



Original Article

ISSN : 2277-3657  
CODEN(USA) : IJPRPM

## Assessment of the Pituitary Gland by MRI in Patients with Different Prolactin Levels in Hail Region

Badria Awad Elamin<sup>1</sup>, Fayza Abutaleb Qaba<sup>2</sup>, Abdullah Mohammed Alshammry<sup>3</sup>, Rahaf Khaled Alharbi<sup>4</sup>, Abdulaziz Saeed Alahmari<sup>5</sup>, Qurain Turki Alshammari<sup>1\*</sup>

<sup>1</sup>Department of Diagnostic Radiology, College of Applied Medical Sciences, University of Hail, Hail, Saudi Arabia.

<sup>2</sup>Department of Radiology, Maternity and Children Hospital, Tabuk Health Cluster, Tabuk, Saudi Arabia.

<sup>3</sup>Department of Radiology, King Salman Specialist Hospital, Hail Health Cluster, Hail, Saudi Arabia.

<sup>4</sup>Department of Radiology, Maternity and Children Hospital, Hail Health Cluster, Hail, Saudi Arabia.

<sup>5</sup>Department of Radiology, King Salman Hospital, Riyadh Health Cluster, Riyadh, Saudi Arabia.

\*Email: [g.algrain@uoh.edu.sa](mailto:g.algrain@uoh.edu.sa)

### ABSTRACT

The pituitary gland is considered the maestro gland that regulates the function of all glands. Magnetic resonance imaging (MRI) is a routine and widely accepted method for investigating pituitary gland abnormalities. This study was performed to assess the pituitary gland by MRI in patients with different prolactin levels in Hail Region, Saudi Arabia. The data of this study were collected retrospectively from a patient with a pituitary MRI from the radiology department and a prolactin test from a laboratory in the King Khalid Hospital in Hail Region, in the period from January 2022 to June 2022. The sample of this study consisted of 102 patients with prolactin tests from both genders who were examined by MRI for the Pituitary and their ages ranged from 18 to 60 years old. They were from Hail Region. The results of this study showed that female patients from 31- 40 years old have more chance of hyperprolactinemia diseases. Hyperprolactinemia is a common condition among women of reproductive age rather than males. The largest percentage according to Gender was in favor of females with a rate of 74 and a percentage of (72.5%), followed by males with a rate of 28 and a percentage of (27.50%). The study concluded that the high prolactin level be evaluated using MRI to assess the pituitary gland size and tumor, and the result can be investigated and compared with the previous study if it is found.

**Key words:** Magnetic resonance imaging (MRI), Pituitary gland, Adenoma, High resolution, Hyperprolactinemia

### INTRODUCTION

The proposal aims to assess MRI results of pituitary glands in patients with different prolactin levels in Hail City, Saudi Arabia. Magnetic resonance imaging (MRI) is a routine and widely accepted method for investigating pituitary gland abnormalities in the patient which with prolactin disorders. High-resolution MRIs have an 85-90% efficiency rate in identifying micro adenomas even when patients had normal pituitary glands [1, 2]. Imaging ensures that it assesses adenoma sizes to inform surgery feasibility while assessing the therapy effects. However, it is used only after other diagnosis methods, such as drug-induced and secondary hyperprolactinemia, have ruled out the impossibility of adenomas since they focus on identifying macroadenomas. It is significant to avoid misdiagnosis, which leads to adverse health impacts in the future. The study will evaluate the Hail Hospitals database to identify MRI findings of pituitary glands in relation to prolactin levels.

The research will determine clinical attributes and assessment of pituitary abnormalities according to patients with abnormal prolactin levels using MRI in Hail Region. Additionally, it will confirm whether MRI is an evidence-based diagnosis mechanism that can reduce misdiagnosis to improve patient outcomes.

According to Hussein *et al.* [3] data deficiency is prevalent due to the lack of a national registry that keeps records on patients with a specific health condition, which can inform a collaborative remedy. The same study found a likelihood for 46.4% of pituitary gland tumors in the country, which vary among ethnicities, possibly because of the contributions of ethnic disparities in tumor distribution observed internationally [4]. Additionally, there is a dire need to measure, analyze, as well as examine thyroid problems among populations with thyroid-centric complications. Ahmed *et al.* [2] study showed significantly high levels of prolactin in men and women patients in the Hails region in a sample of 202 patients. As a result, there is a need for using a larger sample to validate the observation using MRI. The main research objective is to explore the relationship in findings between MRI of the pituitary gland and prolactin levels in the serum.

## MATERIALS AND METHODS

The study was performed at King Khalid in Hail, Saudi Arabia, in the period from January 2022 to June 2022. This retrospective cross-sectional study was conducted in Hail Hospitals using clinical records for included all MRI pituitary patients who had abnormal test levels of Prolactin. Approval was obtained and written and signed consent was obtained from each patient before the data is analyzed. The study consisted of 102 patients with a dependent variable which include clinical records with abnormal levels of prolactin underwent to Brain and pituitary MRI. The independent variable was age and gender. Any patients should be free of MRI contraindications that include Brain aneurysm clips, Blood vessel stents, pacemakers, and metal implantations. IV line contact after a check on kidney function test result.

The MRI Brain and pituitary protocols take about 30-45 mins with 1.5T (MAGNETOM Avanto, Siemens Healthineers; Erlangen, Germany). The protocols include head scout, T2 Turbo Spin Echo (TSE) Dark fluid TRA, T1 fl2d saggital, T2 TSE coronal, Small 2.5 mm FOV from scout, T1 TSE coronal 2.5 mm, T2 TSE fs coronal 2.5mm, T1 vibe coronal, Inject Gadolinium 0.1 mmol/kg, T1 VIBE coronal with Contrast, T1TSE sagittal with contrast, T1 TSE R coronal 2.5 mm with contrast, T1 multi-echo recombined gradient-echo (mprage) sagittal.

### Data analysis

The data was collected, compared, and analyzed using IBM SPSS statistics (V. 26.0, IBM Corp., USA, 2019) for data analysis. Data were expressed as mean  $\pm$ SD for quantitative parametric measures in addition to median and percentiles for quantitative nonparametric measures and both number and percentage for categorized data. The appropriate statistical tests be done.

## RESULTS AND DISCUSSION

102 participants were enrolled and completed the study. The distribution of the sample members according to gender, age, and patient complaints was summarized in **Tables 1-3**.

**Table 1.** Frequency distribution of the study sample according to gender

		Gender			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	male	28	27.5	27.5	27.5
	female	74	72.5	72.5	100
	Total	102	100	100	

**Table 2.** Frequency distribution of the study sample according to Age

		Age			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	less than 20	18	17.6	17.6	17.6
	21 to 30	27	26.5	26.5	44.1
	31 to 40	32	31.4	31.4	75.5
	41 to50	14	13.7	13.7	89.2

more than 50	11	10.8	10.8	100
Total	102	100	100	

**Table 3.** Frequency distribution of the study sample according to Patient complains

		Patient complains			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Headache	27	26.5	26.5	26.5
	Amenorrhea	21	20.6	20.6	47.1
	Infertility	12	11.8	11.8	58.8
	Hyperprolactinemia	3	2.9	2.9	61.8
	visual defect	26	25.5	25.5	87.3
	Galactorrhoea	6	5.9	5.9	93.1
	others	7	6.9	6.9	100
	Total	102	100	100	

The distribution of the sample members according to Lab Results was Low, normal and high ,12.75%, 2.94% and 84.31%, respectively. **Table 4** includes the distribution of the sample members according to MRI Results.

**Table 4.** Frequency distribution of the study sample according to MRI Result

		MRI Result			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Microadenoma	17	16.7	16.7	16.7
	Macroadenoma	14	13.7	13.7	30.4
	Normal pituitary	28	27.5	27.5	57.8
	Pituitary hyperplasia	10	9.8	9.8	67.6
	"Cmpression pituitary due to extension CSF into sella turcica"	8	7.8	7.8	75.5
	For farther evaluation	2	2.0	2.0	77.5
	hypoplasia	6	5.9	5.9	83.3
	pituitary lesion	17	16.7	16.7	100
	Total	102	100	100	

The Pearson correlation coefficient was used to measure the relationship between MRI findings on the pituitary glands and prolactin levels, as shown in **Table 5**.

**Table 5.** The relationship betweenMRI findings on the pituitary glands and prolactin levels

		Correlations		
		Patient complains	Lab Results	MRI Result
Patient complains	Pearson Correlation	1	0.025	-0.081-
	Sig. (2-tailed)		0.803	0.419
	N	102	102	102
Lab Results	Pearson Correlation	0.025	1	0.057
	Sig. (2-tailed)	0.803		0.566
	N	102	102	102
MRI Result	Pearson Correlation	-0.081-	0.057	1
	Sig. (2-tailed)	0.419	0.566	

N	102	102	102
---	-----	-----	-----

The Mann-Whitney test was used to find out the differences in any impacts of sex on the correlation between prolactin levels and MRI findings. The statistical analysis showed the results in **Table 6**.

**Table 6.** Test results of Mann-Whitney

		Ranks		
	Gender	N	Mean Rank	Sum of Ranks
Patient complains	male	28	53.84	1507.5
	female	74	50.61	3745.5
	Total	102		
Lab Results	male	28	55.75	1561
	female	74	49.89	3692
	Total	102		
MRI Result	male	28	51.07	1430
	female	74	51.66	3823
	Total	102		
Test Statistics <sup>a</sup>				
	Patient complains	Lab Results	MRI Result	
Mann-Whitney U	970.5	917	1024	
Wilcoxon W	3745.5	3692	1430	
Z	-0.503-	-1.413-	-0.092-	
Asymp. Sig. (2-tailed)	0.615	0.158	0.927	

A. Grouping Variable: Gender

The Kruskal test was used to find out any impacts of age on the correlation between prolactin levels and MRI findings. The statistical analysis showed the results in **Table 7**.

**Table 7.** Test results of Kruskal Wallis Test

		Ranks		
	Age	N	Mean Rank	
Patient complains	of less than 20	18	44.61	
	21 to 30	27	53.89	
	31 to 40	32	50.16	
	41 to 50	14	53.71	
	more than 50	11	58	
	Total	102		
Lab Results	less than 20	18	47.83	
	21 to 30	27	53.67	
	31 to 40	32	51.8	
	41 to 50	14	55.75	
	more than 50	11	45.91	
	Total	102		
MRI Results	of less than 20	18	43.36	
	21 to 30	27	56.76	
	31 to 40	32	47.19	
	41 to 50	14	53.04	

	more than 50	11	62.5
	Total	102	
Test Statistics <sup>a,b</sup>			
	Patient complains	Lab Results	MRI Result
Chi-Square	1.915	2.775	4.61
df	4	4	4
.Asymp. Sig	0.751	0.596	0.33
a. Kruskal Wallis Test			
b. Grouping Variable: Age			

Of the patients included in this study 102, 74 were female and 28 were male. They were of different ages ranging between 18 years to 60 years old. They are coming to the departments with suspected pituitary gland problems related to the symptoms and prolactin test and tumor shown in their MRI Scanning images.

The results showed that the largest percentage according to Gender was in favor of females with a rate of 74 and a percentage of (72.5%), followed by males with a rate of 28 and a percentage of (27.50%), this result is consistent with previous studies discussed the prevalence of hyperprolactinemia among females than among males. The study of [5] revealed that hyperprolactinemia is a common condition, particularly among women of reproductive age, affecting one-third of all infertile women worldwide. Which is the same findings we have found concerning the age of female patients as our results showed that the largest percentage according to Age was in favor of 31 to 40 with a rate of 32 and a percentage of (31.40%), followed by 21 to 30 with a rate of 27 and a percentage of (26.50%), followed by more than 50 with a rate of 11 and a percentage of (10.80%). Other studies mentioned the same were the studies of Vander *et al.* [6] and Isah *et al.* [7] revealed a high incidence of high prolactin levels among females and their med- age of fertile.

The results also showed that the largest percentage of Patient complaints was in favor of Headache with a rate of 27 and a percentage of (26.5%), followed by visual defects with a rate of 26 and a percentage of (25.50%), followed by Amenorrhea with a rate of 21 and a percentage of (20.60 %). Headache was mentioned as a clinical presentation associated with the pituitary gland adenoma in many studies such as [8-10].

On the other hand, the visual defect was mentioned in different related studies. The studies revealed the association of visual defects as a clinical presentation for pituitary adenoma. Bitemporal hemianopia is the most common visual field deficit associated with pituitary tumors, which occurs when the larger gland compresses the body of the chiasm (which is made up of the crossing nasal fibers of each optic nerve). Distinct patterns of field loss are caused by different compression sites, which can be uni-, bilateral, or even central. Depending on the degree of nerve compression, the deficit may be full, involving the entire hemifield, or partial, commencing superiorly and progressing inferiorly. Central scotomas and nerve fiber layer pattern visual field abnormalities can result from anterior lesions, whereas posterior lesions can generate homonymous hemianopia [11, 12].

Amenorrhea is another manifestation of the hyperprolactinemia associated with pituitary adenoma. Many studies revealed that those patients with high prolactin levels reported the absence of their menstrual period. When the level of milk hormone rises, this causes inhibition of the main hormones, FSH and LH, in the occurrence of a regular menstrual cycle, and one of its symptoms is the exit of milk from the breast outside the lactation period [13, 14].

The results showed that the largest percentage according to Lab Results was in favor of High with a rate of 86 and a percentage of (84.30%), followed by Low with a rate of 13 and a percentage of (12.70 %), and followed by normal with a rate of 3 and a percentage of (2.90 %) Microadenoma is a benign tumor that originates in the pituitary gland, a pea-sized organ behind the eyes that controls growth, development, metabolism, and reproduction. Microadenomas can be functional (producing hormones) or nonfunctional (not producing hormones) [15].

## CONCLUSION

The study concluded that patients with high prolactin levels should be evaluated using MRI for investigating the presence of pituitary tumors that secrete the prolactin hormone.

**ACKNOWLEDGMENTS :** The authors would like to acknowledge the volunteers and King Khalid Hospital to conduct this study.

**CONFLICT OF INTEREST :** None

**FINANCIAL SUPPORT :** None

**ETHICS STATEMENT :** None

## REFERENCES

1. Abreu AP, Kaiser UB. Panhypopituitarism. Handbook of Inpatient Endocrinology. 2020:15-26.
2. Ahmed GM, Alcantara JC, Alharbi SA, Alshammari WM, Alshammari FD, Elnaem IS, et al. Differential prolactin levels among male and female patients with thyroid related complains in the Hail regions of Saudi Arabia. *Bioinformation*. 2019;15(9):633-9. doi:10.6026/97320630015633
3. Hussein SH, Wahedi TS, Johani NA, Hakami YA, Alzahrani K, AlMalki MH. Clinical and epidemiological characteristics of pituitary tumours in a single centre in Saudi Arabia. *Hormones*. 2018;17:261-7.
4. Allen MJ, Sharma S. Physiology, adrenocorticotrophic hormone (ACTH). 2018.
5. Nwachuku EO, Green KI. Prevalence of Hyperprolactinemia and Socio-Demographic Profile of Hyperprolactinemic Women in Some Gynaecological Clinics in Rivers State, Nigeria. *ND J Dental Med Sci*. 2019;18(1):50-4.
6. Vander Borgh M, Wyns C. Fertility and infertility: Definition and epidemiology. *Clin Biochem*. 2018;62:2-10.
7. Isah IA, Aliyu IS, Yusuf R, Isah HS, Randawa AJ, Adesiyun AG. Hyperprolactinemia and female infertility: Pattern of clinical presentation in a tertiary health facility in Northern Nigeria. *Sahel Med J*. 2018;21(1):1.
8. Donovan LE, Welch MR. Headaches in patients with pituitary tumors: a clinical conundrum. *Curr Pain Headache Rep*. 2018;22(8):1-7.
9. Suri H, Dougherty C. Presentation and management of headache in pituitary apoplexy. *Curr Pain Headache Rep*. 2019;23(9):1-4.
10. Suri H, Dougherty C. Clinical presentation and management of headache in pituitary tumors. *Curr Pain Headache Rep*. 2018;22(8):1-6.
11. Liang L, Lin H, Lin F, Yang J, Zhang H, Zeng L, et al. Quantitative visual pathway abnormalities predict visual field defects in patients with pituitary adenomas: a diffusion spectrum imaging study. *Eur Radiol*. 2021;31(11):8187-96.
12. Ntali G, Wass JA. Epidemiology, clinical presentation and diagnosis of non-functioning pituitary adenomas. *Pituitary*. 2018;21(2):111-8.
13. Klein DA, Paradise SL, Reeder RM. Amenorrhea: a systematic approach to diagnosis and management. *Am Fam Physician*. 2019;100(1):39-48.
14. Cozzi R, Ambrosio MR, Attanasio R, Battista C, Bozzao A, Caputo M, et al. Italian Association of Clinical Endocrinologists (AME) and International Chapter of Clinical Endocrinology (ICCE). Position statement for clinical practice: prolactin-secreting tumors. *Eur J Endocrinol*. 2022;186(3):P1-33.
15. Wang Y, Sun Z, Jiang Z. Cushing's Disease Caused by a Pituitary Microadenoma Coexistent with a Meningioma: A Case Report and Literature Review. *Int J Gen Med*. 2020:1243-8.