INTRODUCTION
A stenosis which can produce compression of the nerve roots in the absence of other compressive agents, occur with mid-sagittal diameter of 10 mm. So, thoracic canal stenosis may be more common than is currently recognized and account for a portion of the failures in anterior and lateral decompression of thoracic disc herniations. The complication can be avoided if the surgeon is familiar with the spinal anatomy, hypertrophy of the posterior spinal element leading to compromise of the spinal canal and its neural element is a well-recognized pathological entity affecting the lumbar or cervical spines. Such stenosis of the thoracic spine in the absence of generalized rheumatological, metabolic or orthopaedic disorder, or history of trauma is generally considered to be rare. So, thoracic canal stenosis may be more common than is currently recognized and account for a portion of the failures in anterior and lateral decompression of thoracic disc herniation. Stenosis is due to decreased sagittal diameter which has been reported in cervical and lumber canal. Verbiest suggested the anatomical stenosis of lumbar canal as a cause of spinal stenosis syndrome. Stenosis is due to decreased sagittal diameter which has been reported in cervical and lumber canal. Narrowing of spinal canal may be due to embryological or acquired as a result of degenerative changes from ageing, injury or disease or spinal operations. Reduced inter-pedicular distance is one of the causes of primary narrowing of spinal canal. However, several previous studies focussed on cervical and lumber area. No study has been done on thoracic spine. It is very difficult to measure cross sectional areas of the spinal canal, because it has various shape. Thus, we measured spinal canal anteroposterior diameter instead of cross sectional areas. The purpose of this study was to establish normative data for spinal canal in an adult.

MATERIALS AND METHODS
Three hundred sixty thoracic vertebrae of 30 thoracic spines without any apparent deformity or previous spinal surgery were obtained from the discarding cadaver in our medical institution and used in the analysis. 320 vertebrae from White American, Nigerian, Swiss, Japanese populations. Transverse diameter of the vertebral body was comparable to Indian population when we compared with Italian population. Transverse diameter of neural canal was less in almost all levels when we compared with White American, Nigerian, Swiss, Japanese populations. Transverse diameter of the vertebral body was comparable to Caucasians and Negroes. It showed the difference ranging between 3-4 mm.

KEYWORDS : Vertebral body, Stenosis, Neural canal

RESULTS AND DISCUSSION
Table I and Figures 1-4 show the mean and standard deviation and range of cephalic and caudal anteroposterior diameter, transverse diameter of neural canal, transverse diameter of vertebral body at narrowest point.

A) Shape of neural canal
The shape of neural canal was found to be oval from T1-T12 and all the 30 vertebral columns. Newell2 describes in thoracic region the shape is to be circular.
B) Transverse diameter of the neural canal

Table 1 describes the transverse diameter of neural canal from T1 to T12. It first decreased from 17.60±3.8mm at T1 (Range: 13.12-26.44mm) to 15.83±1.72 mm at T3 (Range: 13.50-22.24mm). Then it remained almost constant till T7. Thereafter, it increased gradually to 19.83±2.68 mm at T12 (Range: 15.43-26.54mm). Earlier many authors measured it on different populations and at different levels. It was seen that it was less in South Indian at almost all levels by 0.25-12.70 mm as compared with White American, Nigerian, Swiss and Japanese populations. Differences in the mean values of different populations may be due to racial and ethnic variations. If we observe, it is seen that while A.P. diameters increased up to T12, the transverse diameter increased up to T12. It may be explained by the fact that caudal to T12, there lies cauda equina whose nerves may be going laterally to their respective intervertebral foramina for exit thus increasing transverse diameter of neural canal.

![Image](image1.png)

![Image](image2.png)

![Image](image3.png)

![Image](image4.png)

C) Transverse diameter of vertebral body along narrowest point

Table 1 also depicts the transverse diameter along the narrowest point of vertebral body from T1 to T12. It first decreased from 27.76±3.33mm at T1 (Range: 18.42-34.82mm) to 25.58±2.10mm at T4 (Range: 18.70-30.46mm) and then increased to 35.65±3.29mm at T12 (Range: 25.13-45.37). Earlier many authors measured this parameter at T2, T7, T9. It was seen that, this parameter was comparable to Caucasian and Negroes at L1 L2 level but increased by 2-4 mm at L3-L5 when compared to T1 level in the present study.

When compared with other populations, a marked difference ranging between 5-10 mm was observed.

![Image](image5.png)

D) Cephalic anteroposterior diameter of neural canal

Table 1 shows the cephalic anteroposterior diameter of neural canal from T1 to T12. It was increased from 15.36±1.72mm at T1 (Range: 12.56-17.13 mm) to 18.53±2.25mm at T12 (Range: 14.06-21.05 mm) with slight dips at T7 and T9. When compared with previous studies conducted, on different populations by different authors it was seen that in South Indians, it was almost comparable to Caucasian and Swiss7 populations. However, it was less in South Indians at almost all levels by 0.1-0.54 mm as compared with Americans. It was more in South Indians at almost all levels by 1.56-2.38mm as compared with Zulu and Sotho Negroes, by 2.2-3.4mm as compared with Indian12 and by 0.5-1.5mm as compared with Italian13 populations.

![Image](image6.png)

When it was compared with cephalic anteroposterior diameter, it was found to be more at almost all levels by 0.1-0.5mm except at T1, T3, T12 where it was almost equal. If we have a close look at Table 1, it is seen that both cephalic and caudal A.P. diameter of neural canal is maximum at T12 levels which may be attributed to the lumbar enlargement of the spinal cord lying at next level.

The anteroposterior diameter of the spinal canal has a clinical significance. The anteroposterior diameter of the spinal canal has a clinical significance.
importance in traumatic, degenerative and inflammatory conditions. Narrowing of the spinal canal can usually occur in the central part of the spinal canal or in the intervertebral foramen.

A knowledge of anteroposterior diameter and transverse diameters of neural canal may be useful in the detection of conditions like spinal canal stenosis\textsuperscript{13}. Generally, with greater initial size of the canal, there is more space around the spinal cord and more encroachment can be tolerated without cord compression. Accordingly, the individual with developmental stenosis of the spinal canal is more susceptible to cord damage from spondylosis than the one with a canal of more generous proportions. Also since transverse diameter was the largest dimension of spinal canal, it indicates that A.P. diameter is clinically the most significant dimension of spinal canal. The lumbar part of spinal canal houses the cauda equina so its narrowing which may be congenital or acquired, may lead to compression of these roots causing low backache. Transverse diameter of the spinal canal at any segmental level is proportional to the size of vertebral body at that level\textsuperscript{14-16}. This observation is significant as clinicians while assessing the size of spinal canal from anteroposterior radiographs need not take into consideration variables like build of the individual and X ray magnification factor. It also helps in specifying whether an individual’s measurement on spinal canal are within the normal limits for respective body size or not, thus, helping to identify a stenosis or dilatation of spinal canal. The purpose of this study was to establish the range of normal values of the thoracic spinal canal midsagittal diameter in adults in the interest of facilitating clinical investigation of vertebral canal stenosis.

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CONFLICT OF INTEREST: None Declared

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