ORIGINAL ARTICLE

STUDY OF SEXUAL DIMORPHISM IN HUMAN LUMBAR VERTEBRAL CANAL IN VIDARBHA REGION

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ABSTRACT: Increase in number of patients suffering from backache all over the world needs changing health policies & cost benefit analysis. Hence with this aim the morphometric study of Lumbar Vertebral Canal was undertaken. **AIMS:** To reveal sexual dimorphism in human Lumbar Vertebral Canal. **METHODS & MATERIALS:** The material from 50 cadaveric specimens of the Lumbar Vertebra (intact) extending from the upper border of L1 to upper border of S1 including intervertebral discs were studied. **STATISTICAL ANALYSIS:** Data was presented in mean± standard deviation and categorical variable were represented in percentage. Comparison of measurement of Lumbar Canal in Males and females was done by unpaired "t" test. **RESULTS:** By statistical examination, the measurement of Lumbar Canal and vertebral body is greater in males than females of same age groups. The various dimensions of the canal and body of dissected segments were measured at all levels. **CONCLUSION:** The total measurement of canal in male is greater than female and the total measurements of body is also greater in male than female. The height of Lumbar Canal is more in male than female.
KEYWORDS: Sexual dimorphism (differences) of Lumbar Canal.

INTRODUCTION: Determination of sex from Lumbar Canal of an individual specimen includes examination of every segment of lumbar region. The examination of the bones helps in establishing personal identity in archeological specimen obtained after excavation as was well as in medico legal cases. This work is of great interest and will be helpful to Anthropologists, Anatomists, Forensic experts, Orthopaedicians and Radiologists.

According to Ammonocufi (1982)[1] the canal body ratio is 0.6 at L1 & L2, 0.6 at L4 and 0.5 at L5 in female whereas, the canal body ratio is 0.6 at L1 and 0.5 at L2 to L5 in males.

Vidarbha is a big region where race, climate and nutritional status vary. Abnormal movement, jerks caused by speed breakers or uneven surface during vehicles problems.

Human lumbar canal is important due to factors like many movements, maintenance of upright posture and weight transmission.

The lumbar canal is wider and contains cauda equina in place of spinal cord in the neurological involvement is rare.

According to Hooton (1946)[2] "The determination of sex from the post cranial skeleton in easy in about 80% of cases, difficult but possible in another 10% of cases and quite dubious in the remaining".

Krogman[3] (1946) pointed out that "even when the entire human body, pelvis and skull are available not more than 95% accuracy can be achieved." Whereas, according to Stewert (1954)

"measurement will never be a substitute for the speed and efficiency in which personal judgment based on wide experience can effect a diagnosis on the sex of a skeleton".

Taking into account the limitation of the investigation of procedures, plain radiographic examination of vertical column retains its diagnostic significance, more so as an economic screening procedure and easy accessibility by the majority Its important shall however increase if standard values of upper of and lower limits of canal and body dimensions are available for application to the any population under study.

Taking into consideration this scenario the present study aims to determine sex from Lumbar Canal in age group of 30-70 years.

According to T.M.W. Chung Shih (1992),[4] studied the transverse diameter of LUMBAR vertebral body ranges between 37-46 mm, anteroposterior diameter of body ranges between 29-35 mm and height of each kind of lumbar body ranges from 23-26 mm for 36 specimens of cadavers of both sexes.

Morphometric study of human LUMBAR canal was carried out by various workers:

Varbiest (1955),[5] in Americans stated that the midsagittal diameter of cadaveric LUMBAR spinal canal is 15 mm and measurement below 13mm indicates stenosis in adult age group.

S. Eisenstein (1977),[6] studied and quoted that, normally in adults the interpedicular diameter is 18 mm and the anteroposterior diameter is 13 mm in cadavers of south Africa and Caucasoids.

According to Postachini et al (1983),[7] the midsagittal diameter of canal ranges between 15-13mm in Italian population of adult age group cadavers.

According to T.M.W. Chung Shih (1992),[4] the anteroposterior mean diameter of cadaveric LUMBAR canal in adult group of Indians ranges between 7.12 to 4.25 mm and interpedicular diameter ranges between 25.65 to 28.02 mm (mean), midsaggital diameter of each kind of LUMBAR vertebral bodies ranges between 29 to 39 mm. Transverse diameter of each kind of LUMBAR vertebral bodies ranges between 37 to 46 mm (mean) and heights of each kind of lumbar vertebral bodies ranges from 23 to 26 mm.

By considering radiological study of lumbar canal, Following points are there, According to Hinck et al (1966), the transverse diameter of canal on x-ray is 25-30 mm in males and 24-29 mm in females of adult age group in white American.

According to chabra s. (1991),[8] in north Indians the transverse diameter of canal is 26-37 mm in males 24-34 mm in females of adult age group in radiological study.

Vinay Bhalereo (1995)[9] Sushil vairagade (1985)[10] state the shape of upper LUMBAR canal is almost circular and it changes gradually to triangular shape in lower LUMBAR vertebra in 5 cadavers

According to Vairagade B. R. (1996)[11] the transverse diameter of canal on x-ray ranges between 18-34 mm in males and missagittal diameter ranges between 16=20mm in 30 x-ray of males for asymptomatic cases and anteroposterior diameter of body ranges between 36-38 mm in males and transverse diameter of body rangese between 43-55 mm in adult age group.

According to Nirwan A. B. (2003)[12] in Gujarati population the transverse diameter of canal ranges between 24-30 mm in males, 18-30 mm in females of adult age group of radiological study.

There are five intervertebral discs in LUMBAR canal region.

Hollinshead (1962)[13] studied and reported that the LUMBAR region discs are wedge shaped, thicker anteriorly than posteriorly and entirely responsible for the upper part of curve. The body of fifth LUMBAR vertebra is greater anteriorly than posterioly and similar is the shape of 5th LUMBAR disc.

According to Green and Silver (1981)[14] the disc between L5 and S1 the most wedge shaped in the body and there is a tendency nevertheless for the body of L5 to slide forward with respect to the piece of sacrum.

Appleys Soloman (1987)[15] says that L4/L5 and L5/S1 disc are the sites for physical stress and hence more commonly acute disc rupture occurs at these sites.

According to Todds data (Grants 1999) the length of disc between L1 and L2 IS 9.7 mm, between L2 and L3 is 11.3mm, between L3 and L4 is 12.4mm and between L5 and S1 is 17.1mm. According to Mcnab (1971),[16] trauma and biochemical ageing changes accelerates lumbar disc degeneration.

According to Apley Solomon (1987)[15] with normal ageing disc gradually dries out the nucleus pulposus becomes turgid and herniation takes place through all directions and frequently perforates vertebral end plates to produce schomarls nodes.

With ageing, intervertebral disc show loss of water, decrease amount of hyaluronic acid and number of elastic fibers in ligamentum flava as stated by Koseoglu (1988).

Spondylolisthesis because of degeneration is called pseudo spondylolisthesis as stated by Junghan's (1974).[17]

Slipping of vertebral body occurs more commonly in males with canals being larger at L5-S1 level in them. Therefore, anterior slipping occur before compression as stated by Newman (1976).[18]

The laminae of L5 on one or both sides may be defective and unable to stand the strain resulting into downwards slipping of L5 vertebral body as stated by Green and Silver (1981).[14]

Slipping forward of vertebral body most commonly at L4 & L5 or L5 and S1 occurs because of disc degeneration, congenital defects spondylolysis, traumatic bone diseases, tumours as per Mc Gregor (1986).[19]

When there is a congenital cleft, trauma causing rupture through isthmus break in laminae causes slipping of vertebral body most commonly at L4 & L5 Grant's (1999).

Forword slopping of fifth Lumbar Vertebra over 1st sacral vertebra produces low back pain and depression may be found on surface above it on examination as stated by A. S. Moni (2004).[20]

Disc slipping in 75 % patients with lumbar disc lesions at L4 and L5 or L5 and S1 is common site because of large discs and more movement quotes Mc gregor (1986).

According to Rosenberg (1995) in degenerative type of spondylolisthesis slipping occurs most commonly at L4 level because of straight and stable joint between L4 and L5. Spondylosis is

associated with disc degeneration and recurrent disc prolapse and is associated with gradual flattening of disc resulting into intability Apley's (1987).[15]

In old age intervertebratebral space is reduced and fusion of adjacent vertebrae osteophytes formation causes pressure on nerves (Dutta,[20] 2000).

Scolisosis, Lordosis, Kyphosis produced due to congenital defects, tuberculosis, dislocation of hindp joint, abnormal movements, fusion of adjacent vertebrae, osteophytes formationand disc degenartion causes above condition. Gorden L. (1982).[21]

Enhanced curvature of female lumbar spine for the eventual support of weight of uterus during pregnancy results into lorodosis (Amonoo Kuofi 1992).

They are also associated with rotational deformity, abnormal flexion, multiple fractures says Grant's (1999).

Spurling (1937)[22] reported that stenosis of lumbar canal occur due to buldging of Ligamentum flavum mainly.Whereas, congenital deformity and developmental stenosis results into progressive post, natal narrowing of vertebral canal (Spurling 1945).[22]

Usually, after the onset of degeneration, disc and facet joint changes in males are affected more than woman between 35-65 year (Verbiest, 1954).[5]

Latrogenic stenosis is a series of post-operative spinal stenosis after Laminactomy as observed by Bodyskes (1976).[23] Whereas, stenosis caused by congenital narrowing in achondroplasia, osteophytes, paget's disease and spondylolisthesis is stated by Lee Mcgregor (1986) L4 and L5 level are most commonly involved in lumbar spinal canal stenosis and the stenosis is produced by disc herniation, fibrous scar or by osseous changes Teen–Meen Wang Chung Shih (1992).[4]

After 4th decade of life and ageing process osteoarthritic changes in the joints of the articular process, by formation of osteophytes together with degeneration, causes stenosis quotes R. S. Shell (1993). [24]

MATERIAL & METHODS: The present work was carried out in department of Anatomy Govt. Medical College.

50 cadaveric specimens of Lumbar Vertebrae (intact) extending from upper border of L1 to upper border of S1 including intervetebral discs were collected.

In cadaveric specimens, measurements of Lumbar Canals in 20 females and 30 males was taken. Cadaveric specimens were belonging to age groups between 30–70 years.

The Lumbar portion of Vertebral column was obtained by sawing proximally between T-12 and L1 and distally between L5 and S1. It was difficult to carry out the measurements at different levels in the intact lumbar portions of vertebral column. Therefore specimens were sawed by an electric band saw of 2 mm thickness separating lumbar vertebrae from each other and before separating lumbar vertebrae total length of Lumbar Canal was measured from upper border of L1 to upper border of S1. All measurements are taken with the help of vernier calliper.

Diagram Showing Measurements Of Midsaggital Diameter Of Canal

Diagram Showing Measurements Of Interpedicular Diameter Of Canal

Cadaveric Intact Specimens Of 30 Males Lumbar Vertebrae

Cadaveric Intact Specimens Of 20 Females Lumbar Vertebrae

Calculation

For calculation statistical formulae are

1) $Mean \rightarrow x\ \frac{\sum x}{n}$

Where X = Mean

X = Individual value

$\sum x$ = The sum of all measurments.

2) Standard Deviation

S.D. = $\frac{\sqrt{\sum(x-\bar{x})2}}{n}$

3) Coefficient of Variation → $\frac{S.D.}{x} x100$

4) Standard Error → $\frac{S.D.}{\sqrt{n}}$

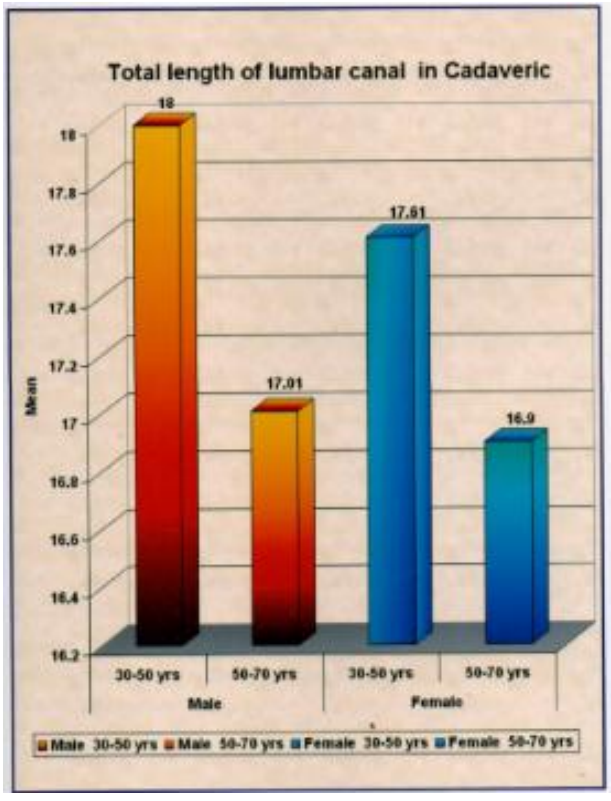
STATISTICAL ANALYSIS: In statistical analysis measurements of present study is compared with the previous study and results are expressed as mean ± standard deviation and categorical variables are expressed in percentages. The significance of differences in the means between the present study in vidarbha region of Maharashtra and previous Indian Study are compared for significance. Present study shows non-significance in all 5 type of measurements 1] Height of

lumbar of vertebral body, 2] Inter pedicular diameter of lumbar canal, 3] Antero-posterior diameter of body, 4] Transverse diameter of vertebral body and 5] Antero-posterior diameter of canal.

The p value in calculated and T test was applied to know whether difference between the previous study and present study is significant or non-significant.

OBSERVATIONS: Antero-posterior diameter and transverse diameter of canal & body is greater in males than females. The length of the Lumbar canal decreases in height in between 50-70yrs in both the sexes. Charts and graphs shown on last page.

a. Table Number 1, Shows transverse diameter of canal was increased from 1st to 5th lumbar vertebrae.
b. Table Number 2, Shows midsagittal diameter was decreased from L1 to L5.
c. Table Number 3, Shows gradual increase as Antero Posterior Diameter of body from L1 to L5.
d. Table Number 4, Shows gradual increase of diameter of Transverse diameter of vertebral body.
e. Table Number 5, Shows height of lumbar vertebral body did not differ much between L2 L3 L4.
f. Table Number 7, 8, 9, 10 and 11 Shows the statistical calculation where there is no significant difference between previous Study and present study parameter measurement (NS – Non Significant).



DISCUSSION: The present study is carried out to reveal sexual differences of Lumbar canal with help of lumbar canal measurements (for male & female). The transverse diameter of the canal was remarkably increased from 1st to 5th Lumbar Vertebra with the range of 20.1 to 40 mm in males and 23 to 30.2 mm in females. The mid sagittal diameter of canal from L1 to L5 ranges between 4.4-12.6 mm in male and 4 to 12.2 mm in female. The gradual increase of AP (body) diameter from L1 to L5 in male increased from 25.8 mm to 38.1 mm and 25.9 to 37.7 mm in females. The gradual increase of (body) diameter is from 34.4 to 48.2 mm in males and 35.4 to 46.7 mm in females.

The height of vertebral lumbar body did not differ much between L2, L3and L4. In male it ranges from 18.8 to 30.2 mm and in female ranges from 18.9-29.8 mm (L1 to L5). According to T. M. W. Chung Shih (1992)[4] the transverse diameter of body ranges between 37 to 46 mm and antero-posterior diameter of body ranges between 29 to 35 mm. Whereas, height of each kind of lumbar vertebral body ranges from 23to26 mm in 36 specimen of both sexes of Indians cadavers. Vinay Bhalerao (1975),[9] Susheel Vairagade (1985),[10] Stated that the shape of Upper Lumbar Canal is almost circular and this changes gradually to triangular shape in lower lumbar vertebra in cadavers.

According to Frazers (1958),[25] A.K. Zargar (2004), Gray (2005)[26] the discs account for more than 1/5th of total length of column.

This study is greatly helpful to orthopedician, Forensic Experts.

SEXUAL DIFFERENCES: When the sacrum turns backwards and downwards sharpness of the angle is modified by the curvature of large LUMBAR body thus the wedging is more marked in females as stated by Frazers (1958).

Lawrence (1971),[27] observed by x-ray taking in recumbent position and concluded for spondylolysthesis the highest relative frequency of spondylolysthesis was found at L5 to S1 in man (42%) anat L4 to L5 in woman (41%) and spondylolysthesis occurred at the level of one segment in 91% of the man and in 89% of woman.

In majority of woman (Patients) in 3rd and 4th decade and premenopausal period the lesions are perhaps associated with oestrogen secretion Gorden. L. (1982)

In postmenopausal women there is disc degeneration, here height is lost because of vertebral softening and collapse with resultant swelling of disc. Gorden L. (1982)

In the male subjects, canal / body ratio is 0.6 at L1 and 0.5 at L2 to L5 and in the female subjects the, ratio is 0.6 at L1-L4 and 0.5 at L5 reported Amonookuofi (1982).[1]

In males the mean horizontal diameter increased steadily from age group 10-20 years until age group 40-50 years at all lumbar levels except the 4th lumbar level. Vertical diameter in females showed decrease dimension from 30-49 except at 1st LUMBAR level and from 49 to more than 50 years there is a significant increase in diameter. In males the vertical diameter is increased sharply from 30 to 49 years and this is followed by decline of diameter in the 50+ years group as observed Amoonoo Kuofi (1994).

In the 10-20 years of age group, the mean diameter of female pedicles were greater than the mean diameter of male pedicles and. reversal is noted from age group 20-30 year onwards with male diameters exceeding those of females Amoonoo K, (1995).

Normally the lumbosacral angle is 120 in females the angle is greater than males- A. S. Moni (2004).[28]

The width of the canal is greater in females than males in 10-40 years males, lumbosacral angles are greater than the female angles while in older age group (above 40 years) female has greater lumbosacral angles as per Gray (2004 and 2005).

CONCLUSION: By statistical analysis

1. The interpedicular diameter of canal in male ranges from 20-40 mm (L1 to L5 level) and in female 4 to 12 mm.
2. The Antero-posterior diameter of body in male ranges between 25 to 38 mm and in female ranges between 25 to 37 mm.
3. The transverse diameter of body ranges between 34 to 48 mm in males and in female ranges 35 to 46 mm.
4. The height of each kind of lumbar vertebral bodies 18 to 30 mm in males and 18 to 29.8 mm in female.
5. The total length of lumbar canal ranges from 16 to 19.5 cm. in males and in female ranges between 16 to 18.6 cm.
6. The types B & C was seen commonly in males and females for lumbar canal.
7. This study is helpful to radiologist and orthopaedician etc. For ruling out the causes of lower backache and to maintain normal Anatomical posture while sitting or different walks of life. Whereas, Anatomist and forensic experts can use this information for establishing personal identity and the sex of skeleton from lumbar canal study as a personal identity.

(MM) OFLUMBAR	**CANAL**				
Details of Measurements	**Male 30 -70 Years Age Groups**				
Levels	L1	L2	L3	L4	L5
No. Of Bones	30	30	30	30	30
Range	20.01 -30.5	22.7 -32.4	23.5-34.3	24.5-36.2	25.5-40
Mean	26.45	26.57	26.92	27.84	28.9
Standard Deviation	2.24	2.19	2.03	2.1	2.45
Calculated Range	21.97-30.93	22.19-30.95	22.86-30.98	23.64-32.04	24-33.8
Details of Measurements	**Male 30 -70 Years Age Groups**				
Levels	L1	L2	L3	L4	L5
No. Of Bones	30	30	30	30	30
Range	20.01 -30.5	22.7 -32.4	23.5-34.3	24.5-36.2	25.5-40

Mean	26.45	26.57	26.92	27.84	28.9
Standard Deviation	2.24	2.19	2.03	2.1	2.45
Calculated Range	21.97-30.93	22.19-30.95	22.86-30.98	23.64-32.04	24-33.8
The transverse or interpedicular diameter of the canal was remarkably increased from the 1st to 5th lumbar vertebrae with a range of 20.1 to 40mm in males (from L1 to L5)					
In females the diameters of the canal ranges between 23-30.2mm in females (from L1 to L5)					

Table 1: Cadaveric measurements of interpedicular / transversdiameter

Details of Measurements	**Male 30 -70 Years Age Groups**				
Levels	L1	L2	L3	L4	L5
No. of Bones	30	30	30	30	30
Range	4.4-12.6	4.4-12.6	3.2-11.4	2.1-10.3	1.4-9.6
Mean	7.37	7.34	6.63	5.14	4.44
Standard Deviation	1.85	1.89	1.89	1.9	1.86
Calculated Range	3.67-11.07	3.56-11.12	2.85-10.41	1.42-8.86	0.72-8.16
Details of Measurements	**Male 30 -70 Years Age Groups**				
Levels	L1	L2	L3	L4	L5
No. of Bones	20	20	20	20	20
Range	4-12.2	4-10.4	2.8-11	1.7-9.9	1-9.2
Mean	7.19	6.76	6.34	5.29	4.36
Standard Deviation	2.19	1.55	2.11	2.2	2.16
Calculated Range	2.81-11.57	3.56-9.86	2.12-10.56	0.87-9.71	0.04-8.68
The midsagittal diameter however was the narrower dimension, and from L1 to L5 it decreased in diametter and in males it ranges between 4.4-12.6 mm and in females it ranges between 4-12.2mm (from L1 to L5)					

Table 2: Cadaveric Measurements of Anteroposterior or Mid Saagittal Diameter (Mm) of Lumbar Canal

Details of Measurements	**Male 30 -70 Years Age Groups**				
Levels	**L1**	**L2**	**L3**	**L4**	**L5**
No. Of Bones	20	20	20	20	20
Range	25.8-34.2	24.3-35.4	28.2-36.6	28.4-36.8	29.7-38.1
Mean	29.61	30.48	31.87	32.21	33.51
Standard Deviation	2.33	2.46	2.18	2.3	2.33
Calculated Range	24.95-34.7	25.56-35.4	27.51-36.23	29.35-37.67	34.34-41.82

Details of Measurements	Male 30 -70 Years Age Groups				
Levels	**L1**	**L2**	**L3**	**L4**	**L5**
No. of Bones	30	30	30	30	30
Range	25.9-33.8	27.1-35	28.3-35.4	28.5-36.4	29.8-37.7
Mean	30.1	31.3	32.03	32.7	34
Standard Deviation	2.28	2.28	2.09	2.3	2.28
Calculated Range	25.54-34.66	26.74-35.86	27.85-36.21	28.14-37.26	29.44-38.56
There is gradual increase from L1 to L5 vertebrae for antiposterior Measurements in both malles and females. The lumbar vertebal bodies Increased from 25.8mm to 38.1mm in males and 25.9-37.7mm in females. from (L1 to L5)					

Table 3: Cadaveric measurements of lumbarvertebral bodies table Showing anteroposterior /mid sagittal diameter of boddies (mm)

Details of Measurements	Male 30 -70 Years Age Groups				
Levels	**L1**	**L2**	**L3**	**L4**	**L5**
No. of Bones	30	30	30	30	30
Range	34.4-42.2	24.3-4.8	32.4-47.5	32.2-46.2	40.2-48.2
Mean	38.08	38.19	41.96	41.64	43.22
Standard Deviation	1.87	2.12	4.79	2.1	2.11
Calculated Range	34.34-41.82	31.63-44.11	30.31-49.47	37.03-45.51	37.75-46.19
Details of Measurements	**Male 30 -70 Years Age Groups**				
Levels	**L1**	**L2**	**L3**	**L4**	**L5**
No. of Bones	20	20	20	20	20
The observation shown increase of diameter from 34.4 mm to 48.2 mm males and in females shown gradual increase of diameter from 35.4mm to 46.7mm (from L1 to L5)					

Table 4: Cadaveric Measurements of Transverse Diameter of Body (Mm)

Details of Measurements	Male 30 -70 Years Age Groups				
Levels	**L1**	**L2**	**L3**	**L4**	**L5**
No. of Bones	30	30	30	30	30
Range	18.8-27.2	20.8-29.2	20.1-29.2	20.1-29.5	21.8-30.2

Mean	22.61	24.61	24.71	25.01	25.61
Standard Deviation	2.3	2.06	2.32	2.3	2.33
Calculated Range	18.01-27.21	20.49-28.35	20.07-29.35	2.13-29.46	21.54-30.66
Details of Measurements	**Male 30 -70 Years Age Groups**				
Levels	**L1**	**L2**	**L3**	**L4**	**L5**
Heights of vetebral lumbar body did not differ much between L2, L3, L4. in males from 18.8-30.2 mm and in females ranges from 18.9-29.8 mm (from L1 to L5)					

Table 5: Cadaveric measurements of heights of each king of lumbar Vertibral bodies (mm)

Details of Measurement	**Cadaveric**				**Radiological**			
Sex	**Male**		**Female**		**Male**		**Female**	
Age group	30.-50 Yrs.	50-70 yrs.	30-50 yrs.	50-70 yrs	30-50 yrs.	50-70 yrs.	30-50 yrs.	50-70 yrs
No. of samples	15	15	10	10	15	15	10	10
Mean	18.0	17.01	17.61	16.9	22.44	20.38	20.0	18.58
Standard deviation	0.73	0.62	0.82	1.01	1.42	1.28	1.14	0.71
Range	16.8-19.5	16.3-18.5	16.5-18.6	15.4-18.4	19.4-24.2	18.4-22.4	18.4-21.6	17.6-19.6
C.v.	4.05%	3.64%	4.66%	5.97%	6.32%	6.28%	5.70%	3.82%
There is a decrease in height of lumbar canal in between 50-70 years in both sexes, and in radiological and cadaveric cases, because of changes occurs in the disc, the water content of disc, related to the shock absorbing capacity and downward trend with age reflects the decline in elastic deformity. In old age osteoporotic changes and degenerative changes are observed radiologicaly.								

Table 6: The Total Length of Lumbar Canal (Cm)

Levels	**Present Study mean + SEM, mm**	**Previous Study Mean + SEM, mm**	**Significant / Non -Significant**
L1	22.81+0.32	23.71+0.34	NS
L2	24.81+0.32	24.41+0.32	NS
L3	24.92+0.32	25.33+0.35	NS
L4	25.22+0.32	25.29+0.36	NS
L5	25.81+0.32	25.50+0.35	NS

Table 7: Table Showing Height of Lumbar Vertebral Bodies in Vidharbha Region and Previous Study in Cadavers

Levels	Present Study mean + (2005) SEM, mm	Previous Study (1992) Mean + SEM, mm	Significant / Non - Significant
L1	26.27+0.29	25.65+0.24	NS
L2	26.32+0.30	25.69+0.33	NS
L3	26.73+0.26	26.52+0.28	NS
L4	27.57+0.26	27.23+0.39	NS
L5	25.81+0.32	25.50+0.35	NS
L1	28.59+0.29	28.02+0.37	NS

Table 8: Table Showing Interpedicular diameter of lumbar canal vidarbha Region and Previous Study in Candavers

Levels	Present Study mean + (2005) SEM, mm	Previous Study (1992) Mean + SEM, mm	Significant / Non - Significant
L1	7.30+0.27	7.55+0.20	NS
L2	7.11+0.25	7.00+0.22	NS
L3	6.51+0.27	6.38+0.21	NS
L4	5.20+0.28	5.11+0.21	NS
L5	4.41+0.27	4.54+0.18	NS
L1	28.59+0.29	28.02+0.37	NS

Table 9: Table Showing Mid -Sagital Diameter of Limbar Canal in Vidarbha Vidarbha Region and Previous Study in Candavers

Levels	Present Study Mean + SEM, mm	Previous Study Mean + SEM, mm	Significant / Non -Significant
L1	37.91+0.26	37.56+0.56	NS
L2	38.86+0.54	39.04+0.70	NS
L3	41.13+0.57	41.99+0.72	NS
L4	41.49+0.27	41.25+0.93	NS
L5	42.72+0.72	41.75+0.81	NS

Table 10: Table showing transverse diameter of lumbar vertebral body in Vidarbha region and previous study in Candavers

Present Study mean + (2005) SEM, mm	Previous Study (1992) Mean + SEM, mm	Significant / Non - Significant
29.81+0.32	29.62+0.33	NS
30.81+0.34	30.19+0.36	NS
31.93+0.30	31.25+0.38	NS
32.41+0.32	32.02+0.42	NS
33.71+0.32	33.16+0.47	NS

Table 11: Table Showing Mid-Sagital Diameter of Lumbar Vertibral Bodies Vidarbha Region and Previous Study in Candavers

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