Annual Methodological Archive Research Review
http://amresearchreview.com/index.php/Journal/about
Volume 4, Issue 3 (2026)

Online ISSN 3007-3197
Print ISSN 3007-3189

http://amresearchreview.com/index.php/Journal/about

Prevalence of Pituitary Macro Adenoma and their Neurological Sequelae on Magetic Resonance Imaging

Danish Naeem
Sarhad Institute of Allied Health Sciences, SUIT, Peshawar. toorakhan212@gmail.com

Sayyed Rohail Shah
Sarhad Institute of Allied Health Sciences, SUIT, Peshawar. rohailshah879@gmail.com

Mauz Khan
Sarhad Institute of Allied Health Sciences, SUIT, Peshawar. mauzkhan 1828@gmail.com

Nabeela Farman*
Sarhad Institute of Allied Health Sciences, SUIT, Peshawar. Coresponding Author Email: nabeela.siahs@suit.edu.pk

Aamir Aziz
Sarhad Institute of Allied Health Sciences, SUIT, Peshawar. aamir.biotech@suit.edu.pk

Hamad Ullah
Sarhad Institute of Allied Health Sciences, SUIT, Peshawar. hamadullah.siahs@suit.edu.pk

ABSTRACT

Pituitary macro adenoma are intracranial excrescence measuring for 10 mm or greater in size. This retrospective cross-sectional study included 114 patients 20-60 or older than 60. Pituitary macro adenoma prevalence was (22.80%), higher in males (56.14%) than females (43.85%). It was more prevalent in older age 60 or older people (29.82%) while in the young age people 20-29 it was less prevalent (9.64%). Average age people 40-49 have average prevalence rate of (24.56%). Clinical symptoms were observed in all the patients in which headache was 100%, Bitemporal hemianopia was (26.92%), decreased visual acuity was (19.23%), Cranial nerve palsy

Annual Methodological Archive Research Review
http://amresearchreview.com/index.php/Journal/about
Volume 4, Issue 3 (2026)

Online ISSN 3007-3197
Print ISSN 3007-3189

http://amresearchreview.com/index.php/Journal/about

was (11.53%) and normal MRI was (3.84%).Two types of complications were seen, Hyperpituitarism and hydrocephalus.Hyperpituitarism was (76.92%) and hydrocephalus was (23.07%).

Keywords: Pituitary Macro Adenoma, Bitemporal Hemianopia, Visual Defects, MRI

INTRODUCTION

Pituitary gland or master gland is an important gland of human endocrine system that plays a vital role in regulating important functions like growth, metabolism, reproduction etc by secreting different hormones. Regardless of its small size, about 0.5 g in weight and 10 mm in diameter, various physiological processes are controlled by pituitary gland. Different pathological conditions that effect the gland, especially pituitary adenomas, can have wide systematic and neurological impacts. Pituitary adenomas are benign masses that constitutes 10-25 % of all intracranial tumors, due to which they are the third most common intracranial tumors (ICT) after gliomas and meningioma. Due to their size, hormonal activities and their anatomical location, these neoplasms may cause severe problems. On the basis of size, these tumors are divided into two groups; 1: Micro adenomas (<1cm), 2: Macro adenomas (>1cm) (Molitch 2020).

With the advancement and large scale MRI technology, the incidental rate of pituitary adenomas has increased substantially, revealing many cases undiagnosed. MRI (Magnetic Resonance Imaging) is a gold standard modality for pituitary macro adenomas detection due to its superior ability to delineate soft tissue structures, visualize suprasellar extension, and asses' compression of the optic chiasm (OC) and cavernous sinus. Among these, pituitary macro adenomas are of particular clinical significance because of the compression of the surrounding structures due to its macro size (Watanabe *et al*, 2014).

Due to advancement in neurological imaging, the epidemiology of pituitary adenoma has evolved. Earlier the detection of such tumors were based on autopsy and surgical series, which were leading to underestimation of prevalence, but advancement in health, pituitary adenomas are considered common lesions. A systematic review based on autopsy and radiological analysis, reported an overall prevalence of 16.7% making adenomas more common than it was believed earlier

Annual Methodological Archive Research Review
http://amresearchreview.com/index.php/Journal/about
Volume 4, Issue 3 (2026)

Online ISSN 3007-3197
Print ISSN 3007-3189

http://amresearchreview.com/index.php/Journal/about

Ezzat *et al.* (2004).

An incidental studies from Scandinavia, United Kingdom and United States reported an incident rate (IR) of 3.9 to 7.4 cases per 100,000 per year, with prevalence estimates between 76 and 116 per 100,000 population. Middle age and elder populations are the average categories to have more prevalence. In contrast to micro adenomas, which often lead to hormonal dysfunction, macro adenomas are nonfunctioning and are present due to mass effect. The mean age at diagnosis is between 40 and 60 years, and both genders are effected, although some studies show a slight male dominance for macro adenoma (Molitch *et al*, 2020). In south Asian countries including Pakistan, limited data of pituitary tumors are available because of the low availability of MRI convenience. Indians researchers found that pituitary adenomas constituted 15% of intracranial tumors (ICT) diagnosed with MRI, with macro adenomas comprised majorly.

Pituitary macro adenomas result in neurological problems like optic chiasm compression, invasion of cavernous sinus, intracranial pressure, pituitary apoplexy etc due to its macro appearance. Compression of OC leads to bitemporal hemianopia (BTH), the hallmark clinical sign. For coorelating visual symptoms with chiasmal displacement, MRI is a gold standard modality to be used (Watanabe *et al.*, 2014). Cavernous sinus invasion can lead to diplopia, ptosis, or facial numbness. They are known as aggressive tumor extension but are less frequent than visual acuity (VA). Head or intracranial pressure could be the result of cavernous sinus invasion, optic chiasm compression or increased intracranial pressure due to mass effect Hydrocephalus could occur due to third ventricle obstruction. Pituitary apoplexy presenting with sudden head ache, visual loss or ophthalmoplegia (Liu *et al.*, 2016).

Rationale of this research is based on three primary factors, regional data scarcity because there is limited data available about pituitary macro adenoma in Pakistan and clinical impacts that improves healthcare problems by early detection through MRI and resource allocation to improve healthcare and to optimize neuroimaging resources by establishing prevalence data about pituitary macro adenoma.

Annual Methodological Archive Research Review
http://amresearchreview.com/index.php/Journal/about
Volume 4, Issue 3 (2026)

Online ISSN 3007-3197
Print ISSN 3007-3189

http://amresearchreview.com/index.php/Journal/about

Material and Methods

This study design is a retrospective cross-sectional to find the prevalence rate of pituitary macro adenoma and its neurological sequelae on MRI. Cross-sectional approach allows researchers to asses disease frequency and their neurological sequelae at a single point. Crosssectional approach is also widely used in hospitals-based imaging researches. For finding prevalence of pituitary macro adenoma and neurological problems assessment, this study is best suited.

This research was done at the Radiology department of {Nuclear Medicine, Oncology, and Radiotherapy Institute}, a tertiary care hospital with new technology of neuroimaging facilities. MRI machines of 1.5 Tesla and 3 Tesla are available at the Radiology department, which are used for brain imaging in routine. The cross-sectional approach was selected due to its diverse pool of patients and access for the patients who have been diagnosed with those sellar and suprasellar lesions.

Patients with confirm pituitary macro adenoma were the targeted as a study population between January 2020 and 2025. These patients were considered as representative of individuals referred for brain MRI due to sellar or suprasellar lesions..

Data Collection Procedure

Data was collected from the patients referred for MRI who underwent standard imaging protocols. After approval from the research committee of Sarhad Institute Of Allied Health Sciences (SIAHS), Sarhad University Peshawar, a retrospective cross-sectional study was conducted to determine the prevalence of pituitary macro adenoma and to find their neurological problems on MRI. The data were collected by the agreed consent of the hospital radiology department. The study was totally based on confidentiality.

Data Analysis Plan

Collected data were interpreted using Stata software for analysis. Descriptive statistics were used for demographic analysis and neurological sequelae findings by using Stata software.

Annual Methodological Archive Research Review
http://amresearchreview.com/index.php/Journal/about
Volume 4, Issue 3 (2026)

Online ISSN 3007-3197
Print ISSN 3007-3189

http://amresearchreview.com/index.php/Journal/about

RESULTS

Prevalence of Pituitary Macro Adenoma

Table 4.1 shows the prevalence of pituitary macro adenoma which is present in 26 (22.80%) patients, while it is absent in 88 (77.20%) out of 114. Pituitary macro adenomas are less prevalent because micro adenomas are detected eraly by modern radiological techniques like MRI before it grow larger in size. In other words we could say that the functioning adenomas creates hormonal dysfunctions like prolactinomas, GH secreting tumors etc which led to early clinical diagnosis.

Table 4.1: ***Prevalence Of Macro Adenoma***

	Frequency	Percentage
Macro adenoma Present	26	22.80%
Macro adenoma Absent	88	77.20%
Total	114	100%

Demographic Distribution

Table 4.2 shows that 114 patients out of 200 populations included in this study have 100% prevalence of pituitary macro adenoma. Older age people 60 or older than 60 have maximum prevalence rate of pituitary macro adenoma while younger people aged 20-29 have the least prevalence rate of pituitary macro adenoma. It is more prevalent in older age people than younger age people because pituitary macro adenomas grow slowly with time. In young age people it is micro and is asymptomatic, with growing age it has more time to become macro adenoma. Hormonal changes are vision defects may go unnoticed for years, so it is usually not been taken serious because of showing no symptoms. Similarly non- functioning adenomas do not produce hormones, so they do not cause any early symptoms. Older people are simply exposed to more years of risk than younger people.

Table 4.2: ***Demographic Distribution***

Age Group	Frequency	Percent
20-29	11	9.64%
30-39	19	16.66%
40-49	28	24.56%

Annual Methodological Archive Research Review
http://amresearchreview.com/index.php/Journal/about
Volume 4, Issue 3 (2026)

Online ISSN 3007-3197
Print ISSN 3007-3189
http://amresearchreview.com/index.php/Journal/about

50-59	22	19.29%
60 ≥	34	29.82%
Total	114	100%

Gender Based Analysis

Table 4.3 shows that out of 114 patients having 22.80% of prevalence rate of pituitary macro adenoma, 64 (56.14%) patients are males while 50 (43.85%) patients are females. It shows that males have higher prevalence rate of pituitary macro adenoma than females. Females have less prevalence of pituitary macro adenoma because micro tumors in females cause menstrual disturbances, infertility or galactorrhea which bring them early to the medical attention for diagnosis than males, as we know that males lack this hormonal active status. Due to delayed detection in males, the micro adenoma grows into macro adenoma with age. The following table show the percentage of individual who have macro adenoma, categorized on the basis of gender:

Table 4.3: ***Gender Based Analysis***

Gender	**Frequency**	
		Percent
Female	50	43.85%
Male	64	56.14%
Total	114	100%

Clinical Symptoms

Table 4.4 shows clinical symptoms of pituitary macro adenoma. Out of 114 patients having confirm pituitary macro adenoma, 114 (100%) shows headache symptoms, 7 (26.92%) shows Bitemporal hemianopia symptoms, 5 (19.23%) shows Decreased visual acuity symptoms, 3(11.53%) shows Cranial nerve palsy and 1 (3.84%) are having normal MRI.

Table 4.4: ***Clinical Symptoms***

Symptoms	**Frequency**	**Percentage**
Headache	114	100%
Bitemporal Hemianopia	7	26.92%

Annual Methodological Archive Research Review
http://amresearchreview.com/index.php/Journal/about
Volume 4, Issue 3 (2026)

Online ISSN 3007-3197
Print ISSN 3007-3189

http://amresearchreview.com/index.php/Journal/about

Decreased visual acuity	5	19.23%
Cranial Nerve Palsy	3	11.53%
Normal MRI	1	3.84%

Complications

Out of 26 patients, 20 (76.92%) shows hyperpituitarism complications while 6 (23.07%) shows hydrocephalus complications. Hyperpituitarism is more common in macro adenoma patients than hydrocephalus because many macro adenomas arise from hormone secreting cells. Even if these cells enlarge in size, they retain their secreting ability, leading to hormonal hypersecretion, and hyperpituitarism occurs. If the tumors enlarges up to maximum size, they still cannot touch the third ventricle to create hydrocephalus, but in very rare conditions.

Table 4.5: ***Complications***

Complications	**Frequency**	**Percentage**
Hyperpituitarism	20	76.92%
Hydrocephalus	6	23.07%

DISCUSSIONS

This study shows that the prevalence rate of pituitary macro adenoma is higher in males (64) than females (50). This study have worked on prevalence, demographic distribution, neurological sequelae of 114 patients using MRI. A male pre dominance over female, consistent with previous literature which shows that there is a slightly higher prevalence of pituitary macro adenoma in males than females (Molitch *et al* , 2017).

Headache is reported in more patients (38.46%) which supports the previous study that reported headache symptoms in 40-60% people (Margetis *et al*, 2014). The symptoms of headache could be due to the stretching of Dura, compression by tumor, and cavernous sinus invasion.

Visual disturbances is seen in many patients, a classic finding of chiasmal compression. However, Bitemporal hemianopia was less prevalent then headache because headache often precede visual field defects in clinical presentations (Tempourlou *et al*., 2016). Only 19.23% patients have decreased visual acuity, which reflects the variability in the degree of optic nerve compression.

Annual Methodological Archive Research Review
http://amresearchreview.com/index.php/Journal/about
Volume 4, Issue 3 (2026)

Online ISSN 3007-3197
Print ISSN 3007-3189

http://amresearchreview.com/index.php/Journal/about

Cranial nerve palsy was observed in 11.53% of patient, which is relatively uncommon but usually indicates lateral extension to the cavernous sinus (Shimon *et al* , 2021). (Ntali *et al*, 2018) reported that 55-60% of people with macro adenoma is presented with headache which is similar to our results. In 2020, Dekkers *et al* documented that optic chiasm compression could be seen in 25-35% of people which is comparable to our 30% results. The male predominance was reported by Molitch in 2017, which is reaffirmed in this study (MF ratio = 1.5:1). This study clarifies that the early MRI manifestation in patients presenting with continuous headache and visual disturbances is a first important step towards on time diagnosis and treatment pituitary tumors. Timely detection of chiasmal compression is difficult to prevent visual loss. Beside the very low prevalent cranial nerve palsy is a good evidence of late manifestation of invasive macro adenoma. Due to its small sample size this study is limited and the single study center could may affect its generalizability. Large research centers are recommended for more representative data. This study has clear ideas about headache, followed by visual disturbances which are the common symptoms of macro adenoma. The stone modality that play a pivotal rule in its detection is MRI, which correlates strongly with neurological sequelae. Early checkup and management is important for preventing long-term morbidity.

This study has focused importantly on clinical implications of pituitary macro adenoma. MRI is very important tool to recognize the headache and visual disturbances on time that prevent the irreversible neurological damage. Looking at the results, clinicians should maintain a high index of suspicion in patients with persistent headache or unexplained symptoms. The early diagnosis should not only improve patients health outcomes but also decrease the risk of complications associated with tumor progression.

CONCLUSION

This research did analysis to find the prevalence rate of pituitary macro adenoma and their neurological sequelae on MRI in a defined sample size. This study finds that pituitary macro adenoma is more prevalent in males than females and has a higher prevalence in older age adults. Most of the patients were presented clinically with headache and visual disturbances like bitemporal hemianopia and cranial nerve

Annual Methodological Archive Research Review
http://amresearchreview.com/index.php/Journal/about
Volume 4, Issue 3 (2026)

Online ISSN 3007-3197
Print ISSN 3007-3189
http://amresearchreview.com/index.php/Journal/about

palsies, though their prevalence varied among the study of population. Headache is detected as the most common symptoms of pituitary macro adenoma on MRI scans, while visual defects were less commonly detected. This association in symptoms underscores the heterogeneity of clinical management associated with pituitary macro adenoma. Magnetic resonance imaging was the strong reason not only to localize the tumor or measuring the size of the tumor but also to find the neurological problems and played a stone standard modality role in pituitary macro adenoma to prevent the irreversible effects. MRI also has the ability to correlate radiological findings with neurological sequelae.

REFERENCES

Gheno, R., Borges, R. B., & Dos Reis, R. C. P. (2025). Sample size matters: A step-bystep guide for radiologists. Journal of Clinical Imaging Science, 15, 34.

Ho, R.-W., Huang, H.-M., & Ho, J.-T. (2015). The Influence of Pituitary Adenoma Size on Vision and Visual Outcomes after Trans-Sphenoidal Adenectomy: A Report of 78 Cases. Journal of Korean Neurosurgical Society, 57(1), 23.

J. (2001). Clinicopathologic Features of Long-Term Survivors and Disease-Free Survivors After Resection of Hepatocellular Carcinoma: A Study of a Prospective Cohort. Journal of Clinical Oncology, 19(12), 3037–3044.

Lee, I. H., Miller, N. R., Zan, E., Tavares, F., Blitz, A. M., Sung, H., Yousem, D. M., & Boland, M. V. (2015). Visual Defects in Patients With Pituitary Adenomas: The Myth of Bitemporal Hemianopsia. American Journal of Roentgenology, 205(5), W512– W518.

Molitch, M. E. (2017). Diagnosis and Treatment of Pituitary Adenomas: A Review.

Mulisa, T., Tessema, F., & Merga, H. (2017). Patients' satisfaction towards radiological service and associated factors in Hawassa University Teaching and referral hospital, Southern Ethiopia. BMC Health Services Research, 17(1), 441.

Ono, M., Miki, N., Amano, K., Hayashi, M., Kawamata, T., Seki, T., Takano, K., Katagiri, S., Yamamoto, M., Nishikawa, T., Kubo, O., Sano, T., Hori, T., & Okada, Y. (2011). A Case of Corticotroph Carcinoma that Caused Multiple Cranial Nerve Palsies, Destructive Petrosal Bone Invasion, and Liver Metastasis. Endocrine Pathology, 22(1), 10–17.

Online ISSN 3007-3197
Print ISSN 3007-3189

Peli, E., & Satgunam, P. (2014). Bitemporal hemianopia; its unique binocular complexities and a novel remedy. Ophthalmic and Physiological Optics, 34(2), 233– 242.

Poon, R. T.-P., Ng, I. O.-L., Fan, S.-T., Lai, E. C.-S., Lo, C.-M., Liu, C.-L., & Wong,

Tsukamoto, T., & Miki, Y. (2023). Imaging of pituitary tumors: An update with the 5th WHO Classifications—part 1. Pituitary neuroendocrine tumor (PitNET)/pituitary adenoma. Japanese Journal of Radiology, 41(8), 789–806.

Uvelius, E., Valdemarsson, S., Bengzon, J., Hammar, B., & Siesjö, P. (2023). Visual acuity in patients with non-functioning pituitary adenoma: Prognostic factors and long-term outcome after surgery. Brain and Spine, 3, 102667. JAMA, 317(5), 516.

Wang, X., & Cheng, Z. (2020). Cross-Sectional Studies. Chest, 158(1), S65–S71.