

**A STUDY ON OUTCOMES AND COMPLICATIONS OF INSTRUMENTATION IN  
SPINAL TUBERCULOSIS****Dr. Robert Ahmed Khan<sup>1\*</sup>, Dr. Md. Moshir Rahman<sup>2</sup> and Dr. Abu Saleh Md. Abu Obaida<sup>1</sup>**<sup>1</sup>Department of Neurosurgery, Bangabandhu Sheikh Mujib Medical University, Shahbag, Dhaka, Bangladesh.<sup>2</sup>Department of Neurosurgery, Holy Family Red Crescent Medical College, Easkaton Garden Road, Dhaka, Bangladesh.**\*Corresponding Author: Dr. Robert Ahmed Khan**

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**ABSTRACT**

**Introduction:** Spinal tuberculosis (TB) is one of the earliest diseases known to have infected the human race. It may cause neurological deficit and spinal deformity. Spinal instrumentation stabilizes the spine and restores mechanical balance. **Objective:** The main objective of this is to assess the outcomes and complications of instrumentation in spinal tuberculosis. **Method:** In this retrospective study, a total of 40 patients were observed, of which 28 were male and 12 were female. This study investigated data on all cases of spinal tuberculosis in a private hospital (Comfort Hospital), Dhaka, Bangladesh from 2016 to 2019 which provided combined posterior instrumentation and anterior spinal fusion. This study included in all cases of instability, kyphotic deformity or loss of lordosis. Clinical outcomes were assessed on a follow-up to one year using the Visual Analog Scale (VAS), updated MacNab Parameters and radiographic outcomes (segmental kyphotic angle). Patients were evaluated for kyphotic correction, fusion formation and neurological status before and after the surgery. **Results:** 12 cervical and cervicothoracic lesions, 10 thoracic and thoracolumbar lesions and 18 lumbar and lumbosacral lesions, were found. 13 patients had mainly anterior surgery, 16 had posterior surgery and 11 patients had combined instrumentation surgery. The mean VAS scores showed a decrease and radiographies showed improved kyphotic angles. Using the updated MacNab criteria, 14 cases had an outstanding performance, 19 good, 5 average and 2 bad. **Conclusion:** Instrumentation helps to achieve not only stabilization of the spine but also deformity correction. Stabilization followed by early mobilization enable continuous healing. Depending on the situation the option of implant should be individualized. If clinical procedures are followed, the operating complications and residual deficits can be reduced in spinal tuberculosis surgery.

**KEYWORDS:** Instrumentation, Tuberculosis, Neurological deficit, Spinal deformity.**INTRODUCTION**

Spinal tuberculosis (TB) causes neurological complications and a grotesque spinal deformity that is caused secondary to infectious disease.<sup>[1,2]</sup> Also after recovery, spinal deformities tend to develop during development due to biomechanical pressures on the structurally compromised vertebral column and cause significant degenerative changes in the proximal and distal segments of the spine. The spinal cord undergoes structural modifications that cause late paraplegia, resulting in poor chances of neural recovery following surgery.<sup>[3]</sup> Recently, the goal is to cure the disease, with no sequelae of neural complications and a near-normal spine. The spine has to be secured by sufficient external braces before it reaches structural strength. Surgically treatable lesions are debrided and the resulting void is grafted using a tricortical cortico-cancellous bone graft, which at first implanted is weak. The reparative process, revascularisation and bone-graft incorporation take several months. At this time, to prevent graft-related

complications such as slippage/breakage and consequent degradation of kyphosis and neural complications, the spine must be covered either by an external corset or by instrumented stabilization at the same time or a second stage.<sup>[4]</sup> It was proposed that an external splint be needed when the bone graft reaches 5 cm (two-disk heights) to avoid complications associated with the graft.<sup>[1,5]</sup> Instrumental stabilization also allows for faster ambulation and improved recovery, decreases morbidity and facilitates substantial pain relief and self-confidence development.

Patients with spinal tuberculosis have multiple signs and symptoms that can include back or leg pain, kyphotic deformity, palpable mass in the paraspinal zone, and neurological compromise. The two most important sequelae of TB spine are kyphotic deformity and neurological compromise. Due to kyphotic deformity, spinal abscess and/or granulation tissue compressing the spinal cord, neurological problems happen. Most cases in

our country presented late, and the disc space was already infected. Nevertheless, kyphosis is rare in the lumbar spine, where weakened vertebral bodies have a propensity for telescoping. Because the spine is contaminated, instrumentation, in terms of tuberculous discitis, poses no additional danger. Early operative treatment with instrumentation, if indicated, minimises neurological impairment and spinal deformity in selected patients. Intractable pain is mainly due to the presence of epidural pressure compressing the nerve roots, along with spinal dysfunction. Studies have been performed on overall healing and fusion rates, residual kyphosis, bone graft complications, reconstruction surgical technique, deformity correction technique and its efficacy, retrospective instrument-assisted versus anterior correction of surgical deformity, the stability of the corrected curve and neurological improvement.<sup>[6-11]</sup> Nevertheless, none of the research dealt solely with surgery-related complications, their residuals, surgery restriction, and surgery failure rates. It is important to understand the essence of spinal tuberculosis and complicated tuberculosis surgical indications based on the level of lesions, the severity of deformation, and neurology. If the agreed treatment protocols are strictly adhered to, with positive management results the surgical complications and their residuals will be minimized and/or avoided. Longitudinal research seeks to examine the cumulative occurrence of intra- and postoperative complications and sequelae and to suggest prophylactic steps to mitigate or reduce complications. Satisfactory outcomes of radical surgery have been documented in terms of resolution, recurrence, deformity and neurological recovery. The present research assesses the outcome and risks of anterior, lateral, and post-spinal instrumentation combined.

## OBJECTIVE

The main objective is to assess the outcomes and complications of instrumentation in spinal tuberculosis.

## MATERIALS AND METHODS

**Study type:** Retrospective study

**Study place:** A single private hospital (Comfort Hospital), Dhaka, Bangladesh

**Study period:** 2016 to 2019

**Sample size:** A total of 40 patients. Of this population 28 were male and 12 were female

### Inclusion criteria

- Cases spinal tuberculosis with instability.
- Patients with kyphotic deformity or loss of lordosis.
- Cases of combined posterior instrumentation and anterior spinal fusion.

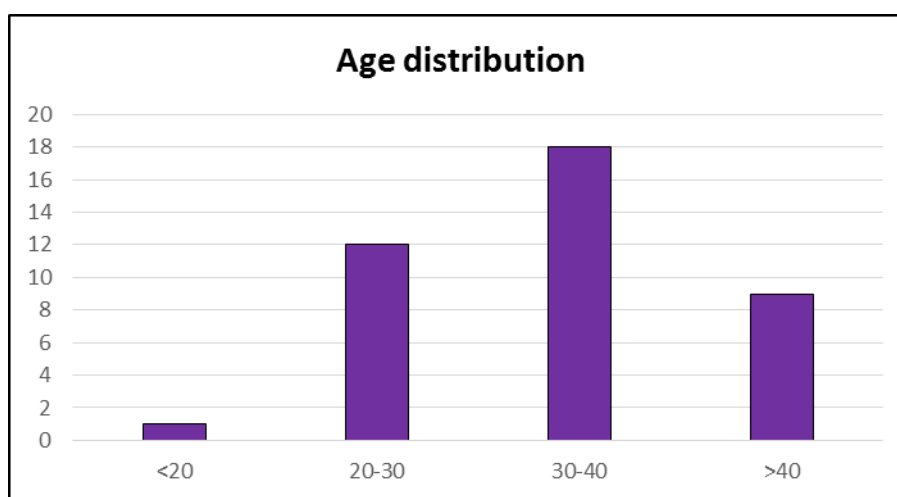
### Study procedure

The patients were selected retrospectively and their clinical & radiological features were studied in detail. Data were studied preoperatively & postoperatively as well. Clinical outcomes were measured by the Visual Analogue Scale (VAS), modified MacNab Criteria, and radiographic outcomes (kyphotic angle) on the follow-up to one year. Patients were evaluated before and after surgery for kyphotic correction and neurological status.

## RESULTS

### Age distribution

This study enrolled 40 consecutive patients, including 28 males and 12 females. The maximum number of patients was between 30 to 40 years old of this study (Figure-1).



**Figure 1: Age distribution of the patients.**

Table 1 shows the data collected from the selected patients. The average pre-operative, immediate postoperative, and last follow-up kyphotic angles were recorded respectively. The kyphotic angles showed better results over time in maximum patients. The mean segmental kyphotic angle was reduced after operations, it

was maintained up to one year. Their sites of involvement, surgical approaches are shown in this data chart.

Table 1: Patient's data.

Pts. No.	Sex	Sites of involvement	Approach	Preop Kyphosis (°)	Postop Kyphosis(°)	Final Kyphosis(°)
1	Male	T+TL	Anterior	22	17	17
2	Male	L+LS	Anterior	26	13	13
3	Male	T+TL	Posterior	21	19	20
4	Female	L+LS	Posterior	31	16	16
5	Female	T+TL	Anterior	35	26	27
6	Male	C+CT	Combined	19	11	11
7	Female	C+CT	Combined	29	16	16
8	Female	L+LS	Anterior	21	9	9
9	Male	L+LS	Posterior	13	4	5
10	Male	T+TL	Combined	9	3	6
11	Male	C+CT	Anterior	37	22	22
12	Male	L+LS	Anterior	44	32	32
13	Male	L+LS	Posterior	52	38	39
14	Male	T+TL	Combined	18	12	12
15	Female	L+LS	Posterior	23	18	18
16	Male	L+LS	Posterior	29	22	23
17	Male	C+CT	Anterior	31	21	24
18	Male	T+TL	Posterior	22	16	16
19	Male	L+LS	Posterior	17	10	12
20	Male	C+CT	Combined	21	9	9
21	Male	C+CT	Anterior	28	14	14
22	Male	L+LS	Anterior	21	12	13
23	Male	L+LS	Posterior	39	23	24
24	Female	C+CT	Combined	41	25	26
25	Female	L+LS	Combined	32	23	23
26	Male	T+TL	Posterior	22	15	15
27	Male	T+TL	Anterior	28	9	9
28	Male	C+CT	Combined	41	27	28
29	Female	L+LS	Posterior	29	13	13
30	Male	L+LS	Posterior	38	21	21
31	Male	L+LS	Anterior	18	8	9
32	Female	T+TL	Combined	22	10	10
33	Male	C+CT	Posterior	47	33	33
34	Male	L+LS	Posterior	35	31	32
35	Female	C+CT	Combined	26	15	15
36	Female	T+TL	Anterior	18	11	13
37	Male	C+CT	Combined	11	4	6
38	Male	C+CT	Posterior	24	13	13
39	Female	L+LS	Posterior	17	10	10
40	Male	L+LS	Anterior	29	14	16

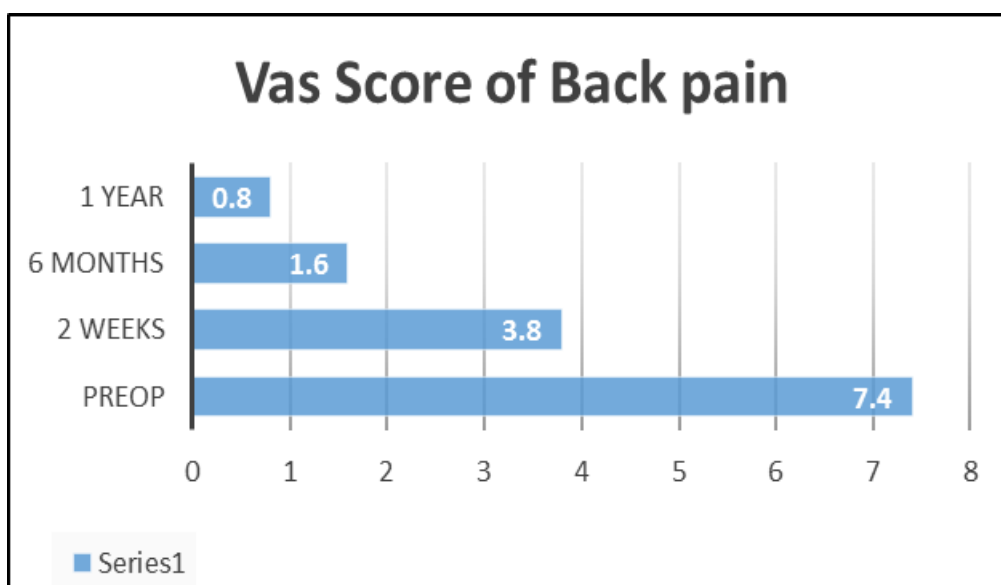
\*T- thoracic; L- lumbar; C- cervical; CT- cervicothoracic; TL- thoracolumbar; LS- lumbosacral.

The clinical symptoms and signs of the selected patients are shown below in table 2-

Table 2: Clinical symptoms and signs of 40 spinal TB patients.

Clinical sign and symptoms	Number of patients(%)
Back pain	37
Weakness	23
Numbness	19
Weight loss	17
Tenderness	33
Percussion pain	35
Kyphosis	21

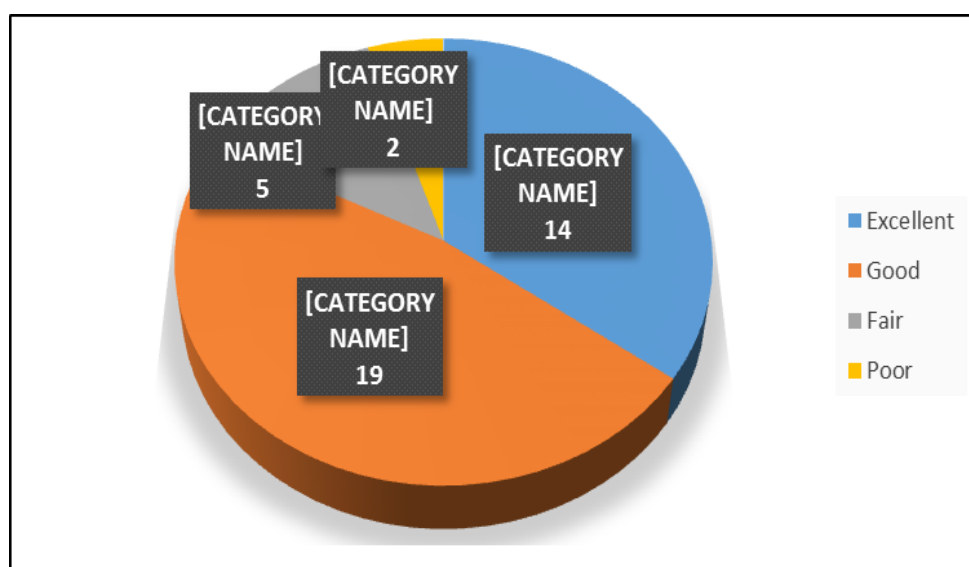
Initial VAS (Visual Analog Scale) scores of patients showed fast and lasting pain relief and improvement in daily activities. Mean VAS back pain scores decreased from 7.4 to 3.8 at two week's follow-up. After six months, mean VAS back scores decreased to 1.6, and after one year the mean VAS back scores decreased to 0.8 (Figure 2).



**Figure 2: VAS score of back pain of patients.**

Figure 2 shows that Modified MacNab criteria were used to evaluate the clinical results after one year of surgery.

Overall, 14 cases had excellent results, 19 had good results, 5 had fair results and 2 had poor results.



**Figure 3: Modified MacNab criteria.**

Early complications, intraoperative and postoperative complications, including superficial wound infection, spinal cord or nerve root injury, and postoperative respiratory failure, occurred were recorded in this study. The most formidable intraoperative complications were the large vessel injury that occurred in one patient. There was one thoracic root injury. Respiratory distress complications were observed in nine patients. Postoperatively there were wound infections in three, peroneal palsy in one, graft problems in thirteen patients. These complications are summarized in Table 3.

**Table 3: Intraoperative and postoperative complications.**

Intraoperative complications	Number of patients
Large vessel injuries	1
Ureter injuries	0
Superficial infection	2
Neural tissue damage	3
Root injury	1
Peritoneal perforation	2
Postoperative complications	
Wound infection	3
Harvest site pain	4
Leakage of cerebrospinal fluid	1
Implant failure	2
Vascular injury	0
Respiratory complication (distress)	9
Intercostal neuralgia	6
Intercostal neuroma	8
Peroneal palsy	1
Graft problems	13

## DISCUSSION

Spinal tuberculosis goes way back in history. Many experts believe that it is a "medical condition".<sup>[12-14]</sup> Anti-TB drug therapy has played a significant role in the therapy of tuberculosis, in particular at the early stage of infection. Also, multiple studies have shown that the majority of spinal tuberculosis patients (82–95%) respond very well to medical care.<sup>[15]</sup> Abhay Nene et al. announced that over 98% of their patients (69 out of 70) had been treated with conservative results, without the need for surgical decompression.<sup>[14]</sup> Anti-TB drug therapy may not be appropriate in all circumstances, especially in cases where there is a risk of dysfunction, neurological deterioration, bony deformity(kyphosis) and medical treatment failure. Spinal surgery involves extracting the lesion of the spinal cord, relieving nerve compression and restoring spinal integrity, which effectively relieves compression of the spinal cord and prevents kyphosis. To prevent permanent neurological impairment and mitigate spinal deformity, early diagnosis and prompt care are required.<sup>[16]</sup> The surgeons found out that "No patient with neurological disability healed or stabilized with non-operational treatment" and proposed many surgical strategies, including anterior spinal fusion, anterior-posterior spinal fusion, posterior spinal fusion alone, and posterior spinal fusion accompanied by anterior spinal fusion. In any given situation, the surgical procedure used differs due to neurological defects, spinal deformities, abscesses, and radicular or dural compression.

The anterior approach has long been regarded as the gold standard, since an anterior radical excision takes the surgeon directly to the lesion, provides optimal vision, immediately and completely decompresses the spinal cord.<sup>[17-19]</sup> But recently many authors suggested that post-stabilization is required to restore spinal stability and correct kyphotic deformity.<sup>[20]</sup>

Before reaching the operating room, the preoperative symptoms should be checked to avoid preventable complications. We assume that the prevention and prior assessment of potential complications are key factors in increasing surgical success rates and in promoting patient recovery. It was widely recognized that the rates of surgical complications in deformity correction surgery were higher and that the surgical operation for advanced tuberculosis was full of complications and poor outcomes, particularly when the procedure was done without a solid judgement.<sup>[21]</sup> The injuries of the large vessels, cord and nerves, and respiratory issues were some of the most severe complications in the current series. In the current series respiratory depression formed after an anterior cervical surgery in nine patients.

Treatment for spinal tuberculosis is aimed at decompressing the neural structures, preventing the development of paraplegia and kyphotic deformity, treating the current deformity and neurological disability, enabling early ambulation and restoring the patient to daily life.<sup>[22-24]</sup> Moon et al. claimed that the correction of kyphosis by interbody fusion done with classical anterior radical surgery per se is ineffective.<sup>[13]</sup> In our series most of the cases were addressed by posterior or combined approach. Mean back pain scores for VAS in this study decreased significantly after six months and one year of follow-up. Following operations, the mean segmental kyphotic angle improved. Good kyphosis correction is very important for long-term mechanical stability and complete sagittal equilibrium, as kyphosis correction shortens the lever arm and decreases tension over the spine that is affected.

## CONCLUSION

In spinal tuberculosis instrumented stabilization is effective. Instrumentation helps to achieve stable spine fixation to enable continuous recovery, as movement is still possible in and around the spinal cord. Any attempt

must be made with some sort of instrumentation wherever indicated to minimise the deformity. If clinical protocols are followed, in spinal tuberculosis surgery, the surgical complications and residuals can be minimized. The highly advanced surgical technique improved surgical instruments and newly developed anti-tubercular drugs significantly lead to reducing the complications of the procedure.

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**Patient Consent:** This study obtained patient consent directly from the patient.

**Author's Contributions:** The author's contributions include manuscript preparation and editing. The manuscript has been prepared by the author himself to be submitted and published.

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