

Variation in Weight of the Human Pituitary Gland in Different Age & Sex

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Abstract:

Context: The pituitary gland produces several hormones that regulate growth, metabolism and reproduction. Deviations from the normal functions of the gland certainly derange the harmony of life. Therefore, this study is important to identify variation in the weight of human pituitary gland in relation to age and sex.

Materials & Methods: A cross-sectional analytical type of study was conducted in the department of Anatomy, Dhaka Medical College, on sixty (40 of male and 20 of female) human pituitary glands were collected from unclaimed dead bodies that were under examination in the morgue of department of Forensic Medicine, Dhaka Medical College, Dhaka.

The samples were divided into four groups. i.e. Group-A (20-29 years), Group-B (30-39 years), Group-C (40-49 years) and Group-D (50-59 years). The weight of the gland with the stalk was measured by means of a digital electric balance.

Results: In male the mean \pm SD weight of the pituitary gland was found 355.56 ± 49.78 , 261.18 ± 52.31 , 244.44 ± 51.26 and 210 ± 18.71 mg in group A, B, C and D respectively. In female the mean \pm SD weight was 381.11 ± 14.53 mg, 345 ± 19.27 mg and 313.33 ± 11.53 mg in group A, B, and C respectively.

Conclusion: The weight of the pituitary gland showed gradual decreasing values with advancing age. The mean \pm SD weight of male gland in this study was significantly lower than that of female glands.

Key Word: Weight, pituitary gland

Introduction:

The pituitary gland (hypophysis cerebri) is a reddish grey, ovoid body lies within the hypophyseal fossa of the sphenoid bone, covered superiorly by diaphragma sellae, which is pierced centrally by an

aperture for the infundibulum¹. It is attached to the hypothalamic region of the brain by a narrow stalk and has both neural and vascular connections with the brain². Structurally the gland is divided into a larger anterior region (adenohypophysis) and a smaller posterior region (neurohypophysis). They differ in development, types, arrangement of cells, their vascular and neural supplies.¹ Physiologically adenohypophysis is important, as it produces hormones that regulate growth, metabolism and reproduction³. The pituitary secretes at least nine hormones, they stimulate the secretion of other endocrine glands e.g. thyroid, adrenal cortex and gonads.⁴ If the activity of hypophysis decreases, the patient suffers greatly from reduced activity of the thyroid gland, the gonads and the adrenal cortex.⁵ The gland measures about 12 mm in

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transverse and 8 mm in antero-posterior diameter and weighs about 500 mg¹. Dynamic changes occur in the size, shape and signal intensity of the pituitary gland during life⁶. These changes reflect the complex hormonal environment of the gland and are most pronounced at times of hormonal flux, such as menarche and pregnancy⁶. A radiological study conducted in London by McLachlan et al. in 1968, showed sex differences in weight of the gland. In a random postmortem sample (50 adults, male-23 and female-27 in number) - the gland was larger in females than males⁷. Rasmussen (1928;1934) conducted a study on American population, where the mean gland weight of women (n=33) was more than that of men (n= 47) aged over 50 years . Erdheim and Stumme (1909) established in their study that increased gland size in females is mainly due to post pregnancies. In 22 multipara dying at term or within one week of delivery, mean gland weight was 1,070 mg and in 13 multipara dying one to seven weeks postpartum, the mean weight was 788 mg. Thereafter the gland diminishes in weight⁷. The gland weighs approximately 800 mg in the parous female^{8&9}. The weight of the gland usually varies according to activity¹⁰. The average weight of pituitary gland in men is about 500 to 700 mg, being slightly heavier in non-pregnant women and much heavier in pregnant women¹¹. In females during or after pregnancy, the weight of the gland can be reached up to 1 gm¹². Pituitary adenomas are indolent tumors, which accounts for 10-15% of all diagnosed intracranial neoplasms¹³. A prospective cross sectional study in the Northern part of Bangladesh reveals that, the prevalence of hyperprolactinemia accounts for about 43% and 21% of primary and secondary infertility respectively¹⁴. Prolactinomas are accounting for about 60% of primary pituitary tumors¹⁵. The second most common type is somatotrophic adenoma - which is characterized by elevated level of growth hormone- results in gigantism and acromegaly before and after closure of epiphysis respectively¹⁶. About 25% of patients have diabetes insipidus¹².

Materials:

The present study was performed on 60 (sixty) post mortem human pituitary glands of different age groups, of which 40 (forty) were males and 20 (twenty) females. Among them, the lowest age was 22 years in both sexes and the highest age was 55 years (male) and 45 years (female).

These entire samples were collected from the whole brains of the unclaimed dead bodies that were under examination in the Department of Forensic Medicine of Dhaka Medical College, Dhaka.

Methods:

Place and duration of study: This study was carried out in the Department of Anatomy, Dhaka Medical College, Dhaka, Bangladesh, from July 2009 to June 2010.

Grouping of the samples: The samples were divided into four groups by decade into age group A (20-29 years), group B (30- 39 years), group C (40-49 years) and group D (50-59 years)¹⁷. Detailed grouping and distribution of samples for morphological study were shown in Table –I.

Table- I
Grouping of the samples

Group	Age in years	Number of samples	
		Male	Female
	A20-29	09	09
B	30-39	17	08
C	40-49	09	03
D	50-59	05	00

Measurement of weight:

Immediately after collection, the surface of each pituitary gland was dried with a blotting paper. Then the weight of the gland with the stalk was measured by means of a digital electric balance (Sartorius TE212, made in Germany) in grams. Then the weight in grams were converted to milligrams by multiplying with 1000.

Ethical Clearance:

This study was approved by Ethical Review Committee of Dhaka Medical College, Dhaka

Results:

Results are shown in the Table –II, Figure- 1.

Table – II
Weight of male & female pituitary gland in different age groups

Group (Age in years)	Number (n)	Weight (mg) of Male gland Mean \pm SD	Weight (mg) of Female gland Mean \pm SD	Weight (mg) Both sex Mean \pm SD
A	M= 9	355.56 \pm 49.78	381.11 \pm 14.53	368.33 \pm 32.92
(20-29)	F= 9	(280 – 470)	(360 – 410)	(280 – 470)
B	M= 17	261.18 \pm 52.31	345 \pm 19.27	288 \pm 59.37
(30-39)	F= 8	(180 – 330)	(320 – 370)	(180 – 370)
C	M= 9	244.44 \pm 51.26	313.33 \pm 11.53	261.67 \pm 53.91
(40-49)	F= 3	(190 – 350)	(300 – 340)	(190 – 350)
D	M= 5	210 \pm 18.71	-	210 \pm 18.71
(50-59)	F= 0	(180 – 230)		(180 – 230)

Figure in parenthesis indicates range. During statistical analysis, comparison between the sex was done by unpaired student's 't' test and in between different age group. Comparison was done by One way ANOVA.

P >0.05 ^{ns}; Weight between male & female gland in group A.

P < 0.01***; Weight between male & female gland in group B.

P < 0.01 **; Weight between male & female gland in group C.

P < 0.01 **, Weight between group A & B, A & C, A & D, B & D

P >0.01 ^{ns}; Weight between group B & C and C & D.

Note: n = Number of samples, SD = Standard deviation, ns = not significant, **/ *** = significant.

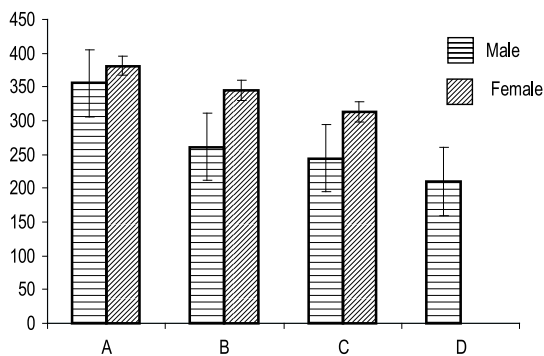


Fig.-1 : Bar diagram showing weight of the pituitary gland in male and female in different age groups.

The mean \pm SD of weight of the pituitary gland was found 355.56 \pm 49.78, 261.18 \pm 52.31, 244.44 \pm 51.26 and 210 \pm 18.71 mg in male samples of group A, B, C and D respectively. In female the mean \pm SD of weight was 381.11 \pm 14.53 mg, 345 \pm 19.27

mg and 313.33 \pm 11.53 mg in group A, B, and C respectively. Significant differences were observed in mean \pm SD of weight in between male and female in both group B (P < 0.01) and group C (P < 0.01) (Table II).

The mean \pm SD of weight of the pituitary gland was 368.33 \pm 32.92, 288 \pm 59.37, 261.67 \pm 53.91 and 210 \pm 18.71 mg in group A, B, C and D respectively. The highest weight was found in group A and the lowest one was found in group D. Significant differences were found in mean \pm SD of weight in between group A and B (P < 0.01), group A and C (P < 0.01), group A and D (P < 0.01) and group B and D (P < 0.01) (Table II).

Discussion:

In the present study, the mean \pm SD of weight of the pituitary gland was found to be 368.33 \pm 32.92mg in group A, 288 \pm 59.37mg in group B, 261.67 \pm

53.91mg in group C and 210 ± 18.71 mg in group D which was smaller to all the values that were found in texts or other literatures. The pituitary gland weighs about 500mg in adults stated by Rogers and Jacob⁵, Fawcett¹⁸, Gartner and Hiatt³, Thibodeau and Patton¹⁹, Maitra¹⁶, Keele, Neil and Joels⁴, Ross and Pawlina²⁰, Crossman¹, Krause² & Mescher²¹, which was more than values of the present study. The reason of this difference may be due to racial variation of the study population. The mean \pm SD of weight of male gland in this study was significantly lower than that of female; this result was similar to that of McLachlan's study in London. McLachlan et al. in 1968 revealed the mean weight of pituitary gland to be 685mg in female and 533mg in male by conducting a radiological study on 50 adult post mortem sample (23 from male and 27 from female)⁷. The present study also revealed that the mean \pm SD of weight declines with age which was statistically significant ($P < 0.01$) but cannot be compared as literature or texts regarding these changes were not available.

Conclusion:

The observation and results of the present study are expected to standardize the morphology of the pituitary gland in Bangladeshi people. The weight of the pituitary gland showed gradual decreasing values with advancing age. Females have larger weight than that of males, which were statistically significant. Further studies to find out the cause of heavier glands in females & decreasing weight of pituitary gland with advancing ages are recommended.

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