



RESEARCH ARTICLE

MANAGEMENT OF SPINAL TUBERCULOSIS AMONG SUDANESE PATIENTS

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ARTICLE INFO

Article History:

Received 15th April, 2014

Received in revised form

10th May, 2014

Accepted 08th June, 2014

Published online 20th July, 2014

Key words:

Pott's Disease,
Tuberculosis,
PCR.

ABSTRACT

Introduction: Tuberculosis, an infectious disease caused by *Mycobacterium tuberculosis*. It primarily affects the lung causing pulmonary tuberculosis. It can also affect intestine, meninges, bones and joints, lymph glands and other organs of the body. The disease is usually chronic with varying clinical manifestations. The most important form is the pulmonary tuberculosis.

Materials and Methods: This is a retrospective study had been carried out in The National Center of Neurological Sciences (NCNS), during January 2003 to December 2006. All Sudanese patients attending National center for Neurological Sciences and diagnosed clinically and Radiologically as having pott,s disease were included in the present study. Polymerase chain reaction was performed on all selected patients as a confirmatory diagnostic tool.

Results: Thirty patients were included in the present study, male were 15 constituting 50%, and female were 15 and constituting 50%. The most affected age group was (50-59)years (26.7%). 50% of the patients from Khartoum State, followed by, 10% from Kassala state. 25 of the patients (83%) were positive PCR for *mycobacterium tuberculosis* . Plain X-ray radiographs of the vertebral spine showed both vertebral destruction and wedge fracture in 26 patients (86.7%) , only wedge fracture in 2 patients (6.7%) and vertebral destruction in 1 patient (3.3%). MRI showed cord compression in all patients, and 27 patients had paravertebral abscess.

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INTRODUCTION

Tuberculosis, an infectious disease caused by *Mycobacterium tuberculosis*. It primarily affects the lung causing pulmonary tuberculosis. It can also affect intestine, meninges, bones and joints, lymph glands and other organs of the body. The disease is usually chronic with varying clinical manifestations. The most important form is the pulmonary tuberculosis (Park 1997). The global incidence of tuberculosis is rising, with about 8.8 million new cases (AL-Amend 1993) and 2 million deaths each year from this curable disease (Jeffery 2000). Almost 1.3 million cases and 450 000 deaths occur among children each year (Hasseb 1945). In Sudan tuberculosis is one of the main public health problems with about 90/100,000 new smear positive cases per year and 25,000 new TB cases reported in 2004. Health problems are augmented by the civil conflict which causes poor nutrition and overcrowding in camps for displaced (Petersonal *et al.*, 1999). The agent of tuberculosis, *Mycobacterium tuberculosis*, *Mycobacterium bovis* and *Mycobacterium africanum* are members of the order

Actinomycetales and the family *Mycobacteriaceae*. The tubercle bacilli are non-spore forming, non motile, pleomorphic, weakly gram-positive curved rods 2-4µm long. They are obligate aerobes, grow best at 37-41° C, produce niacin and they lack pigmentation (Hasseb 1945). *M. Tuberculosis* is a facultative intracellular parasite (Park 1997). Skeletal tuberculosis constitutes 35% of extrapulmonary disease with the spine affected in 30-60% of cases. The most often affected is thoracolumber spine with less frequent involvement of cervical and sacral spine. Unilateral sacroiliac (S1) joint involvement is not uncommon. Pott's disease presents in the mid thoracic spine and thoracolumber junction. It results from the hematogenous spread of *M. tuberculosis*. The primary focus for infection is different for different age groups (Amitabha Banerjee *et al.*, 1987).

General Objective

To assess the clinical presentation of Pott's disease of the spine among patients in National Center For Neurological Sciences (NCNS).

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Specific Objective

To Determine the benefits and importance of the surgical decompressive procedures (corpectomy, laminectomy, drainage of abscess and debridment), bone graft and fixation of spinal tuberculosis in prevention of neurological deficits.

MATERIALS AND METHODS

This is a retrospective study had been carried out in The National Center of Neurological Sciences (NCNS), during January 2003 to December 2006. All Sudanese patients attending National center for Neurological Sciences and diagnosed clinically and Radiologically as having pott's disease were included in the present study. Polymerase chain reaction was performed on all selected patients as a confirmatory diagnostic tool. Data was analyzed by using SPSS (statistical package for social science) computerized program.

RESULTS

Thirty patients were included in the present study, male were 15 constituting 50%, and female were 15 and constituting 50%. The most affected age group was (50-59) years (26.7%). 50% of the patients from Khartoum State, followed by, 10% from Kassala state. Clinical presentations were displayed in Figures (1, 2, 3, 4,5).

The power in the lower limbs for patients with spinal tuberculosis

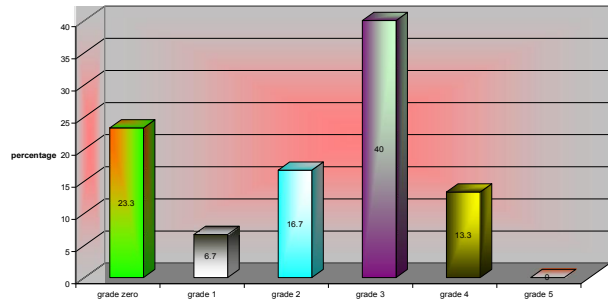


Fig. 3. shows power grading in Pott's disease

Types of sensory impairment

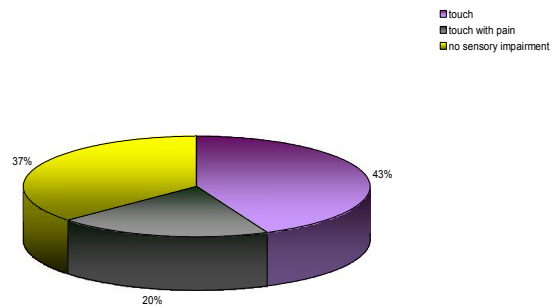


Fig. 4. shows types of sensory impairment

Course of the disease

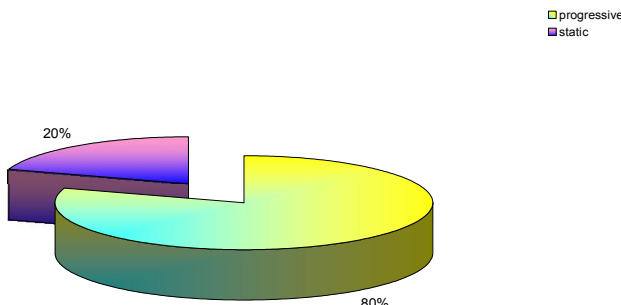


Fig. 1. shows course of the disease in Pott's disease

Findings in the back in spinal tuberculosis

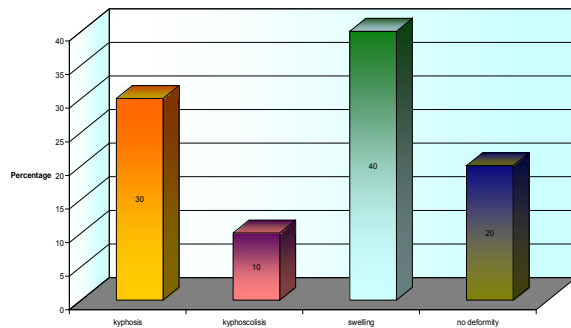


Fig.5 shows local back examinations

The presenting symptoms in spinal tuberculosis in the study population

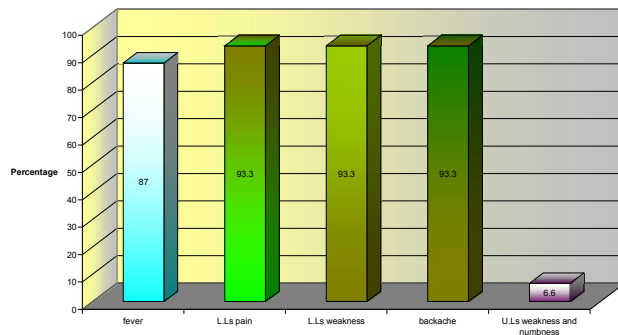


Fig. 2. shows symptoms in spinal tuberculosis in Pott's disease

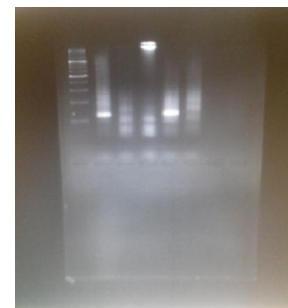


Fig. 6 shows positive PCR for Mycobacterium TB Lane 1, Ladder 100bp, Lane 2 , positive sample

Investigations were displayed in Table (1). 25 of the patients (83%) were positive PCR for mycobacterium tuberculosis (Fig.6) Plain X-ray radiographs of the vertebral spine showed both vertebral destruction and wedge fracture in 26 patients (86.7%), only wedge fracture in 2 patients (6.7%) and vertebral destruction in 1 patient (3.3%). Fig. (7) MRI showed cord compression in all patients, and 27 patients had paravertebral abscess. Fig. (8) Regard treatment, medical and surgical treatment were started simultaneously in 28 patients (93.3%), 2 patients received surgical treatment after 3 weeks of medical treatment (6.7%). Outcome of surgical treatment revealed that, 20% of the patients were completely improve regard neurological deficit, 73% were improved but still having some deficit and 7% of the patients dead.

Table 1. ESR in spinal tuberculosis

Value	Number	Percentage
20-40 mm/hr	4	13.3
40-60 mm/hr	1	3.3
60-80 mm/hr	4	13.3
80-100 mm/hr	6	20
100-120 mm/hr	13	43.3
120-140mm/lhr	2	6.7
Total	30	100.0

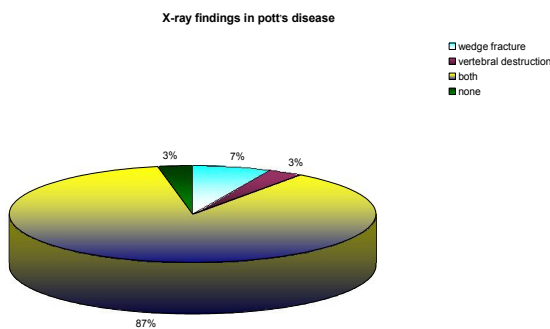


Fig.7. shows X-Ray findings

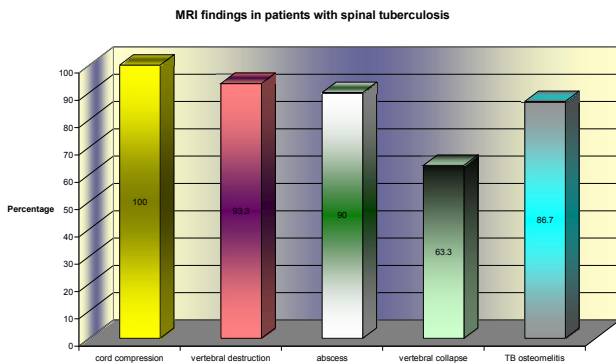


Fig. 8. shows MRI findings in Pott's disease

DISCUSSION

This study included 30 patients, with equal distribution of male and female, male to female ratio was 1:1. Another study found that, adults males are commonly affected than females

(AL-Amend 1993), this difference may be due to our small sample size. The most affected age group was 50-59 years (26.7%), followed by age group 30-39 years (23.3%). International literature revealed that the most common affected groups were young adults and elderly (AL-Amend 1993), however Mehmet Turket found that, the common affected age group was the middle age (Perry and Nickel 1972). The duration of the illness ranging between 1 day to 2 years. This finding was agreed with study done by Garg *et al.* (1998). In the present study (50%) of the patients was living in Khartoum State. In this study our findings revealed that (93.3%), of the Patients had Lower limbs weakness, backache. This findings agreed with study done by Harlod Ellis (1986). Paraparesis was found to be more common than paraplegia, and it was detected in (76.7%) while paraplegia was detected in (23.3%) of cases. Ikem IC found paraparesis in (47.1%) of patients with spinal tuberculosis in his study of 34 cases with pott's disease of spine. (Cotton and Flipo 1996) Since most of the lesions affected the cord and the course of the disease was progressive over time, most of the patients presented with the spastic type of paraplegia (83.3%), while (16.7%) presented with the flaccid type, this in keeping with literature mentioning that spastic type is the commonest type of paraplegia (Harlod Ellis 1986). The commonest sites for the lesions were in the thoracic area in (80%) mainly D₅. this result was comparable with Razai A R result when studied the management of pott's disease in 20 patients in New York, he found that the thoracic spine was involved in 13 patients which was the commonest area in his study also, followed by the lumbar spine which was involved in 4, also this the second common area in our study. Mehmet Turget (1997) when studied the clinical pattern of pott's disease in Turkey in 950 cases ended with the same result which is that the common site is the thoracic area. (Perry and Nickel 1972) This also comparable with the literature mentioned that the thoracic spine is involved in about 65% of cases, and the lumbar, cervical and thoracolumbar spine in about 20%, 10% and 5%, respectively (Garg *et al.*, 1998).

Sensory level was detected in (43.3%), all the patients had loss of simple touch sensation, and 6 patients had loss sensation of pain (20.0%), this result can be explained by the fact that the pathway of superficial sensation which entering the spinal cord after passing through posterior root ganglia crossing in front of the spinal canal, so in case of anterior cord compression the sensations affected are as follows: touch, pain and temperature, Kalita J found in his study of 43 cases of spinal tuberculosis 20 patients (46.5%) had loss of deep sensation in form of joint position sense (Sinan *et al.*, 2004). Tenderness in the back was detected in 16 patients (53.3%), Alothman A, in his study of tuberculous spondylitis in 69 cases in Saudi Arabia he found that tenderness was the most frequent sign and it was present in (45%) of cases (Andronikou *et al.*, 2002). 12 patients presented with swelling on the back (40%), Mehmet in his study in Turkey found this percent less (10%) this may be due to his large size of data 694 patients (Perry and Nickel 1972). In the present study kyphosis and kyphoscoliosis were found in 30%, 10% of the patients respectively. Other studies done by Ikem IC and Alothman A, mentioned that kyphosis and kyphoscoliosis were found in 32.4% and 17% of the patients. (10,14) In this study 14 patients (46.7%) had a history of pulmonary tuberculosis. this finding is less than that reported

by Rezia AR (Mehmet Turgut 1997). ESR was done for all patients, this test highlighting a significant clue for diagnosis of Pott's disease in the occurrence study, and this finding was agreed with a study done by Mehmet Turket (Perry and Nickel 1972). The commonest radiological features in x-ray were vertebral destruction and wedge fracture which were presented (86.6%), this in keep with literature review (Harlod Ellis 1986), however Cotton A, found that the most frequent radiological presentations were discovertebral lesions (93%) when he studied 82 cases of spinal tuberculosis, spondylitis with osteolysis or bone sclerosis at single or multiple levels was seen in the others, tuberculous lesion of the posterior arch was associated in 10% of patients, in most of his cases CT scan showed a fragmentary vertebral destruction which was characteristic of the disease, MRI revealed the precise extent of the lesions into the spinal canal. Morphologic features suggestive of the tuberculous nature of paravertebral abscesses were demonstrated when slices were performed in the axial or coronal plan (Mohammad Wasay and Hiba Arif 2006). The paravertebral abscess was detected in 27 patients (90%), this is less than Sinan T result who mentioned that paravertebral abscess was detected in (65.5%) of his cases (30 cases) (Conen *et al.*, 1986).

MRI was done for all patients and it was of diagnostic value in all cases, the commonest finding was vertebral destruction (93.3%), this is higher than Hans P result where he reported that 37 patients (84%) out of 44 patients presented with spinal tuberculosis had vertebral destruction (Hosten *et al.*, 1995), the abscess and wedge fracture were detected in (90%) of cases, this is less than than Andronikou S result where reported an intraspinal or paraspinal soft-tissue mass or abscess was present in 98% of his cases (53 patients) (Hans *et al.*, 2003). All the patients in MRI had cord compression. Spondylitis was detected in 18 patients (60.0%), Hosten N reported that when he studied 41 patients with spinal tuberculosis, 30 patients (73%) had spondylitis (Lee and Hahn 1968). Most of the patients received medical and surgical treatment (93.3%), only (6.7%) of cases received surgical treatment. The medical treatment in form of isoniazid (10-20 mg/kg/day up to 300 mg), rifampicin (10-20 mg/kg/day, up to 600 mg/day) and pyrazinamide (15-30 mg/kg/day, upto 2 g a day) and streptomycin (30mg/kg/day, up to 1 g a day), the duration of treatment ranging between 1 year to 1.5 years. The surgical procedure was radical debridement and arthrodesis and it was done as follows, the patient operated in supine position after general anesthesia, approached the lower cervical vertebrae (C3 through C7) through a collar incision or one along the anterior border of the sternocleidomastoid muscle. Incised the abscess longitudinally, exposing the spine. Corpectomy of the affected level with bone graft taken from right iliac crest, fixed using distractor and fixation. The transthoracic approach to the thoracic spine provides direct access to the vertebral bodies. Clearly, the midthoracic vertebral bodies are best exposed by this approach, whereas views of the upper and lower extremes of the spine are more limited. In general, a left-sided thoracotomy incision were preferred. The level of the incision should be positioned to meet the level of exposure required. Ordinarily an intercostal space was selected at or just above the involved segment. When one vertebral segment was involved, the rib at that level removed; however, if multiple levels were

involved, the rib at the upper level of the proposed dissection removed. Exposure was improved by resection of a rib, and the rib provided a satisfactory bone.

The technique: The patient was placed in the lateral decubitus position with the left side up, the sand bag used in maintaining the patient's position, and the table was angulated to increase exposure. An incision over the rib corresponding to the involved vertebra was made and exposed it subperiosteally. Hemostasis during the exposure was maintained. Disarticulated the rib from the transverse process and the hemifacets of the vertebral body. The parietal pleura was incised and reflected off of the spine). The segmental vessels were identified crossing the midportion of each vertebral body and ligated and divided. The periosteum was reflected carefully overlying the spine with elevators to expose the involved vertebrae. A small elevator was used to clearly delineate the pedicle of the vertebrae and a Kerrison rongeur to remove the pedicle, thus exposing the dural sac. The disc spaces were identified above and below the vertebrae and incised the anulus. The disc material was removed using rongeurs and curets. An entire cross section of the vertebral body was thus developed, and the anterior margin of the neural canal was identified with the posterior longitudinal ligament lying in the slight concavity on the back of the vertebral body. The segmental vessels and disc spaces were exposed. To accomplish the intended procedure usually corpectomy and strut grafting. fixation of the vertebra was made using rood and screws. The anterior retroperitoneal approach to the lumbar vertebral bodies is a modification of the anterolateral approach was commonly used. It was for extensive resection, debridement, or grafting at multiple levels in the lumbar spine. Depending on which portion of the lumbar spine is to be approached, the incision was varied in placement between the twelfth rib and the superior aspect of the iliac crest. The major dissection in this approach was behind the kidney in the potential space between the renal fascia and the quadratus lumborum and psoas muscles. The approach was made most often from the left side to avoid the liver and the inferior vena cava, which is more difficult to repair than the aorta should vascular injury occurred during the approach to the spine. An oblique incision was made over the twelfth rib from the lateral border of the quadratus lumborum to the lateral border of the rectus abdominus muscle to allow exposure of the first and second lumbar vertebrae.

Alternatively, incision several fingerbreadths below and parallel to the costal margin was placed when exposure of the lower lumbar vertebrae (L3 to L5) was necessary. The peritoneum reflected anteriorly by blunt dissection. The psoas muscle was identified in the retroperitoneal space and the ureter allowed to fall anteriorly with the retroperitoneal fat. The sympathetic chain was found between the vertebral bodies and the psoas muscle laterally, whereas the genitofemoral nerve was lying on the anterior aspect of the psoas muscle. Debridement, corpectomy, bone graft and fixation was conducted. The outcome of management of spinal tuberculosis was assessed 6 months post operatively and the findings as follows, 25 of the patients (83.3%) improved after the combination of treatment (medical and surgical), this comparable with Mehmet Turgut result in Turkey mentioning

that; best results were obtained with a combination of surgery and antituberculous chemotherapy (Perry and Nickel 1972). This result is comparable also to the literature (Garg *et al.*, 1998). Six patients fully improved after treatment (20%), 22 patients showed partially improvement (73%), 1 patient and 2 patients died (7%), the first one died due to sepsis after surgery while the second one died because of extensive illness (milliary TB). Thirteen patients had relief of backache (82%). 9 patients regaining the sphincters control (67%) 11 patient showed improvement in the back deformity (91.7%) 10 patients showed improvement of sensations (77%). 24 patients showed improvement of paraplegia and paraparesis (80%). Six patients their power retained to 5 (25%), 9 patients to grade 4 (37.5%), 3 patients to grade 3 (12.5%), 6 patients to grade 2 (25%). Kim *et al.* (1993) reported 140 patients who were treated with radical anterior surgery in 1993. They obtained 51% initial correction of kyphosis, but the rate of correction dropped to 7.5% by 2-year follow-up. Others have reported similar results with radical anterior surgery (Allothman *et al.*, 2001). (Moon *et al.*, 1999; Sahn 1999) and (Chen *et al.*, 1970; Chuttani 1970) reported 44 and 29 patients with TB of the spine, respectively, who were treated by anterior radical surgery combined with posterior instrumentation and fusion. They achieved remarkable correction of the kyphotic deformity, and loss of correction after surgery was negligible (1°-3°) (Kim *et al.*, 1993).

Conclusion

- There is no significant difference in the prevalence of TB of the spine infection between males and females.
- The prevalence of infection increases with increased age mainly adults in middle age, still they are a productive years.
- The disease is wide spread in Sudan, but most of patients came from Khartoum and from low social class.
- Paraplegia, backache fever and lower limb pain were the main presenting symptoms.
- Neurological involvement can occur at any stage of Pott's spine and even years later
- Patients who had both medical and surgical treatment, had better outcome.
- Plain X-ray radiographs, ESR were simple and in expensive investigations for Pott's disease.
- PCR was an accurate test for diagnosis of tuberculosis.

REFERENCES

- AL-Amend – M. History of tuberculosis Saudi Medical J 1993; 14 : 515-20.
- Alothman A, Memish Z A, Awada A. Tuberculous spondylitis: analysis of 69 cases from Saudia Arabia. Spine 2001 Dec 15; 26(24) E565-70.
- Amitabha Banerjee, MD, Duald E. Tow MD. Tuberculous spondylitis. October 18, 1987.
- Andronikou S, Jadwat S, Douis H. Pattern of disease on MRI in 53 children with tuberculous spondylitis and the role of gadolinium. *Pediatr Radiol.* 2002 Nov; 32(11):798-805. Epub 2002 Aug 17.
- Chuttani HK. Intestinal tuberculosis in modern trends. In: Card W, Creamer B (editors) *Gastroenterology*. London: Butter Worth's 1970. P. 308-27.
- Conen D, Jelk W, Dubach U. Clinical manifestations of tuberculosis today. *Schweiz Med Wochenschr.* 1986 Feb 15; 116(7):211-5.
- Cotten A, Flipo RM. Spinal tuberculosis .Study of clinical and radiological aspects from a series of 82 cases. *J Radiol.* 1996 Jun; 77(6):419-26.
- Garg RK, Karak B, Misra S. Acute paraparesis with tuberculous meningitis. *Postgrad Med J* 1998; 74:269-271.
- Hans P., Mark E. Schweitzer A, *et al.* MR imaging findings in spinal infections: rules or myths. *Radiology* 2003; 228:506-514.
- Harlod Ellis. *Clinical anatomy revised seventh edition.* Blackwell scientific publication 1986. p149, 386, 389.
- Haseb MA. Tuberculosis surveys in Sudan. *Trop Med Hyg* 1945; 57: 234-38.
- Hosten N, Lemke AJ, Mayer HM, *etal.* Spondylitis: borderline findings in magnetic resonance tomography. *Aktuelle Radiol.* 1995 May; 5(3):164-8.
- Jeffery R. Tuberculosis. In: Behrman R, Kleigman R, Jenson H, editors. *Nelson Textbook of Pediatrics.* 16th ed. Philadelphia: WB. Saunders Company, 2000: 885-97.
- Kim BJ, Ko HS, Lim Y, Seo JG, Zoo SK, Jeon TH. The clinical study of the tuberculous spondylitis. *J Korean Orthop Assoc.* 1993; 28:2221-2232.
- Lee EY, Hahn MS. A study of influences of the anterior intervertebral fusion upon the correctability of kyphosis in tuberculous spondylitis. *J Korean Orthop Assoc.* 1968; 3:31-
- Mehmet Turgut, Oner Bulent Alparslan Pott's spinal disease in Turkey: A survey study of 950 cases. *Clinical neurology and Neurosurgery.* Volume 99 (1997) p.27.
- Mohammad Wasay, Hiba Arif. Neuroimaging of Tuberculous Myelitis: Analysis of Ten Cases and Review of Literature. *Journal of Neuroimaging,* Volume 16 Issue 3 .P. 197 - July 2006.
- Park K. *Parks Textbook of Preventive and Social Medicine.* Prem Nagar Jabalipur, India. 1997. 15th edition, 138-151.
- Perry J. and V.L. Nickel, The halo in spinal abnormalities. Practical factors and avoidance of complication, *Orthop Clin North Am* 3 (1972), p. 69.
- Peterson TJ, Castl-white M, Young J, Moss AR. Stress at takl, knowledge and attitude about tuberculosis and tuberculosis control among handles adult. *Int J Tuberc Lung Dis* 1999 June; 3(6): 528-33.
- Sahn SA. Tuberculous empyema semin. *Resp Infe* 1999; 14: 82-87.
- Sinan T, Al-Khawari H, Ismail M. Spinal tuberculosis: CT and MRI feature. *Ann Saudi Med.* 2004 Nov-Dec; 24(6):437-41.
