DOI: https://doi.org/10.3329/bjns.v10i1.49167

*Original Article*

# Correlation between the Size of Tumour with Early Postoperative Serum Sodium Imbalance in Sellar and Suprasellar Space Occupying Lesion after Transsphenoidal surgery

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**Conflict of interest:** There is no conflict of interest relevant to this paper to disclose.

**Funding Agency:** was not funded by any institute or any group.

**Contribution of Authors:** Principal Investigator and Manuscript preparation-
Data collection-
Scalp block with anaesthesia-
Editorial formatting-



**Received:** 12.03.19
**Accepted:** 01.07.19

## Abstract

***Background:*** *Seller and suprasellar space occupying lesions are frequently encountered intracranial lesions now-a-days. Surgery through transsphenoidal route is the most preferable approach which is frequently performed for excision of these space occupying lesions. The lesions are located in a very critical area because they are surrounded by the hypothalamus, pituitary gland and cavernous sinus which are responsible to maintain various hormonal functions as well as regulation of plasma osmolality and plasma electrolytes. So, during and after operation various types of osmolality and electrolytes related complications are often encountered. Among them serum sodium imbalance is the most frequent one.*

***Objective:*** *Tumour size is one of the very important predisposing factors which influence the serum sodium level after surgery. For investigating the correlation between the size of sellar and suprasellar space occupying lesions with the incidence of postoperative sodium imbalance after transsphenoidal surgery of the patient having these lesions.*

***Material and method:*** *Thirty patients with sellar and suprasellar space occupying lesions meeting the inclusion criteria were enrolled. The largest diameter of the tumour was measured in the coronal or sagittal planes from pre-operative MRI's. They underwent transsphenoidal surgery and were observed for first 7 postoperative days and serum electrolytes was measured every day. Patients in this study were considered to have serum sodium imbalance if the narrow range of 135-145 mmol/L was not maintained. Then according to the tumour size they were divided in to two groups. Then the two groups were compared and the frequency of development of post-operative sodium imbalance, their time of onset and types of imbalances were observed.*

***Result:*** *60% of the patients in our study developed post operative serum sodium imbalance after transsphenoidal surgery. Among them 40% of the patients developed hypernatraemia, 13.3% of the patient developed hyponatraemia and only 6.7% patient developed combined imbalance. Hypernatraemia is more common than hyponatraemia after transsphenoidal surgery. Peak incidence of hyponatraemia occurred on 3rd post-operative day and hypernatraemia occurred at 1st postoperative day. In the large size tumour group (>30mm) 46.66% had serum sodium imbalance and imbalance was observed in 13.33% of the small size group (d"30mm) and there is significant difference of sodium imbalance between large and small size group and p-value was 0.001. r- value 0.776 indicates that the size of the tumour strongly correlates with postoperative sodium imbalance and there is significant association between size of*

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*the tumour with sodium imbalance. The study found no significant association between age, sex or types of the lesions with postoperative sodium imbalance (p=0.43).*

***Conclusion:*** *Post operative serum sodium imbalance after transsphenoidal surgery is a burning issue for the neurosurgeon now a day. Early prediction of these types of notorious complication is helpful for preoperative and post operative management of the patient. The size of the lesion is one of the most significant markers. As well as a strong association between size of the tumour with post operative sodium imbalance was found. This will help us in perioperative management of the patients, and reduces complication related mortality and morbidity after the transsphenoidal surgery.*

***Key wards:*** *Tumour, early postoperative, serum sodium imbalance, sellar and suprasellar, space occupying lesion, transsphenoidal surgery.*

*Bang. J Neurosurgery 2020; 10(1): 82-91*

**Introduction:**

The sella turcica lies in close proximity to several important anatomical structures including the optic chiasm, the internal carotid arteries and the pituitary gland, which is connected to the hypothalamus[1]. The pituitary gland is enclosed in the sella turcica and bridged over by a fold of duramater called the diaphragm sellae, with the sphenoidal air sinuses below and the optic chiasm above. The cavernous sinuses are lateral to the pituitary fossa and contain the 3rd, 4th, Va and 6th cranial nerves and the internal carotid arteries. The gland is composed of two lobes, anterior and posterior, and is connected to the hypothalamus by the infundibular stalk, which has portal vessels carrying blood from the median eminence of the hypothalamus to the anterior lobe and nerve fibers to the posterior lobe[2].

Diseases of the hypothalamus and pituitary are rare, with an annual incidence of approximately 1:50000[2]. Lesions of the sellar and parasellar region are very common, accounting for 10–15% of intracranial masses based on surgical experience. Pituitary adenomas account for about 90% of lesions of the sellar and parasellar region according to different large surgical series[3].

A sellar mass was diagnosed in 1197 patients undergoing MRI. Pituitary adenomas accounted for 81% of all diagnosed masses, with most due to prolactinomas and nonfunctioning adenomas. Rare cases of a functioning TSH adenoma, functioning LH/FSH adenoma, and other mixed hormone producing adenomas were also observed. Two hundred sixteen pituitary masses identified by MRI were not adenomas, accounting for 18% of all observed lesions. One hundred twenty-four of these masses were newly diagnosed after pituitary MRI scans and confirmed with pathological reports. The most common etiology encountered in this group was a pituitary cyst, with Rathke cleft cyst representing 19% of all nonadenomatous lesions. Other commonly observed masses were craniopharyngiomas (15%) and meningiomas (15%)[4].

Sellar and suprasellar masses occur with overlapping clinical and radiological features, ranging from asymptomatic incidental presentations to hormonal symptoms, or compressive local mass effects on nearby vital surrounding structures. The severity depends on the location, size and growth potential of the tumour[3].

Common clinical picture, due to mass effect of expanding tumor impinging on neighbor structures: visual defects (from minimal visual field defect to typical hemianopsia to amaurosys), headache, and symptoms of hyper and hypopituitarism. Giant adenomas can give rise to cavernous sinus syndrome with oculomotor nerve palsies or seizures (when expanding through cavernous sinus to temporal lobe), DI, SIADH and hydrocephalus. These latter manifestations are so rare that must prompt an accurate differential diagnosis with non-adenomatous lesions of the region. All these entities, mostly Cushing's disease and acromegaly, are associated to increased morbidity and mortality, when untreated. Although commonly defined as benign tumors, invasion of surrounding tissues can occur in half of pituitary adenomas[3].

ADH (vasopressin) which is secreted from posterior pituitary has physiological effects on collecting duct of kidney resulted increase the permeability of collecting duct and reabsoprtion of water through water channel (aquaporin) by binding with V2 receptor in the process of simple diffusion. It is one of the important hormones who maintain the sodium and water homeostasis in the body[5].

The perfect surgical routes to the sellar and suprasellar lesions from below are through transsphenoidal approaches or from above subfrontal or pterional transsylvian approach or basal bifrontal interhemispheric approach. The two main lines of approach to sella turcica and pituitary gland the high way (transcranial) and the subway (transsphenoidal) were being developed in early 1900. The selection of surgical approach is based on size of the tumour and its anatomical extension. Proper selection of the surgical approaches and extent of resection has got tremendous influence upon mortality, morbidity or progression free survival[6].

Mechanism causing hypopituitarism in large pituitary adenomas may be infundibular compression and the resulting impaired delivery of hypothalamic hormones, rather than destruction of the pituitary tissue by the tumour. This explains the better recovery rate of pituitary function in cases with preoperative hyperprolactinemia[7].

After transsphenoidal surgery, DI can results from an interruption in the transport of ADH release from the posterior pituitary, or retrograde damage to the cell body in the hypothalamic nuclei. Thus damage anywhere along the hypothalamus pituitary axis can result DI[8]. Following transphenoidal surgery DI and SIADH may cause morbidity due to fluid and electrolyte imbalance and in particular disturbance of sodium homeostasis due to inappropriate antidiuretic hormone secretion[9].

Because sodium is the main constituent of plasma osmolality, these osmolality related disorders (DI and SIADH) are typically characterized by hypernatremia and hyponatremia, respectively[10]. Hypernatraemia is more common than hyponatraemia after transsphenoidal surgery. Recent study showed that 35% patients developed hypernatraemia (Na >145 mmol/L) with peak sodium levels at a median of 2 days (mean 2.3 days) following surgery and 18% patients developed hyponatraemia (Na <135 mmol/L) with sodium levels at a median of 6 days (mean 6.4 days) postoperative[1].

While most changes are mild, symptoms can occur if the serum sodium level falls below 130 mmol/L or above 149 mmol/L. The condition is transient in the majority of cases, although the incidence of prolonged or permanent DI, as a result of a more central injury of the pituitary-hypothalamic region, has been reported to range from 1.6 to 31%[4].

In case of insufficient ADH secretion, high quantities of dilute urine can be lost and the serum sodium level and plasma osmolality may raise leading to the need for water replacement. In case of inappropriate or uncontrolled ADH release (not stimulated by increased plasma osmolality or hypovolemia; but triggered by brain signals or caused by neuronal damage), serum sodium usually drops unless water supply is markedly restricted[9]. Symptoms of sodium imbalance include dizziness, headaches, paraesthesias, nausea, vomiting and lethargy, but can progress to altered mental status and seizures if severe hyponatraemia or hypernatraemia occur[11].

SIADH may occur after surgical manipulation of the pituitary stalk, neurohypophysis or the hypothalamus. However, a recent meta-analysis found that postsurgical DI was less frequent in those who underwent endoscopic surgery compared to those who had microsurgical resection (15% vs. 28%, p = 0.03)[12].

The following variables: age, diagnosis, extension (intrasellar and extrasellar), sex, tumour size (macroadenoma, microadenoma and giant adenoma) may influence the postoperative sodium imbalance. Tumour size was of significance for the development of hyponatraemia[13]. Previous studies have suggested the tumor size or patient age as risk factors for postoperative hyponatremia after pituitary surgery[1] (Staiger et al., 2013). Previous study found no impact of sex on the incidence of postoperative DI or hyponatremia[13].

The incidence of a plasma sodium disturbance was 61% in the group with larger tumours and 43%in the small group. This supports the findings of an earlier study, which stated that patients with macroadenomas are more at risk to develop delayed hyponatraemia than patients with smaller tumour[1].

Some authors have shown DI is more common after the resection of macroadenoma the circumstance is likely caused by the more aggressive gland and stalk manipulation required during resection of tumour as well as changes in sellar and suprasellar anatomy[8]. A study that identified lesion size as a risk factor for postoperative hyponatremia could reflect the fact that larger lesions require manipulation of the pituitary stalk for resection[14].

The purpose of this study is therefore to assess whether prognostic factor (tumor size) has any association with postoperative sodium imbalance or not.

Methods and materials

This cross- sectional analytical study was carried out in the Department of Neurosurgery, Bangabandhu Sheikh Mujib Medical University and some private hospitals in Dhaka from July 2013 to December 2014 Patients having seller and suprasellar SOL and plan to undergo transsphenoidal surgery for the first time. Purposive and convenient sampling technique was used. The sample size was 30. Sample was divided into two groups. In Group 1: Tumor diameter >30mm and in Group II: Tumor diameter d"30mm (The largest diameter of the tumor measured in the coronal or sagittal plane). The selection criteria was Patient having seller and suprasellar space occupying lesion (SOL) who have undergone transsphenoidal surgery for the first time. The exclusion criteria were patient having metabolic diseases e.g. CRF, Uncontrolled Diabetes mellitus and Cushing diseases, recurrent sellar and suprasellar tumour, plan to excision of the tumor through transcranial or combined approaches and patient who had preoperative sodium imbalance and postoperative diarrhea, vomiting and patients got diuretics. The variables were tumor size (The largest diameter of the tumor measured in the coronal or sagittal plane from preoperative MRI of the brain), Hyponatremia (measured by ISE method), Hypernatremia (measured by ISE method). Data were collected using a data collection sheet. On the basis of inclusion and exclusion criteria cases were selected from the neurosurgery department of proposed hospitals. All patients were explained about the nature and purpose of study and their informed written consent were obtained. Relevant baseline information were recorded in a preformed data collection sheet. After measuring the tumour size they were grouped in to two groups. Group I: tumour size >30mm; group II -tumour size d"30mm (the largest diameter of the tumour measured in the coronal or sagittal plane). Then surgery was performed through transsphenoidal approach by different surgeons. Electrolytes level were measured daily for 7 days. Patients in this study were considered to have serum sodium imbalance if the narrow range of 135-145 mmol/L is not maintained. Then the two groups were compared regarding the frequency of development of post operative sodium imbalance, their time of onset and types of imbalance. Data were processed by utilizing IBM SPSS Statistics program (version 17.0). Results will be described in frequencies or percentages. In this study laboratory tests were done such as in preoperative state Serum electrolytes, Serum creatinine, Serum glucose level, Hormonal assay. In postoperative state Serum electrolytes ($1^{st}$ -$7^{th}$ post operative day) and Urinary specific gravity (measured by specific gravity meter) were measured as laboratory taste. Pre operative MRI scan brain was also studied. Data were processed by utilizing IBM SPSS Statistics program (version 17.0). Results were described in frequencies or percentage. Statistical comparisons were done using fisher's exact test, spearman rank correlation test and chi-square test. P-value d" 0.05 was considered statistically significant.

**Results:**

Of the 30 patients, the most common age of presentation were between 21-40 and 31-40 years (26.7% ) each. 20% were in 41-50 age group years, 16.6 % were d"20 years , only 10% were >50 years . Maximum 73.4% were in between 21-50 years. Mean age of the patients was 34.5 ± 15.1 years and lowest and highest ages were 8.5 and 70 years respectively. Shown in Table I

**Table-I**

*Distribution of patients by age (n=30)*

| Age | Frequency | Percentage |
|---|---|---|
| ≤20 | 5 | 16.6 |
| 21 – 30 | 8 | 26.7 |
| 31 - 40 | 8 | 26.7 |
| 41 - 50 | 6 | 20.0 |
| >50 | 3 | 10.0 |
| Total | 30 | 100.0 |
| Mean ± SD | 34.5 ± 15.1 (8.5 - 70) | |

Distribution of the patients by gender 63.3% were males and only 36.7% were females, giving a male female ratio of roughly 1.72: 1. Shown in table no. II

**Table-II**

*Distribution of patients by Gender (n=30)*

| Gender | Frequency | Percentage |
|---|---|---|
| Male | 19 | 63.3 |
| Female | 11 | 36.7 |
| Total | 30 | 100.0 |

Distribution of patients by clinical feature. Headache was the most common clinical presentation, 100% of patients were presented with this feature. Next frequent feature was visual impairment 93.3%. 33.3 % of the patients presented with vomiting, 26.7% patients

presented with cranial nerve palsy, 20% patient presented with features of hyperpitutarism (eg. Acromegaly ) on other hand 13.3% of the patients were presented with feature of hypopituitarism (eg. Hypogonadism, hypothyroidism etc.) and only 10% patients had history seizure. Shown in Table No. III.

**Table-III**

*Distribution of patients by clinical features*

| Clinical features | Frequency | Percentage |
|---|---|---|
| Vomiting | 10 | 33.3 |
| Headache | 30 | 100.0 |
| Seizure | 3 | 10.0 |
| Visual problem | 28 | 93.3 |
| 3rd, 4th, 5th & 6th nerve palsy | 8 | 26.7 |
| Feature of hypopituitarism | 4 | 13.3 |
| Feature of hyperpitutarism | 6 | 20.0 |

Among the 30 patients 15 had tumour size (maximum diameter in coronal or sagittal plan of MRI) were d" 30mm and the other 15 had tumour size were > 30mm. The range of size was 15 – 53mm. Mean size of the tumour was 32.3. Shown in table No. IV.

**Table-IV**

*Distribution of patients by size of lesions (n=30)*

| Size of lesion (mm) | Frequency | Percentage |
|---|---|---|
| d" 30 | 15 | 50.0 |
| > 30 | 15 | 50.0 |
| Total | 30 | 100.0 |
| Mean ± SD | 32.3 ± 11.9 (15 - 53) | |

Distribution of patients according to the sites and extension of the lesions. Sellar tumours with suprasellar extension were the most frequently encountered which accounted 76.7% of all lesions. Only 10% patients had the lesions located in pure supra sellar region and 13.3% patients' lesions remain only in sellar region. Shown in Table No. V.

**Table-V**

*Distribution of patients by lesions according to their sites and extension of lesions (n=30)*

| Type of lesion | Frequency | Percentage |
|---|---|---|
| Sellar | 4 | 13.3 |
| Supra Sellar | 3 | 10.0 |
| Both | 23 | 76.7 |
| Total | 30 | 100.0 |

Distribution of patients by type of approach. Resection through Trans nasal endoscopic rout was done on 56.7% of patients 33.3% of patients underwent surgery through Transnasal microscopic approach. Sublabial microscopic approach was implicated on 10% of patients. Shown in table No. VI.

**Table-VI**

*Distribution of patients by approach of surgery (n=30)*

| Approach of the surgery | Frequency | Percentage |
|---|---|---|
| Trans nasal microscopic | 10 | 33.3 |
| Sublabial | 3 | 10.0 |
| Trans nasal endoscopic | 17 | 56.7 |
| Total | 30 | 100.0 |

Table VII shows that 18(60%) of the patients developed serum sodium imbalance. Among them 40% had hypernatremia (11 pts. 36.7%) were categorized as DI and (1 pts.3.3%) patients could not be categorized. This might be due to excess infusion of normal saline or glucocorticoid concentration in blood. 13.3% patients developed hyponatraemia SIADH and CSW were equally distributed. Only 2(6.7%) patients developed combined imbalance.

**Table-VII**

*Distribution of patients by types and pattern of serum sodium imbalance (n=18)*

| | Frequency | Percentage |
|---|---|---|
| Sodium imbalance | 18 | 60.0 |
| Hyponatremia | 4 | 13.3 |
| SIADH | 2 | 6.7 |
| CSW | 2 | 6.7 |
| Hypernatremia | 12 | 40.0 |
| DI | 11 | 36.7 |
| Uncategorized | 1 | 3.3 |
| Combined | 2 | 6.7 |
| SIADH & DI | 1 | 3.3 |
| CSW & uncategorized | 1 | 3.3 |

According to finding of table IX among the 30 patients 17(56.7%) were finally diagnosed as nonfunctioning pituitary adenomas. 16.7% patients finally diagnosed as growth hormone secreting pituitary adenoma and also 16.7% patient diagnosed as craniopharyngioma and other lesions (e.g. visual pathway glioma, tuberculum sellae meningiomas and inconclusive diagnosis) were found only 10% of patients. Shown in table No. VIII.

Table-VIII
*Distribution of patients by final diagnosis (n=30)*

| Final diagnosis | Frequency | Percentage |
|---|---|---|
| Non functioning adenomas | 17 | 56.7 |
| GH secreting adenomas | 5 | 16.7 |
| Craniopharyngioma | 5 | 16.7 |
| Others | 3 | 10.0 |
| Total | 30 | 100.0 |

Table X Shows that serum sodium imbalance most frequently occurred at 1st postoperative day. 53.85% hypernatraemia occurred at 1st postoperative day, 38.46% hypernatraemia occurred at second day and 7.69% hyponatraemia occurred at 3rd day. Hyponatraemia occur most frequently at 3rd postoperative day 75% among the hyponatraemia. Equal frequency was noticed at 1st and 2nd postoperative day.

**Table-IX**
*Distribution of patients by time of onset of postoperative sodium imbalance (n=18)*

| Days | Hyponatremia (100%) | Hypernatremia (100%) |
|---|---|---|
| Day 1 | 1 (22.5) | 7 (53.85) |
| Day 2 | 1(22.5) | 5(38.46) |
| Day 3 | 3(75) | 0 |
| Day 4 | 0 | 1(7.69) |
| Day 5 | 0 | 0 |
| Day 6 | 0 | 0 |
| Day 7 | 0 | 0 |

Fisher's Exact Test was done to measure the level of significance because sample size was in between 20-40 and one quadrant number of patients was <5.

The table showed >30mm size group 93.3% had sodium imbalance and only 26.7% had sodium imbalance in d"30mm group and there is significant difference of sodium imbalance between large and small size group and p-value is 0.001.

**Table-X**
*Association of size of lesions with serum sodium imbalance (n=30)*

| Size of lesion | Sodium imbalance | | p value |
|---|---|---|---|
| | present | Absent | |
| >30 mm | 14 (93.3) | 1 (6.7) | 0.001 |
| ≤30 mm | 4 (26.7) | 11 (73.3) | |
| Total | 15 (100.0) | 15 (100.0) | |

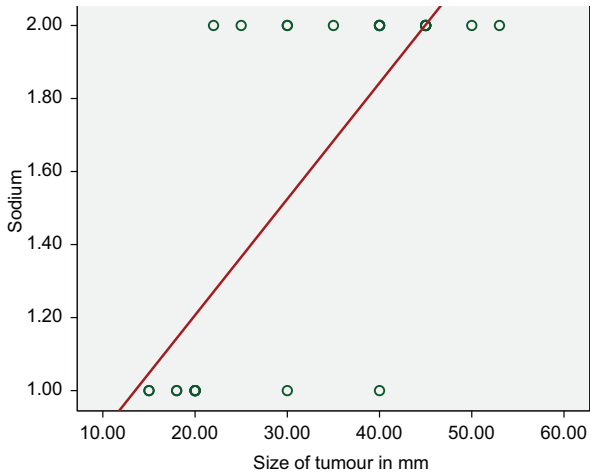


**Fig.-1:** *Correlation of tumour size with serum sodium imbalance (r = 0.776; p= 0.001)*

r- value 0.776 indicates that the size of the tumour strongly correlates with postoperative sodium imbalance and there is significant association between size of the tumour with sodium imbalance (p-0.001)

Contingency table XI shows in large size group (>30mm) association of sex with postoperative sodium imbalance. As the data were qualitative Fisher's Exact Test was done and there is no association between sex and post operative serum sodium imbalance (p=1.00). 11 male showed imbalance but only 7 female showed imbalances.

**Table-XI**
*Association of gender with serum sodium imbalance group1: Tumour size > 30mm (n=15)*

| Gender | Sodium | | p value |
|---|---|---|---|
| | Imbalance | Normal | |
| Male | 9 (64.3) | 1 (100.0) | 1.000 |
| Female | 5 (35.7) | 0 (0.0) | |
| Total | 14 (100.0) | 1 (100.0) | |

Fisher's Exact Test was done to measure the level of significance

Test showed that there was no association with age with postoperative sodium imbalance (p=4.00)

**Table-XI**
*Association of age with serum sodium imbalance in group :1 (Tumor size > 30mm) n=15*

| Age (years) | Sodium | | p value |
|---|---|---|---|
| | Imbalance | Normal | |
| Median | 32.50 | 50.00 | 0.400 |
| Min - Max | 8.50 – 70.00 | 50.00 – 50.00 | |

Mann-Whitney U test was done to measure the level of significant

The table showed large group (>30mm) pituitary lesion there is no significant difference of sodium imbalance between type of lesion with postoperative sodium imbalance was independent irrespective of types of the lesion (p=1.000). Table NO. XII.

**Table-XII**

*Association of types of lesions with serum sodium imbalance in group:1 (size>30mm) n=15*

| Type of lesion | Sodium level | | p value |
|---|---|---|---|
| | Imbalance | Normal | |
| Pituitary | 9 (64.3) | 1 (100.0) | 1.000 |
| Extra-pituitary | 5 (35.7) | 0 (0.0) | |
| Total | 14 (100.0) | 1 (100.0) | |

Fisher's Exact Test was done to measure the level of significance

Contingency table XIII shows association of approach of the surgery with postoperative sodium imbalance in large tumour size. As the data were qualitative, Chi-square test was done and there is no association between approach of the surgery and post operative serum sodium imbalance (p=0.216).

**Table-XIII**

*Association of approach of the surgery with serum sodium imbalance in group: 1 n=15 (Tumor size > 30mm)*

| Approach of the surgery | Sodium | | p value |
|---|---|---|---|
| | Imbalance | Normal | |
| Trans nasal microscopic | 4 (28.6) | 0 (0.0) | 0.216 |
| Sublabial | 2 (14.3) | 0 (0.0) | |
| Trans nasal endoscopic | 8 (57.1) | 1 (100.0) | |
| Total | 14 (100.0) | 1 (100.0) | |

Chi-square test was done to measure the level of significance

**Discussion:**

Seller and suprasellar space occupying lesions are the frequently encountered intracranial lesions now a days. Surgery through transsphenoidal route is the most preferable approach which is frequently performed for excision of these SOL. The lesions are located in a very sensitive area because it is surrounded by hypothalamus, pituitary gland and cavernous sinus which are responsible to maintain various hormonal function and as well as regulation of plasma osmolality and plasma electrolytes. So during and after operation various types of osmolality and electrolytes related complications are noted. Among them serum sodium imbalance is most frequent. As many studies say that it is a independent predictor for postoperative mortality and morbidity.

According to hensen et al., 1999[13] there are some predisposing factors such as patient's age, diagnosis, extension (intrasellar and extrasellar), sex, tumour size (macroadenoma, microadenoma and giant adenoma) may influence the postoperative sodium imbalance. In this study we wanted to prove that large tumour size has an association with postoperative serum sodium imbalance (hyponatraemia or hypernatraemia). Nemerut et al.,2005[8] showed that post operative sodium imbalance occurred due to more aggressive gland and stalk manipulation during resection as well as changes in sellar and suprasellar anatomy in patients with macroadenoma. Jahangiri et al 2013[14] identified that lesion size as a risk factor for postoperative hyponatraemia could reflect the fact that large lesions require manipulation of the pituitary stalk for resection.

Our study was conducted in the department of neurosurgery BSMMU, Dhaka during the period of July 2013 to November 2014 to find out any association between the size of tumour and serum sodium imbalance after transsphenoidal surgery through different routes of the patient having sellar and suprasellar space occupying lesion (SOL).

Final study subject were 30 and age range was 8.5 to 70 years with mean age 32.3 years .The highest incidence was in between 20-40 years. This did not correspond with the study of Staiger et al., 2013[1] where median patient age was 49 and age range was between 20-78 years.

Staiger et al., 2013[1] found that 52% female and 48% male were diagnosed as sellar and suprasellar space occupying lesion. But in our study male predominance was found and male and female ratio was 1.72:1 which bears little consistency with the finding of other investigator.

Common clinical picture of this type of patients due to mass effect of expanding tumor impinging on neighbor structures: visual defects (from minimal visual field defect to typical hemianopsia to aurosys), headache, and symptoms of hyper and hypopituitarism[15]. In our study most frequent clinical feature were head ache and visual disturbance 96%

and 100% respectively which consisted with the above mentioned study and Jho et al., 2012[16] also gave the same statement.

In our study nonfunctioning pituitary tumours were the most frequently encountered lesions in sellar and suprasellar region (about 56.7% of the total lesions). Pituitary adenomas account for about 90% of lesions of the sellar and parasellar region according to different large surgical series, like the German Registry of pituitary tumours[17]. And according to Stiger et al., 2013[1] 56% of the operated lesions were non functioning pituitary adenomas. Our study findings almost correspond with the finding.

According Juraschka et al.,2014[18] explain the extend of resection near-total mean when more e" 90% of the tumours are resected, subtotal (70%–89.9%) and partial (< 70%). In our study near total removal endoscopic was done on 63.3% of patients. Subtotal removal was done on 26.7% of patients. 10% of patients lesions were removed partially.

According to staiger et al., 2013[1] incidence of development of serum sodium imbalance in both male and female is equal and the ratio is 1.1:0.9. Previous study also found no impact of sex on the incidence of postoperative DI or hyponatremia[13] (Hensen et al., 1999). In our study there was no association between sex and postoperative sodium imbalance (p=0.757) which corresponds with the study of the above mentioned investigator.

60% of the patients in our study developed post operative serum sodium imbalance after transsphenoidal surgery. Among them 40% of the patients developed hypernatraemia, 13.3% of the patient developed hyponatraemia and only 6.7% patient developed combined imbalance Hypernatraemia is more common than hyponatraemia after transsphenoidal surgery. Some study showed that 35% patients developed hypernatremia (Na >145 mmol/L) with peak sodium levels at a median of 2 days (mean 2.3 days) following surgery and 18% patients developed hyponatraemia (Na <135 mmol/L) with sodium levels at a median of 6 days (mean 6.4 days) postoperative[1]. Our study result also corresponds with this study.

Hyponatremia as a complication of general elective surgery occurs that within 48hours[19]. Transient begins with an abrupt onset of polyuria within 24–48 h of surgery and gradually resolves over 3–5 day period[12]. In our study the peak incidence of hyponatraemia occurred on 3rd post operative day and hypernatraemia occurred at 1st postoperative day which consistent partially with the study of Staiger et al., 2013[1]; they found peak sodium level at 2nd (mean2.3days) day but hyponatraemia developed on day 6 (mean6.4 days).

Approximately 50% of patients operated for pituitary adenoma developed polyuria or mild hyponatraemia, mostly transient. It cannot be ruled out that some immediate hyponatraemia observed in our patients might be due to extensive neurosurgical exploration, leading to immediate release of AVP from the posterior pituitary. Symptomatic hyponatraemia occurs on an average about 8 days after surgery with arrange of 4–13 days[13].

The pathophysiology of hyponatremia after transsphenoidal surgery is complex. It is initiated by pituitary damage that produces AVP secretion and dysfunctional osmoregulation in most surgically treated patients[20].

Tumour size was associated with an increased incidence of sodium imbalance in non functioning pituitary adenomas. Large tumours cause significantly more sodium disturbance. The incidence of a plasma sodium disturbance was 61% in the group with large tumours and 43% in small tumour group. This supports the findings of an earlier study, which stated that patients with macroadenomas are more prone to develop delayed hyponatraemia than patients with small tumours. This contrasts with the study of Hensen et al. suggesting that tumour size was of significance (p=0.015) for the development of postoperative hyponatraemia[1].

Patients with macroadenoma are somewhat more prone to develop delayed hyponatraemia than patients with small tumours[13] (Hensen et al., 1999). Some authors have shown that DI is more common after the resection of macroadenoma. The circumstance is likely to be caused by the more aggressive gland and stalk manipulation required during resection as well as changes in sellar and suprasellar anatomy in patients with macroadenoma[8] (Nemergut et al., 2005). Our study 60% patients developed postoperative sodium imbalance, among them 46.66% imbalance occurred in large group (>30mm) and only 13.33% sodium imbalance occurred in small group (d"30mm) group. There was significant difference of sodium imbalance between large and small size group and p-

value was 0.001. According to Spearmen correlation test in our study showed r- value 0.776 which indicates that the size of the tumour strongly correlates with postoperative sodium imbalance and there is significant association between size of the tumour with sodium imbalance. That indicates large tumour produces sodium imbalance in postoperative period. The result is consistent with previous study.

The analysis of the tumour size in our study showed that tumour size increases with age. This implies that in older patients more time passes until symptoms occur which result in presenting to a doctor who makes the diagnosis. However comparing the size of the tumour with the age of the patient and the occurrence of sodium disturbance, the elder group of patients showed a similar incidence of sodium imbalance with small as well as with large tumours (52% small, 54% large).

Trans-sphenoidal surgery, now a days, include more than 95% of the surgical indications in the sellar area and approximately 96% of all pituitary adenomas[16].

Craniopharyngioma or an RCC appear to have an increased risk of transient DI. The incidence is less in comparison of other lesions[8]. Lesions such as craniopharyngiomas that typically arise closer to the pituitary stalk theoretically increasing the risk for postoperative hyponatraemia. However, Jahangiri et al., 2013[14] failed to identify pathology as a risk factor for postoperative hyponatraemia. Our study support the above mentioned statement which found no significant association between types of the lesions with postoperative sodium imbalance (p=0.43).

**Conclusion:**

Post operative serum sodium imbalance after transsphenoidal surgery is a burning issue for the neurosurgeon now a days because some time it is an independent predictor for the mortality of the patient. Early prediction of these types of very notorious complication is helpful for preoperative and post operative management of the patient. The size of the lesion is one of the most significant markers. As well as an strong association between size of the tumour with post operative sodium imbalance was found. This will help us in perioperative management of the patients, and reduces complication related mortality and morbidity after the transsphenoidal surgery.

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