



## STUDY OF NORMAL PITUITARY GLAND VOLUME WITH MRI BRAIN IN TERTIARY CARE HOSPITAL

### Neurology

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### ABSTRACT

**AIM:** To find out the range of pituitary gland volumes in adults in different age groups across both genders by Magnetic Resonance Imaging studies.

**INTRODUCTION:** Pituitary gland varies in size and shape among both genders, different age groups and also among different races and ethnicity. Pituitary gland volume measurement more reliably detects subtle changes in size which can be pathological. There is lack of data on normal reference values of pituitary gland volumes in Indian population.

**MATERIALS AND METHODS:** Total 50 apparently healthy individuals were subjected to MRI of pituitary gland. A T1 weighted multiplanar acquisition was performed in sagittal plane with a slice thickness of 3mm. Pituitary gland was traced on all slices and volume calculated.

**RESULTS:** The mean pituitary volume found in males was 2.15 cm<sup>3</sup> and in females it was 2.21 cm<sup>3</sup>. The largest pituitary glands were seen in 41-50 years age group in the male which was significantly larger than that found in female. There was no significant difference in pituitary volume between the two genders at other age groups.

**CONCLUSION:** Normal values of pituitary glands with gender and age variations were found out in this study. The study helps to recognize subtle pathologies of the pituitary gland but also pave way for better understanding of behavioral and personality related differences among different ethnic groups.

### KEYWORDS

Pituitary gland volume, adenoma, MRI brain.

#### AIM

To find out the range of pituitary gland volumes in adults in different age groups across both genders by Magnetic Resonance Imaging studies.

#### INTRODUCTION

Pituitary gland varies in size and shape among both genders, different age groups and also among different races and ethnicity. Pituitary gland volume measurement more reliably detects subtle changes in size which can be pathological. There is lack of data on normal reference values of pituitary gland volumes in Indian population.

#### MATERIALS AND METHODS

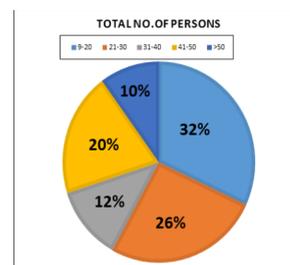
Total 50 apparently healthy individuals were subjected to MRI of pituitary gland. A T1 weighted multiplanar acquisition was performed in sagittal plane with a slice thickness of 3mm. Pituitary gland was traced on all slices and volume calculated. MRI Brain was done for patients with nonspecific neurological symptoms and signs, headache and non-acute stroke. MRI brain was taken with the Patients in supine position with head first, arms beside the trunk. Field of view is centered with nasion in the midline. Type of coil used is head. The mode of scanning is 2D. MRI brain is done sagittal T1 plane or 3 plane GRE localizer. The scan is done in the axial plane from foramen magnum to the vertex. The thickness of slice is 5mm. The pulse sequences were Localiser t2 – tse – tra, t2 - tirmtra dark fluid, t2 - tirmcor dark fluid, t1 - se sag, tof fi3d tramutislab, tof 2d obl sag veno and ep2d diff 3scan trace. The slice interval was 1-2mm. The scan delay was 300 seconds. The contrast was administered intravenously in the dose of 0.2ml/kg rapid injection followed by 10ml saline flush.

#### RESULTS

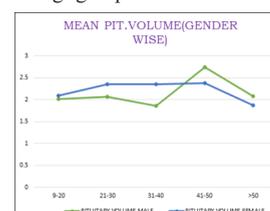
Among the 50 healthy individuals, 16 members belong to age group 9-20, 13 members belong to age group 21-30, 6 members to age group 31-40, 10 members belong to age group 41-50.

#### AGE DISTRIBUTION

AGE GROUP	FREQUENCY
9-20	16
21-30	13
31-40	6
41-50	10
>50	5
TOTAL	50

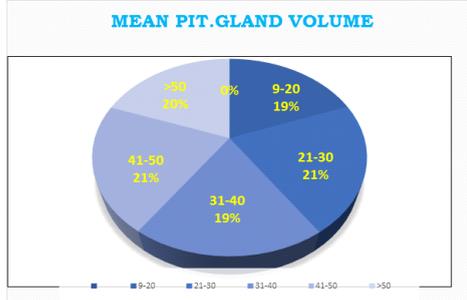


The mean pituitary volume found in males was 2.15 cm<sup>3</sup> and in females it was 2.21 cm<sup>3</sup>. The largest pituitary glands were seen in 41-50 years age group in the male which was significantly larger than that found in female. There was no significant difference in pituitary volume between the two genders at other age groups. There is no significant difference in the height and width of pituitary gland in various age groups. The shape of the pituitary gland were convex, concave and flat in both gender and all age groups.



**GENDER WISE DISTRIBUTION MEAN PIT. GLAND VOLUME MALE & FEMALE**

AGE GROUP	MALE	FEMALE
9-20	2.02	2.09
21-30	2.07	2.36
31-40	1.86	2.35
41-50	2.74	2.38
>50	2.08	1.87
MEAN VALUE	2.15	2.21



**MEAN PITUITARY GLAND VOLUME**

AGE GROUP	MEAN PIT. GLAND VOLUME
9-20	2.05
21-30	2.27
31-40	2.19
41-50	2.49
>50	2



**MEAN HEIGHT AGE WISE**

AGE DISTRIBUTION	MEAN HEIGHT (in Cm)
9-20	1.00 cm
21-30	1.11 cm
31-40	0.99 cm
41-50	1.09 cm
>50	1.01 cm

**MEAN WIDTH AGE WISE**

AGE DISTRIBUTION	MEAN WIDTH (in Cm)
9-20	1.38 cm
21-30	1.45 cm
31-40	1.45 cm
41-50	1.52 cm
>50	1.31 cm

**GENDER WISE DISTRIBUTION OF SHAPE OF PITUITARY GLAND**

SHAPE	MALE	FEMALE
CONVEX	4	8
CONCAVE	4	10
FLAT	10	14

**CONCLUSION**

**Age-dependent changes**

The pituitary gland volume changes depending on hormonal status and what would be a normal gland in one demographic would be grossly abnormal in another.

Generally speaking, young adults have larger glands than older individuals, and hormonally active individuals (puberty/pregnancy) have the largest glands. These plump glands completely fill the pituitary fossa, and have a convex upper border, whereas older

individuals will have a mostly empty pituitary fossa, with a deflated and thinned gland lying on the floor of the sella.

Although one should always be wary of measurements, they can serve to quantify what may otherwise seem overly subjective impressions. These are reasonable maximal figures for the height of the gland<sup>7</sup>:

- children (<12 years): 6 mm (upper surface flat or slightly concave)
- puberty: 10 mm (upper surface convex; more striking in females)
- young adult
- male: 8 mm
- female: 9 mm
- pregnancy: 12 mm

older adult (>50 years): gradually decreases in size

The dimensions of pituitary glands are highly variable, particularly its height. The gland undergoes dramatic changes in size and shape throughout life. A useful guide to the gland's height in relation to age is "Elster's rule" of 6,8,10,12: 6 mm for infants and children, 8 mm in men and postmenopausal women, 10 mm in women of childbearing age and 12 mm for women in late pregnancy or postpartum women<sup>7</sup>. The pituitary stalk has a normal thickness of 2 mm, and it should not exceed a maximum of 4 mm or the width of the basilar artery.

In the present study, the mean pituitary volume found in males was 2.15 cm<sup>3</sup> and in females it was 2.21 cm<sup>3</sup>. The largest pituitary glands were seen in 41-50 years age group in the males which was significantly larger than in females. This is in comparison with the study done by Koichi Takano, et al.,<sup>9</sup>.

In addition, these volumes were significantly larger in females less than 40 yrs than males. After 40 yrs, pituitary volume becomes less in females than males which is inconsistent to study like Tsunoda et al.,<sup>11</sup>. To our knowledge, these findings have not been reported previously. The results obtained in this study demonstrated a gradual linear increase in pituitary gland volume over the first thirty years of life, which was consistent with the study by M. Suzuki et al.,<sup>12</sup>. The volume of the pituitary gland exhibited a growth trend with age prior to the age of 20, and there was evidence of a growth spurt in children in the early teenage years (10 to 14 years old). These results indicated that the growth of the pituitary gland was more prominent in adolescents, particularly in females. The largest difference in pituitary gland volume was observed between the females and males at the ages of 10 to 20 years, which was consistent with the studies by Tsunoda et al.<sup>11</sup>.

Normal values of pituitary glands with gender and age variations were found out in this study. The study helps to recognize subtle pathologies of the pituitary gland but also pave way for better understanding of behavioral and personality related differences among different ethnic groups was compared with certain references, and the values obtained in this study relatively matching each other. The data established in this study is proposed to be used as normal reference range.

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