

# Evaluation of Some Haematological Features of Tandem Spinal Stenosis Subjects In a Tertiary Hospital in Enugu, South East, Nigeria



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## Abstract

Tandem spinal stenosis (TSS) occurs as a result of spondylotic degeneration associated to symptomatic canal narrowing of multiple areas of the spine resulting to neurologic compression. It occurs more in elderly, more in male and the obese. The study was done to evaluate haematological features of tandem spinal stenosis in subjects attending a tertiary hospital in Enugu. The results showed significant increase ( $P < 0.05$ ) in ESR and neutrophil of tandem spinal stenosis (TSS) subjects ( $38.0 \pm 2.6$  mm/hr,  $66.0 \pm 6.2\%$ ) compared to the control ( $10.2 \pm 0.8$  mm/hr,  $58.0 \pm 7.5\%$ ), significant decrease ( $P > 0.05$ ) in lymphocytes, red blood cell, haemoglobin and packed cell volume of the tandem spinal stenosis (TSS) subjects ( $34.0 \pm 8.1\%$ ,  $3.67 \pm 0.5 \times 10^{12}/L$ ,  $11.0 \pm 0.6$  g/dl,  $3.0 \pm 8.6\%$ ) compared to control ( $42.0 \pm 12.0\%$ ,  $4.76 \pm 0.7 \times 10^{12}/L$ ,  $14.3 \pm 0.5$  g/dl,  $43.0 \pm 5.2\%$ ) and no significant difference ( $P > 0.05$ ) in total white cell, mean cell volume, mean cell haemoglobin, mean cell haemoglobin concentration of the tandem spinal stenosis (TSS) subjects ( $4.9 \pm 0.2 \times 10^9/L$ ,  $89.91 \pm 7.9$  fl,  $29.97 \pm 2.7$  pg,  $333.33 \pm 15.0$  g/l) compared to control ( $5.0 \pm 0.5 \times 10^9/L$ ,  $90.34 \pm 4.3$  fl,  $30.11 \pm 3.4$  pg,  $333.26 \pm 23.0$  g/l) respectively. It shows that tandem spinal stenosis leads to anaemia and inflammation as shown by the decrease in the red blood cell, haemoglobin, packed cell volume and increased in neutrophil as a sign of oxidative stress which could be a result of inflammation or the pains, it could also lead to immunodeficiency as seen in reduction in lymphocytes.

## Introduction

Tandem spinal stenosis (TSS) is reported as an infrequent, but medically crucial phenomenon; with a stated incidence of between 5 and 28% of spinal stenosis cases. Tandem stenosis is a distinct syndrome, generally as a result of spondylotic degeneration linked to symptomatic canal narrowing of multiple areas of the spine leading to significant neurologic compression [1-3]. Importantly, patients with tandem stenosis will present with signs of intermittent neurogenic claudication, progressive gait disturbance, and findings of mixed myelopathy and polyradiculopathy in both the upper and lower extremities. Frequently it is not until after surgical correction of the primary symptomatic area that the second area of symptomatic stenosis becomes evident [1-3].

It is strongly shown that cervical spondylotic myelopathy (CSM) is the highest common cause of spinal cord injury in older adults [4-6]. It is reported that degenerative changes with radiographic evidence of compression are evident in up to 50% of the population older than 55, but only 10% proceed to have symptoms of nerve root or spinal cord compression. The

pathology of spondylotic myelopathy is caused by degenerative changes of the disc, facet joints, hypertrophy of the ligamentum flavum, uncovertebral hypertrophy, and the possibility of a congenitally small central canal [7-10]. This condition typically occurs between the ages of 50-70, with complaints of insidious onset, 3:2 male/female respectively [11]. The primary initial symptoms of patients with CSM are frequently gait disturbances due to compression or degenerative changes of the spinocerebellar and corticospinal tracts [12]. This is characterized by a spastic or ataxic gait with a wide base of support and stooping posture. A loss of fine motor control is the most frequent complaint, typically manifesting as complaints of clumsy hands and/or difficulty writing [13-15].

Incontinence of urine and occasionally of bowel may be present in advanced cases. Cases of primary central canal stenosis may not include radicular symptoms to the upper extremities, but will present with long tract signs only. The presentation during physical examination will include: generalized hyperreflexia, clonus more likely in the lower than upper extremities, a positive Hoffmann's sign, a positive L'hermitte's sign, and

positive Babinski reflexes [13]. Lumbar spinal stenosis (LSS) is a commonly encountered condition, and may also occur as a component of TSS. The typical LSS patient is more likely to be male, in the fifth or sixth decade of life [16]. Clinically, the most frequent signs are leg pain, which is most often exacerbated by walking or extension and relieved with flexion; altered reflexes; weakness in a myotomal distribution; and decreased sensation to touch and vibration. Gait is frequently flexed and with a wide base of support [17,18], similar to that of CSM. Cauda equina syndrome (CES) is a rare, but serious, complication of LSS. Typical early signs and symptoms include low back and leg pain as well as abnormalities of the bulbocavernosus and ischiocavernosus reflexes [19,20].

There is paucity of published research works on haematological features of tandem spinal stenosis in this part of the world. It is pertinent to carry out this research for proper diagnosis and management of the patients.

### Aim

The aim of the study was to determine the hematological features of Tandem Spinal Stenosis subjects in Enugu, South East, Nigeria.

### Materials and Method

#### Study Area

The study was done in National Orthopaedic Hospital, Enugu, Nigeria.

#### Study Design

The study is a hospital based prospective cross sectional study using purposive sampling technique from January 2016 to May 2017.

#### Subjects

The subjects comprised of a total of sixty (60) subjects, 30 subjects were Tandem Spinal Stenosis (TSS) patients aged 60-75 years (20 females and 10 males) and 30 (15 females, 15 males) subjects were apparently healthy individuals aged matched as the control.

#### Ethical Consideration

This study was performed in compliance with the guidelines of the Helsinki Declaration on biomedical research on human subjects. It was a prospective study, and confidentiality of the identity of the patients and personal health information was maintained.

#### Statistical Analysis

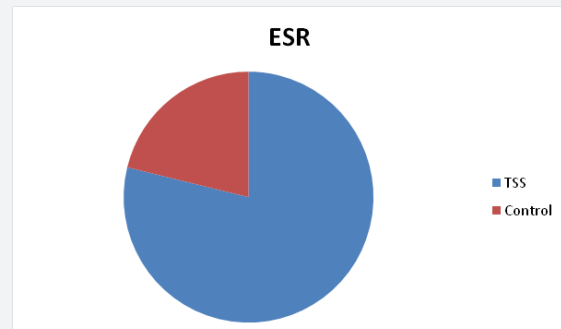
The results were presented in tables as mean and standard deviation and student t-test used for analysis and the level of significance was set at  $P < 0.05$

#### Haematological Investigation

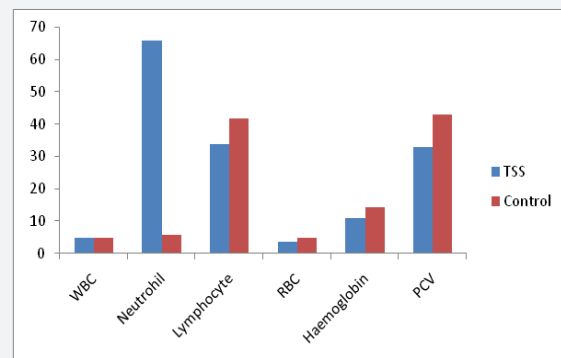
The haematological investigations were done using Mindray BC-5300. The haematological parameters investigated include

Erythrocyte Sedimentation Rate (ESR) total white blood cells (WBC), neutrophils, lymphocytes, red blood cells, haemoglobin, packed cell volume (PCV), mean cell volume (MCV), mean cell haemoglobin (MCH) and mean cell haemoglobin concentration (MCHC).

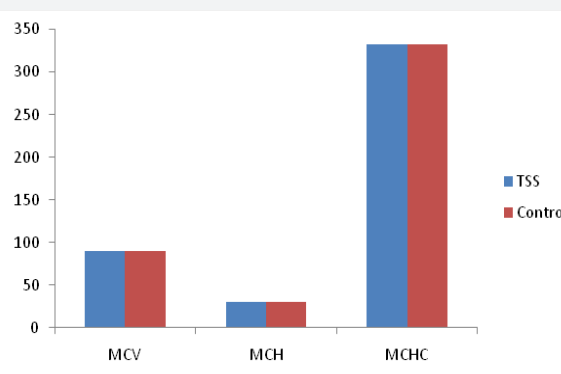
### Results



**Figure 1:** Showing ESR of tandem spinal stenosis (TSS) subjects and control.



**Figure 2:** Showing WBC, neutrophil, lymphocyte, RBC, Haemoglobin and PCV of Tandem Spinal Stenosis (TSS) subjects and control.



**Figure 3:** Showing MCV, MCH and MCHC of Tandem Spinal Stenosis (TSS) subjects and control.

The results showed significant increase ( $P < 0.05$ ) in ESR and neutrophil of tandem spinal stenosis (TSS) subjects ( $38.0 \pm 2.6$  mm/hr,  $66.0 \pm 6.2\%$ ) compared to the control ( $10.2 \pm 0.8$  mm/hr,  $58.0 \pm 7.5\%$ ), significant decrease ( $P > 0.05$ ) in lymphocytes, red blood cell, haemoglobin and packed cell

volume of the tandem spinal stenosis (TSS) subjects ( $34.0 \pm 8.1\%$ ,  $3.67 \pm 0.5 \times 10^{12}/L$ ,  $11.0 \pm 0.6g/dl$ ,  $3.0 \pm 8.6\%$ ) compared to control ( $42.0 \pm 12.0\%$ ,  $4.76 \pm 0.7 \times 10^{12}/L$ ,  $14.3 \pm 0.5g/dl$ ,  $43.0 \pm 5.2\%$ ) and no significant difference ( $P > 0.05$ ) in total white cell, mean cell volume, mean cell haemoglobin, mean cell haemoglobin

concentration of the tandem spinal stenosis (TSS) subjects ( $4.9 \pm 0.2 \times 10^9/L$ ,  $89.91 \pm 7.9fl$ ,  $29.97 \pm 2.7pg$ ,  $333.33 \pm 15.0g/l$ ) compared to control ( $5.0 \pm 0.5 \times 10^9/L$ ,  $90.34 \pm 4.3fl$ ,  $30.11 \pm 3.4pg$ ,  $333.26 \pm 23.0g/l$ ) respectively (Table 1) (Figures 1-3).

**Table 1:** Comparison of haematological features of the tandem spinal stenosis (TSS) subjects to control.

Parameters			TSS			Control	Level of Significance
ESR (mm/hr)			$38.0 \pm 2.6$			$10.2 \pm 0.8$	$p < 0.05$
WBC ( $\times 10^9/L$ )		$4.9 \pm 0.2$			$5.0 \pm 0.5$	$P > 0.05$	
Neutrophil (%)	$66.0 \pm 6.2$		$58.0 \pm 7.5$			$P < 0.05$	
Lymphocyte (%)		$34.0 \pm 8.1$		$42.0 \pm 12.0$		$P < 0.05$	
RBC ( $\times 10^{12}/L$ )		$3.67 \pm 0.5$		$4.76 \pm 0.7$		$P < 0.05$	
Haemoglobin (g/dl)		$11.0 \pm 0.6$		$14.3 \pm 0.5$		$P < 0.05$	
PCV (%)			$33.0 \pm 8.6$			$43.0 \pm 5.2$	$P < 0.05$
MCV (fl)			$89.91 \pm 7.9$			$90.34 \pm 4.3$	$P > 0.05$
MCH (pg)			$29.97 \pm 2.7$			$30.11 \pm 3.4$	$P > 0.05$
MCHC (g/l)			$333.33 \pm 15.0$			$333.26 \pm 23.0$	$P > 0.05$

ESR: Erythrocyte Sedimentation Rate; WBC: Tostal White Cell Count; RBC: Red Blood Cell; PCV: Packed Cell Volume, MCV: Mean Cell volume; MCH: Mean Cell Haemoglobin; MCHC: Mean Cell Haemoglobin Concentration; TSS: Tandem Spinal Stenosis Subjects

## Discussion

Haematological investigations especially full blood counts are good indicators in health and disease states. It helps to understand the real disease presentation juxtaposed to the clinical features in the patients. Tandem spinal stenosis (TSS) is becoming a major threat especially from the middle aged to the elderly especially in the obese individuals and trauma patients [21-24]. The study showed that there was elevation in erythrocyte sedimentation rate and neutrophil of tandem spinal stenosis subjects compared to the control. This could be linked to hypervolaemia and oxidative stress which may lead to increase release of neutrophil to the circulation. The study also showed significant decrease in lymphocytes, red blood cells, haemoglobin, packed cell volume of the tandem spinal stenosis subjects compared to the control. The decrease in lymphocytes may expose the subjects to immunodeficiency. This could lead to opportunistic infections in the patients. Decrease in red blood cells, haemoglobin and packed cell volume shows that the tandem spinal stenosis patients are exposed to anaemia. This may have adverse effect on their vitality of life. This may be associated with bone marrow suppression and increased pooling of cells to the spleen. There could be delayed and slow erythropoiesis in the patients.

## Conclusion

It shows that tandem spinal stenosis leads to anaemia and inflammation as shown by the decrease in the red blood cell, haemoglobin, packed cell volume and increased in neutrophil as a sign of oxidative stress which could be a result of inflammation or the pains, it could also lead to immunodeficiency as seen in

reduction in lymphocytes. This should be of a great guide to neurosurgeons and orthopaedic surgeons in the management of tandem spinal stenosis.

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