conducted with an objective to find and compare the effectiveness of McKenzie approach and segmental spinal stabilization exercises on neck pain in individuals with cervical postural syndrome.

Pre- and post-assessment were taken using Visual Analogue Scale, Neck Disability Index, and Vernier caliper. Group A was given segmental spinal stabilization exercises, whereas group B was given McKenzie approach.

The results showed that there was significant reduction in pain intensity, post 6 weeks of intervention, in both the groups. According to Gorel. Kjellman *et al.*, they had performed a study on neck pain by providing treatment with McKenzie exercise, conventional exercises, and ultrasound.<sup>[46]</sup> They found that the McKenzie treatment was more favorable than general exercise and control group and had rapid improvement in pain intensity during the first three weeks.<sup>[38]</sup>

According to Yi-Liang Kuo, Tsung-Han Lee, and Yi-Ju Tsai, they had performed study on neck pain by giving spinal stabilization exercises where the pain intensity reduced. The study mentioned about training the deep stabilizer muscles of the cervical spine and improving coordination between superficial and deep cervical muscles.<sup>[24]</sup>

The results showed that there was significant reduction in pain, disability, and correction of rounded shoulders, after 6 weeks of intervention, in both the groups. According to Ilinca I and Rosulescu E, neck rehabilitation is to help the patient to return to the highest level of function, with relieving pain, restoring normal joint mobility, strengthening of specific postural muscle groups, and postural retraining.<sup>[1]</sup>

Segmental spinal exercises were proven effective on neck pain, where Ghaderi F and Jafarabadi carried out a study and found increased deep flexor endurance and decreased EMG activity of sternocleidomastoid muscles, which suggest an important role for stabilizing exercises on reducing the activity of superficial muscles in chronic neck pain.<sup>[5]</sup>

Mean age of the Group A participants was  $37.9 \pm 6.127$ , whereas for Group B was  $38.8 \pm 4.274$  [Tables 1 and 2]. Mean VAS value within the group A before the treatment was  $4.44 \pm 0.893$  (at rest) and  $6.18 \pm 0.625$  (on activity), which was reduced to  $2.18 \pm 0.688$  (at rest) and  $2.64 \pm 0.882$  (on activity), whereas for group B, before treatment the mean VAS value was  $5.05 \pm 0.714$  (at rest) and  $6.34 \pm 0.448$  (on activity), which was reduced to  $2.36 \pm 0.742$  (at rest) and  $2.72 \pm 0.945$  (on activity).

On comparing both the groups, the post values for group A were  $2.18 \pm 0.688$  (at rest)  $2.64 \pm 0.882$  (on activity) and for group B  $2.36 \pm 0.742$  (at rest) and  $2.72 \pm 0.945$  (on activity). Both the groups showed significant difference with respect to VAS [Table 3]. Mean value of Vernier caliper within the group A, before the treatment was  $8.31 \pm 0.469$  (right) and  $8.31 \pm 0.474$  (left), which was reduced to  $6.11 \pm 0.670$  (right) and  $6.05 \pm 0.701$  (left), whereas for group B, before treatment the mean Vernier caliper value was  $8.01 \pm 0.436$  (right) and  $8.02 \pm 0.478$  (left), which was reduced to  $5.75 \pm 0.866$  (right) and  $5.69 \pm 0.816$  (left).

On comparing both the groups, the post values for group A were  $6.11 \pm 0.670$  (right) and  $6.05 \pm 0.701$  (left) and for group B,  $5.75 \pm 0.866$  (right) and  $5.69 \pm 0.816$  (left). Both the groups showed significant difference with respect to Vernier caliper measurements [Table 4]. Mean value of NDI within the group A before the treatment was  $49 \pm 7.876$ , which was reduced to  $24 \pm 4.643$ , whereas for group B, before treatment the mean NDI value was  $52 \pm 13.021$ , which was reduced to  $21 \pm 2.046$ .

On comparing both the groups, the post values for group A were  $24 \pm 4.643$ , and for group B,  $21 \pm 2.046$ . Both the groups showed significant difference with respect to NDI.

[Table 5] Neck pain is a common problem, and it has been increased in these recent years. Several reasons are responsible for this including changes in lifestyle, work habits, and technology usage. Cervical postural syndrome may have long-term complications, which may result in pain, reduced quality of life, and sometimes, this chronic neck pain may also result into mental health issues such as anxiety and depression. Therefore, it is very necessary to treat this condition as early as possible. Application of McKenzie approach and segmental spinal stabilization exercises in physiotherapy will benefit the patients with cervical postural syndrome. Result of the present study

showed extremely significant effects on both the groups for reduction of pain, improving functional ability, and correction of rounded shoulders. Thus, incorporating patient education and a home exercise program will improve outcomes and hasten recovery.

### Limitation and recommendation

Some limitations did exist in the current research. This research focuses on the patients with chronic neck pain; thus, patients with acute neck pain or mild pain with VAS of 0-2 were excluded. Also, the age limit was narrowed. Further studies should be performed on large sample size. Multicentric trials should be executed by using more reliable and valid outcome measures such as advanced imaging modalities.

### Conclusion

The present study concluded that both McKenzie approach and segmental spinal stabilization exercises were effective on neck pain in individuals with cervical postural syndrome.

The findings of the present study showed that both the techniques bring significant reduction in pain, disability, and correction of rounded shoulders, after 4 weeks of intervention.

This study also concluded that on comparing both the techniques group B (McKenzie approach) showed more significant results in reduction in pain, disability, and correction of rounded shoulders than group A (segmental spinal stabilization exercises). Hence, McKenzie protocol is more beneficial than segmental spinal stabilization exercises.

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### Ethical approval

The study was approved by institutional ethical committee of Krishna Institute of Medical Sciences Deemed to be University, Karad, Maharashtra.

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### Conflicts of interest

There are no conflicts of interest.

### Author contribution

Rutuja Avaghade conducted literature review for this manuscript, developed the introduction section of the

manuscript, conducted the discussion of the study and finding; collected data; and analyzed the data. Dr. Sandeep Shinde provided a description of the background information, collected data and analyzed the data, and participated in the prescription of the manuscript. All the authors read and approved the final manuscript.

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