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# Clinical, hormonal, and radiological characteristics of patients with sellar mass at a neurosurgical unit of a neuro-specialized hospital in Dhaka

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## Abstract

**Background:** Mass in the sellar region represents a diverse group of tumors with variable clinical manifestations, hormone secretion patterns and radiological appearance.

**Objective:** To assess the preoperative clinical, hormonal, and radiological characteristics of sellar mass patients preparing for surgery.

**Methods:** This cross-sectional study included 150 patients [83 female, 67 male; median age 35 (interquartile range 28-45) years] with sellar mass identified by magnetic resonance imaging (MRI) of the brain in pituitary protocol & admitted to the neurosurgical unit of a neuro-specialized hospital in Dhaka from January 2019-September 2022. Demographic data, clinical manifestations, and preoperative hormonal and radiological test results were obtained from face-to-face interviews, clinical examinations, and medical records with prior approval from the ethics committee and maintaining strict confidentiality

**Results:** Non-pituitary sellar masses were observed in 19% of study participant; craniopharyngioma (12%) and meningioma (6%) were the most common. Non-functioning pituitary macroadenoma (58%) predominated among the pituitary lesions. Among the hormone-secreting tumors, 13% had growth hormone and 5% each had prolactin and ACTH-secreting tumor. The majority of the participants had presenting symptoms due to the pressure effect of sellar mass, specifically headache (83%) and visual disturbance (80%). Secondary hormonal deficiency was present in 111 (74%) participants. Among them, 54 (36.0%) had secondary hypoadrenalism, 26 (17.3%) had secondary hypothyroidism and 71 (47.3%) had secondary hypogonadism. None had preoperative diabetes insipidus. The diameter of tumors was 3 cm (2.2-4.1) (median and IQR), whereas 44 (29.3%) had giant tumors (diameter ≥4 cm). A suprasellar and parasellar extension was present in 112 (74.7%) and 52 (34.7%) patients respectively.

**Conclusions:** Non-functioning pituitary tumors presenting with mass effects were the most frequent cause of sellar mass in patients preparing for surgery. Hypopituitarism was frequent and involved different axes including adrenal, thyroid and gonad. The masses were fairly large and a considerable proportion had an extension to supra and parasellar areas. *[J Assoc Clin Endocrinol Diabetol Bangladesh, January 2023; 2 (1): 14-18]*

**Keywords:** Sellar mass; Pituitary tumor; Hypopituitarism

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## Introduction

Mass in the sellar region usually represents benign growths of pituitary or nonpituitary origin that are variable in clinical manifestations, hormone secretion patterns, and radiological appearance. The commonly encountered sellar masses include pituitary adenomas, craniopharyngioma, Rathke's cleft cyst, hypophysitis, and meningioma. The comparatively rare form of sellar mass includes astrocytoma, metastatic tumor, abscess, and dermoid cyst.[1] In clinical practice, sellar masses are becoming more prevalent as imaging becomes increasingly accessible. They make up between 14% to 18% of all brain tumors.[2] These may be diagnosed incidentally on a radiological procedure like magnetic resonance imaging (micro incidentaloma 10-38%, macro incidentaloma 0.2% of patients undergoing MRI).[3]

However, they may also present with symptoms of mass effect leading to headache, visual disturbance, or hypopituitarism. Hormone-secreting tumors may present with features of hormone excess.[4]

Magnetic resonance imaging (MRI) is an integral part of the evaluation of sellar mass.[5] It may indicate the underlying etiology and provide necessary information for the surgical team.[6] The size of the mass and its extension may predict postoperative complications and risk of recurrence.[7] In addition, hormone hypersecretion and hyposecretion are often clinically indistinguishable due to the fact that they are frequently compensated for and may manifest with non-specific symptoms. As surgery is the choice of treatment in most of the sellar masses, these patients are frequently admitted to a neurosurgery ward. Clinical, hormonal, and radiological aspects of these patients are important in order to understand their implications on diagnostic strategies and long-term management. The characteristics of this particular group of patients may not resemble those observed in endocrine clinics or even in the neurosurgery outpatient department. However, this information is required for both the treating neurosurgeons and the consulting endocrinologist who provide their opinions on a referral basis. Hence, the present study was carried out to assess the preoperative clinical, hormonal, and radiological characteristics of patients admitted to the Neurosurgery in-patient department with sellar mass at a referral neuroscience institute in Dhaka.

## Methods

**Patient and study design:** This cross-sectional study included 150 patients with sellar mass identified by dynamic magnetic resonance imaging (MRI) of the brain in pituitary protocol & admitted to the neurosurgery department of National Institute of Neurosciences (NINS) and hospital, Dhaka during January 2019 to September 2022. Participants were included by non-probability consecutive sampling when referred to the neuroendocrine team (comprising endocrinologists and neurologists) of the institute for evaluation. Demographic data, clinical manifestations, and preoperative hormonal and radiological test results were obtained from face-to-face interviews, clinical examinations, and medical records.

**Study procedure:** The endocrine tests that were available in all patients included serum basal cortisol, ACTH, FT4, TSH, prolactin, LH, and FSH. In males, serum testosterone was measured, while in females estrogen was measured if there was a history of menstrual disturbance, infertility, or estrogen deficiency syndrome. If there is clinical suspicion of GH excess, basal GH and if needed GH during OGTT were measured. Due to its high price and scarcity, IGF-1 was measured in only a few cases. Overnight low-dose dexamethasone suppression test and 24h urinary-free cortisol were evaluated in participants with clinical suspicion of Cushing syndrome. All the hormones were measured by chemiluminescence immunoassay. In patients with polyuria, serum and urine osmolality were measured to exclude diabetes insipidus (DI). Perimetry and color fundal photograph were performed in each patient.

**Operational definitions:** Secondary hypoadrenalism was defined as basal cortisol <5 µgm/dl in the absence of clinical or biochemical evidence of primary hypoadrenalism (low or low normal ACTH); while secondary hypothyroidism was defined as low FT4 in the presence of normal, low, or slightly elevated TSH (<20 mIU/mL). In males, secondary hypogonadism was defined as low testosterone in the presence of normal or low LH/FSH. In females, low or low-normal LH/FSH alone (in post-menopausal age) or along with low estrogen, menstrual disturbance (in women of reproductive age) was regarded as secondary hypogonadism. Low or low-normal LH/FSH alone (in postmenopausal age) or in conjunction with low estrogen and menstrual disturbance (in women of reproductive age) was considered secondary hypogonadism in females. GH deficiency was not evaluated in the study participants. In MRI largest diameter of the mass was recorded.

Statistical analysis: Data were analyzed using IBM SPSS Statistics for Windows, Version 25.0 (IBM Corp, Armonk, NY, USA). The data distribution was assessed by Shapiro-Wilk test. Results were described in frequencies or percentages for qualitative values and median with interquartile range (IQR) for quantitative values as they had skewed distribution.

**Ethical consideration:** Ethical approval was taken from the Institutional Review Board (IRB) of the study institute. Patients were included after taking prior written consent following a clear briefing about the study's nature, purpose, and procedure. Participants' right to refuse to participate or to withdraw from the study was reserved. They were assured of the confidentiality of the information given by them. The study participants were not subjected to any physical or psychological risk. All participants received routine conventional management during their stay in the hospital. Neither any additional invasive nor

non-invasive procedures were performed on the participants.

## Results

The median age of the participants with sellar mass admitted in a neurosurgical ward was 35 (IQR 28-45) years (Figure-1).

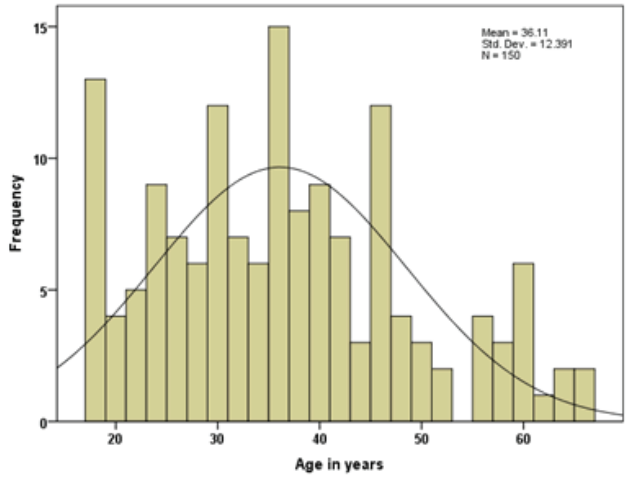


**Figure 1:** Distribution of age among the study participants (N=150)

The majority of the participants were female (83 out of 150, 55%; Figure-2).

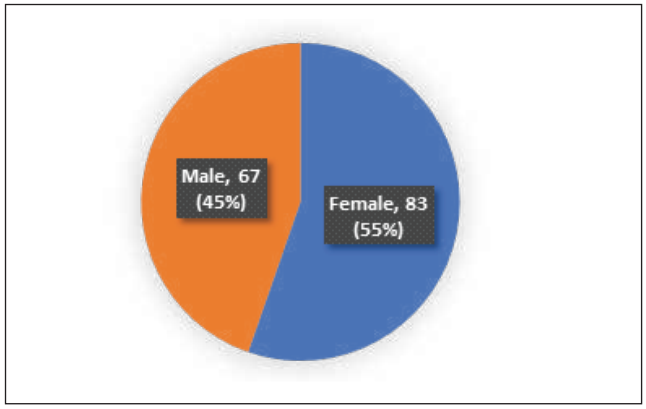


**Figure-2:** Gender distribution of the study participants (N=150)

The presenting symptoms of the participants (Table-I) were mostly resulting from the pressure effect of sellar mass, i.e. headache (83%) and visual disturbance (80%). The subtypes of sellar masses are shown in Figure-3. Non-pituitary lesions comprised 19% of the participants, the majority of which were craniopharyngioma and meningioma. Non-functioning pituitary macroadenoma (58%) predominated among the pituitary lesions. Among the patients with hormone-secreting tumor, 13% had acromegaly and 5% each had prolactinoma and Cushing disease.

**Table-I:** Presenting symptoms of the study participants (N=150)

| Presenting symptoms | Frequency (%) |
|---|---|
| Headache | 125 (83.3%) |
| Visual problem | 120 (80.0%) |
| *Sexual dysfunction | 80 (53.3%) |
| Galactorrhea | 5 (3.3%) |
| Acral enlargement | 24 (16.0%) |
| Cushingoid change | 12 (8.0%) |

*includes male participants with reduced libido and/or erectile dysfunction and pre-menopausal female participants with menstrual irregularity

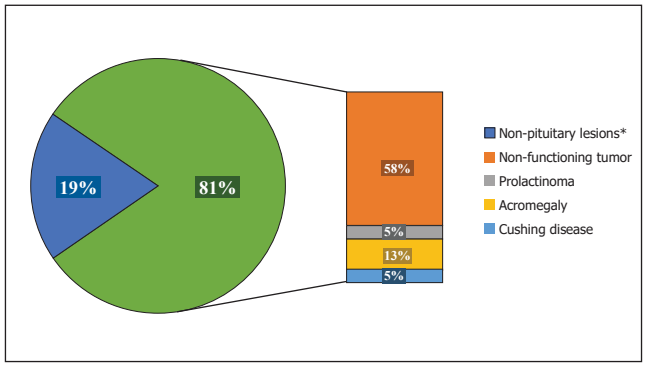


**Figure-3:** Subtypes of sellar mass in the study participants according to postoperative histopathology and clinical characteristics (N=150)
All percentages are over the grand total.
*Non-pituitary lesions include craniopharyngioma (12%), meningioma (6%), epidermoid cyst (1%), chordoma (1%)

Secondary hormonal deficiency was present in 111 (74%) participants. Among them, 54 (36.0%) had secondary hypoadrenalism, 26 (17.3%) had secondary hypothyroidism and 71 (47.3%) had secondary hypogonadism (Figure 4). Normal prolactin level was

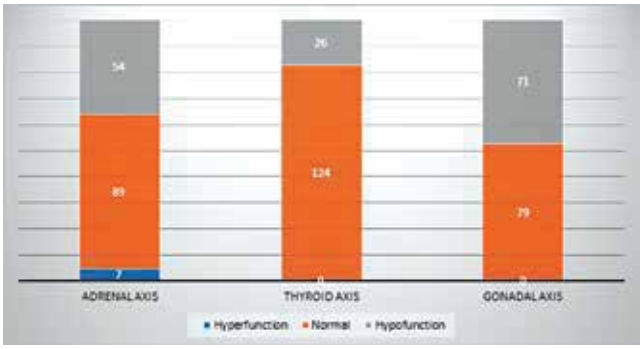


**Figure-4:** Adrenal, thyroid and gonadal axes among the study participants (N=150)

observed in 59.3% of the participants (Figure 5). Elevated prolactin level was seen in different grades in the rest of the participants (<100 ng/mL in 26.0%, 100-200 ng/mL in 4.0%, and >200 in 10.7%). None had preoperative DI.

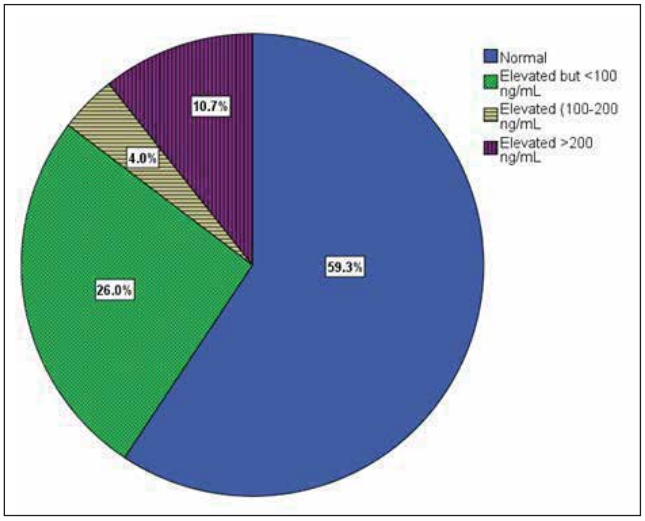


**Figure-5:** Distribution of study participants according to prolactin level (N=150)
Normal prolactin level: Male 3.7-19.4 ng/mL, Female 5.2-26.5 ng/mL

The diameter of tumors was 3 cm (2.2-4.1) (median and IQR), whereas 44 (29.3%) had giant tumors (diameter ≥ 4 cm). A suprasellar extension was present in 112 (74.7%) and parasellar in 52 (34.7%).

## Discussion

Surgery is the choice of treatment in most of the sellar masses. The current study assessed the features of individuals with sellar mass who were preparing for surgery. It was observed that most participants were in the 4th decade of life and there was a female preponderance. The most common cause of sellar mass was non-functioning pituitary tumor presenting with mass effects. Hypopituitarism was frequent and involved different axes including adrenal, thyroid, and gonad. The masses were fairly large and a considerable proportion had extension to supra and parasellar areas.

The current study exclusively enrolled admitted patients in the neurosurgery ward. As a result, the etiological pattern of sellar mass observed in the current study represent a special population and hence cannot be generalized. Although the age and gender distribution of the study participants resembled those of previous studies, the tumor type and tumor diameter were different.[4,8] A notable difference from the previous studies was the proportion of participants with prolactinoma, one of the most frequent causes of sellar mass but observed in only 5% of patients in the present study. The reason behind this is the difference in the inclusion criteria of the current study. As the medical therapy is considered to be the 1st line treatment, only a small number of patients with prolactinoma who require surgery owing to intolerance or inadequate response to dopamine agonists were admitted to a neurosurgical ward and included in this study.[9] The proportion of non-pituitary sellar mass was approximately one in five cases, similar to previous studies, but their pattern was different.[4,8] We observed craniopharyngioma (12%), meningioma (6%), epidermoid cyst (1%) and chordoma (1%) but no hypophysitis or Rathke cleft cyst. Apart from the unusually low frequency of prolactinoma, the proportion of other pituitary tumors was similar to those reported in the literature.[10,11] There was elevated prolactin level in approximately 40% of participants which mostly represents the stalk effect. Nevertheless, it is difficult to distinguish a prolactin-secreting tumor from a non-prolactin adenoma inducing stalk effect. Clinical judgement and post-operative histopathological findings were used to distinguish them.[12]

Sellar masses are often associated with secondary hormonal insufficiency. We observed a much higher rate of secondary hypopituitarism compared to previous studies even if growth hormone deficiency was not formally assessed in the current study.[8,13] The reason behind such observation may be related to the tumor size and tumor type, as previously it was observed that secondary hormonal insufficiency depends on these factors.[13] The median tumor diameter of the current study participants was relatively higher than in studies done outside of neurosurgical settings, where patients of different categories were included. In addition, the frequency of non-functioning adenoma with a higher preponderance of causing secondary hormonal deficiency was also higher in the present study. As a result, it is vital to evaluate a patient for endocrine dysfunction and to start appropriate adrenal and thyroid hormone replacement before sending the patient to the operation theatre for ensuring safe post-operative recovery.[14]

The expertise and experience of the neuroendocrine team in Bangladesh are gradually building up. The current study provides the baseline data of patients with whom the health service need to deal with in neurosurgical settings in close collaboration with endocrinologists, radiologists, and ophthalmologists. However, dynamic and advanced endocrine tests for patients with sellar mass are still not widely available

and practised in the study site. Collaborative interdisciplinary work-up is vital in this regard.

## Conclusion

Non-functioning pituitary tumor presenting with mass effects are the most frequent cause of sellar mass in patients preparing for surgery. Hypopituitarism was frequent and involved different axes including adrenal, thyroid and gonad. The masses were fairly large and a considerable proportion had extension to supra and parasellar areas.

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**Conflict Of Interest**

The authors have no conflicts of interest to disclose

**Financial Disclosure**

The author(s) received no specific funding for this work.

**Data Availability**

Any inquiries regarding supporting data availability of this study should be directed to the corresponding author and are available from the corresponding author on reasonable request.

**Ethics Approval and Consent to Participate**

Ethical approval for the study was obtained from the Institutional Review Board. The written informed consent was obtained from all study participants. All methods were performed in accordance with the relevant guidelines and regulations.



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