IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 17, Issue 01 Ver. X January. (2018), PP 64-67
www.iosrjournals.org

Radiological Study of the Normal Pituitary Gland among Sudanese population

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Abstract: *The pituitary gland width was measured by Magnetic Resonance Imaging Technique, in 69 individuals, the data was evaluated according to sex and age groups. In all cases the mean value of the female pituitary gland width (11.77) mm, which was higher than male (9.60) mm. A gradual increase in the pituitary gland width was noted in the age group (20-29) yrs old, while a decrease in the pituitary width was noted after age (50-59) yrs.Nevertheless, there was a conspicuous increase in the pituitary gland width in the 61yrs in females, and 67 yrs in male, this study reflect the role of puberty and lactation and their relation to the pituitary width. This study opened new doors for more researches in this field to use other specific sciences like histology and physiology of the pituitary cells in details to determine which lobe or cell has got changes exactly.*

Keywords: *Adnohypophysis, Magnetic Resonance Imaging, pituitary gland, pituitary width, Neurohypophysis*

Date of Submission: 05-01-2018 Date of acceptance: 25-01-2018

I. Introduction

The pituitary gland is a central regulator of growth, reproduction, metabolism and stress responses, and functions to relay signals from the hypothalamus to peripheral organs. It is situated within the sella turcica, a recess in the sphenoid bone, at the base of the skull. The hypothalamus is the principal neural structure regulating homeostasis in vertebrates, coordinating complex signals from other regions of the brain and the periphery. The hypothalamus releases factors that control the endocrine activity of the pituitary cells. [1] The pituitary gland is formed by the juxtaposition of the adenohypophysis (anterior and intermediate lobes) and the neurohypophysis (posterior lobe). The anterior pituitary consists of five different endocrine cell types secreting six hormones: somatotrophs that secrete growth hormone (GH), lactotrophs secrete prolactin (PRL), thyrotrophs secrete thyroid-stimulating hormone (TSH), gonadotrophs secrete both gonadotrophins, follicle-stimulating hormone (FSH), luteinizing hormone (LH) and corticotrophs secrete adrenocorticotrophin (ACTH).[2] The intermediate lobe secretes proopiomelanocortin (POMC), a precursor to melanocyte-stimulating hormone (MSH), and involutes in the adult. [2] The neurohypophysis is formed from axonal terminals, projecting from two discrete groups of magnocellular neurones in the hypothalamus, surrounded by modified astrocytes called pituicytes. The two main hormones secreted by the posterior lobe of the pituitary gland, arginine vasopressin (AVP) and oxytocin, are synthesized in the supraoptic and paraventricular nuclei within the hypothalamus. [2,5] he hormones secreted from the anterior pituitary regulate growth, puberty, and metabolism, response to stress, reproduction, and lactation, while those from the posterior pituitary are required during parturition and lactation, and regulate water balance. [2]

II. Material And Methods

This is a descriptive retrospective hospital based study to calculate the width of normal pituitary gland among Sudanese population depending on the age and gender. The Study was conducted at Intalia Medical Centre in Khartoum state, Sudan, during the period March 2014 to Oct 2014. Patients who came for MRI brain with the age range between (20 to79) yrs were included in the study, except those with congenital anomalies or any pathological or surgical condition related to pituitary gland, or treated by exogenous hormonal / steroid / drugs like: phenothiazine, pregnancy and lactation and any gross pathology of the pituitary gland noted during the scan, were excluded from the study. The study variables were age, gender, width of the pituitary gland. The sample size was 38 females and 32 male of adult age groups between (20-79) yrs. MR Imaging was acquired on a 1.5-T GE Signa HD-XT. The measurement was taken in coronal views. 40 CDs were used among the study period to collect data from the apparatus. Then (K. PACS system) was used to manage the reading of the CDs.
All images were obtained with slice thickness of 4 mm, and then they were constructed on (512 x 256) matrix. The width was measured from the right to the left including the stalk of the pituitary gland. The image was

reviewed using the electronic caliper of the display as it found in the (K. PACS system). Then the data were analyzed by SPSS version 21, testing the relation between mean width and age groups by One way ANOVA test evaluated to percentage, considered the P-value was less than 0.05 refer to be a significance.

III. Result

This study showed that the number of males between the all individual groups was 32 (46.4%), while the females was 37 (53.6%), table (4.1).

Table (4.1): Distribution of sex among study population**.**

Gender	Frequency	Percent
Male	32	46.4
Female	37	53.6
Total	69	100.0

The minimal age of the 69 individual was 20 yrs old and the maximum was 79 yrs. The mean age of all individual samples, among the two sex groups was (40. 87) with SD of 15. 381, table (4. 2).

Table (4.2): The Minimum And Maximum Age (Yrs) For The All Individuals In The Study Sample**.**

Age / N	Minimum	Maximum	Mean	SD
69	20	79	40.87	15.381

The minimum value of the pituitary gland width was 5.50 mm. And the maximum value was 15.20 mm. In this study, the mean of the pituitary gland width was 9.8886 ± 2.51488 mm for the all individuals, table (4.3).

Table (4.3): The minimum and maximum value of the pituitary width (mm), including their mean and SD.

W / N	Minimum	Maximum	Mean	SD
69	5.50	15.20	9.8886	2.51488

The mean of the pituitary gland width of 32 male was 8.7250 ± 2.23837 mm, while between 37 female was 10.8949 ± 2.3118 mm, as shown in table (4.4).

Table (4.4): Mean And SD Of The Pituitary Gland Width (Mm) In Both Sexes

Gender	N	Width mean (mm)	SD	SD. Error Mean
Male	32	8.7250	2.23837	.39569
Female	37	10.8949	2.3118	.38160

The frequency of the individual ages between each group was, 22 individuals (31.9%) between the age (20-29) yrs , 14 individuals (20.3%) between (30-39) yrs, 14 individuals (20.3%) between the (40-49) yrs , 11 (15.9%) between (50-59) yrs , 7 individuals (10.1%) between (60-69) yrs and one individual (1.4%) above (70-79) yrs. These results were shown in table (4.5)..

Table (4.5): The Distribution of Age Group Among The Study Population.

Age group (yrs)	Frequency	Percent
20-29	22	31.9
30-39	14	20.3
40-49	14	20.3
50-59	11	15.9
60-69	7	10.1
70-79	1	1.4
Total	69	100.0

In the group age (20-29) yrs the mean width was (10.1636 ± 2.68639), for group age (30-39) yrs, the mean width was (10.8150 ±1.97022), for (40-49) yrs, was (10.6786±2.2777), for (50-59) the was (7.7636±62621), for (60-69) yrs, was (9.3429±2.93420), for group age above yrs, was (7.0000). The mean of pituitary width for all groups was (9.8886 ±2.5148), table (4.6).

Table (4.6): The Distribution of The Age Groups (Yrs) And The Their Means

Age group (yrs)	Mean	N	SD
20-29	10.1636	22	2.68639
30-39	10.8150	14	1.97022
40-49	10.6786	14	2.27771
50-59	7.7636	11	.62621
60-69	9.3429	7	2.93420
70-79	7.0000	1	.
Total	9.8886	69	2.51488

For the female group age (20-29) yrs, the mean width was (11.3727± 2.30915) mm, for group age (30-39) yrs the mean width was (11.7262±1.36186) mm, for group age (40-49)yrs, the mean width was (11.7750±2.15655), for group age (50-59) yrs, the mean was (8.3800±71204) mm, for group age (60-69) yrs, the mean width was (10.2750±3.18891) mm, for group age above 70 yrs, the mean width was (7.0000) mm. Table (4.7).

Table (4.7): Mean pituitary width (mm) for each female age group.

Age group (yrs)	Mean	N	SD
20-29	11.3727	11	2.30915
30-39	11.7262	8	1.36186
40-49	11.7750	8	2.15655
50-59	8.3800	5	.71204
60-69	10.2750	4	3.18891
70-79	7.0000	1	.
Total	10.8949	37	2.32118

For the male group age (20-29) yrs, the mean width was (8.9545±2.57036) mm, for group age (30-39) yrs, the mean width was (9.6000±2.09666) mm, for group age (40-49) yrs, was (9.2167±1.57787) mm, for group age (50-59) yrs, was (7.2500±2.04622) mm, for group age (60-69)yrs, was (8.1000±2.55343) mm and for the age above 70 yrs, the mean width was (8.7250) mm. Table (4.8).

Table (4.8): Mean pituitary width (mm) for each male age group

Age group (yrs)	Mean	N	SD
20-29	8.9545	11	2.57036
30-39	9.6000	6	2.09666
40-49	9.2167	6	1.57787
50-59	7.2500	6	2.04622
60-69	8.1000	3	2.55343
Total	8.7250	32	2.23837

IV. Discussion

MRI usages are more effective than other imaging methods in visualizing the soft tissue like pituitary gland MR findings of physical hyperplasia of the pituitary gland during puberty have been reported previously [19]. Since growth is much more prominent in female, the pituitary gland is much larger in middle age female than in middle age male. This pubertal hyperplasia has been thought to reflect the physical hyper secretion of pituitary hormones at puberty [20]. However, these earlier findings were based on linear parameters (e.g. height and width of the pituitary gland) The pituitary gland width variation is common worldwide, according to a lot of variables like gender, age and race and this study agree with all previous study that took the same variables)[21,22] .This study focused mainly on the pituitary gland width in relation with age and sex, giving result that the pituitary gland width varies according to age and sex as dependant value and this agree with another study which done before[21.22]. The width of the pituitary gland increases by age, as the body needs also increase to hormones.[21] Specially during puberty in both sexes and during lactation in female, and this agree with study done in (Bangkok) Thailand and Bangalore [22].This study ignores the adolescence period because of its minimal value as it is not showed early differences in early age time and this agree with study done before in age between 2 years up to years [26 ,27,28.].

V. Conclusion

Generally, young adults have larger pituitary gland width 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 elder individuals will have a largely empty pituitary fossa, with a deflated and thinned gland, lying in the floor of the sella. these changes of the gland width reflect not only the relation of the age and gender to the gland, but, also the complex hormonal environment and the activity of the gland. the declining in pituitary width with age may reflect the process of aging and a physiological pituitary atrophy. however some patients with advanced ages had significantly higher pituitary width, and other elder individuals showed decrease in the pituitary width this may referred to other hidden co - factors (climate, race, bmi and the axial shape of the head). further studies may be valuable specially like case control and observational and cohort study. consequently, there are many occasions in which one encounters such borderline pituitary abnormalities as physiological hypertrophy, micro adenoma, inflammatory disease, and empty sella, and so on.

Acknowledgements

This research was made possible by the continuous enthusiastic support and contributions from many people. Heartfelt thanks to them for their countless hours of advice and after hours assistance.

References

[1]. KELBERMAN D, RIZZOTI K, ET AL. GENETIC REGULATION OF PITUITARY GLAND DEVELOPMENT IN HUMAN AND MOUSE. ENDOCRINOLOGY REV, 2009 DEC; 30 (7): (790-829).
[2]. Mehta A, Dattani MT. Developmental disorders of the hypothalamus and pituitary gland associated with congenital hypopituitarism. Best Practice in Clinical Endocrinology Metabolism, 2008 Feb; 22 (1): (191-206).
[3]. Cheung CC, Lustig RH. Pituitary development and physiology. Pituitary. 2007 Jan; 10 (4): (335-50).
[4]. Pelletier G, Robert F, et al. Identification of human anterior pituitary cells by immunoelectron microscopy. Clinical Endocrinology Metabolism, 1978 Jan; 4 (6): (534-542).
[5]. Nussey SS, Whitehead SA. Endocrinology An Integrated Approach. Endocrinology, 1999 App; 8 (8): (2001- 276).
[6]. Carter-Su C, Schwartz J, et al. Molecular mechanism of growth hormone action. Annu Rev Physiol, 1996 May; 5 (8): (87-207).
[7]. Veldhuis J D, Roemmich J N, et al. Endocrine control of body composition in infancy, childhood and puberty. Endocrinology Rev, 2005 Feb; 26 (1): (114-46).
[8]. Mc Farland KC, Sprengel R. et al. Lutropin-choriogonadotropin receptor: An unusual member of the G protein-coupled receptor family. Science, 1989 Aug; 4 (5): (494-9).
[9]. Matsumoto AM, Karpas AE, et al. Reinitiation of sperm production in gonadotropin-suppressed normal men by administration of follicle-stimulating hormone. J Clin Invest, 1983 Feb; 7 (72): (1005-1015).
[10]. Adashi EY. Endocrinology of the ovary. Human Reprodutive, 1994 Jan; 4 (9): (815-827).
[11]. Gimpl G, Fahrenholz F. The oxytocin receptor system: structure, function, and regulation. Physiol Rev, 2001Aug ; 1 (81): (629-683).
[12]. Larsen WJ. Human Embryology. Radiology, 2001 Dec; 3 (3): (211-224).
[13]. Moore KL and Persaud TVN. The Developing Human Clinically Oriented Embryology 7th Edition. W.B. Saunders Company. 2003 Nov; 20.(12): (111-117). Is it A textbook?
[14]. Solov'ev GS, Bogdanov AV, et al. Embryonic morphogenesis of the human pituitary. Neurosci Behav Physiol, 2008 Oct; 3 (8): (829-33).
[15]. Bazina M, Stefanović V, et al. Ultrastructural and immunohistochemical characteristics of developing human pituitary gland. Acta Histochem. 2007oct; 9: (5): (366-76).
[16]. Schmook MT, Brugger PC, et al. Forebrain development in fetal MRI: evaluation of anatomical landmarks before gestational week 27. Neuroradiology, 2010 Jun; 5 (6): (495-504).
[17]. Cheung CC, Lustig RH. Pituitary development and physiology. Pituitary, 2007; 10 (4): (335-50).
[18]. S. C. Sanjay, Mouna Subbaramaiah, and Jagannatha S. R. Variation in Size and Shape of A normal Adult Female Pituitary Gland: A radiological Study. Journal of Evolution of Medical and Dental Sciences 2014 May; 10 (10): (142-60)
[19]. Argyropoulou M, Perignon F, et al. Height of normal pituitary gland as a function of age evaluated by magnetic resonance imaging in children. Pediatric Radiolology, 1991 Feb; 21 (1): (247-249).
[20]. Lee PA, Xenakis T, et al. Puberty in girls: Correlation of serum levels of gonadotropins, prolactin, androgens, estrogens, and progestins with physical changes. J Clin Endocrinol 1976; 43: (775-784).
[21]. C. Keanninsiri1, P. Cheiwvit1, et al. Size and Shape of the Pituitary Gland with MR Imaging from Newborn to 30 Years: A Study at Siriraj Hospital. Journal of Evolution of Medical and Dental Sciences 2014 May; Vol 3, Issue 18.
[22]. Tsunoda A, Okuda O, et al. MR Height of the Pituitary Gland as a Function of Age and sex: Especially Physiological Hypertrophy in Adolescence and in Climacterium. AJNR Am J Neuroradiology. 1997; 18: (551-554).
[23]. Peyster RG, Hoover ED, et al. CT appearance of the adolescent and preadolescent pituitary gland. AJNR Am J Neuroradiolology, 1983; 4 (14): (411-414).
[24]. Hayakawa K, Konishi Y, et al. Development and aging of brain midline structures: Assessment with MR imaging. Radiology. 1989 Jan; 17 (2): (171-177).
[25]. Elster AD, Chen MYM, et al. Pituitary gland: MR imaging of physiologic hypertrophy in adolescence. Radiology, 1990 Jan; 17 (4): (681-685).

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