

# SYNDROME OF INAPPROPRIATE ANTIDIURETIC HORMONE SECRETION AND NEUROLOGICAL STROKE

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## ABSTRACT

**OBJECTIVE;** The purpose of this study was to find the frequency of Syndrome of inappropriate antidiuretic hormone secretion (SIADH) in stroke patients

**MATERIAL & METHODS;** We conducted this prospective observational study in medical A unit Hayat Abad Medical complex Peshawar from January 2011 to December 2011. After detailed history examination and investigations review all diagnosed patients of neurological stroke were included in this study after informed consent. All patients were screened for presence of hyponatremia (serum sodium <135 mmol per liter) by performing serum electrolyte. Those having hyponatremia were further looked for presence of SIADH by performing serum osmolality, urinary sodium, arterial blood gases and acid base balance. The diagnostic criteria for SIADH included Hyponatremia, Low serum osmolality, High urinary sodium, High ratio of urine:serum osmolality, Normal renal, adrenal and thyroid function Normal serum potassium and acid base balance and excluding Stroke patients with congestive cardiac failure, renal failure, cirrhosis, Addison's disease and patients with antipsychotic or diuretic medications.

**Results;** Total of 110 stroke patients were enrolled in this study. Male patients outnumbered female. Male patients were 59% and 41% were female. Mean age was 64 years (range 31 to 95 years).

All patients had focal neurological deficit. Left hemiplegia was observed in 38% patients while right hemiplegia was present in 33.6% patients. Dysphasia alone was present in 11% patients and 17.2% patients were comatose. Right cerebral infarct was present in 30% patients while 22.7% patients had left cerebral infarct. Right cerebral bleed was documented in 14.5% patients and left cerebral bleed in 10% stroke patients and 9% patients had subarachnoid hemorrhage while 13.6% patients had brain atrophy on brain imaging. Hyponatremia due to SIADH was documented in 17% patients, comprising 6.3% patients of SAH, 5.45% patients of cerebral bleed, 3.6% patients of cerebral infarct and 1.8% cerebral atrophy.

**Conclusion;** Syndrome of inappropriate antidiuretic hormone secretion is very common in stroke patients and subarachnoid hemorrhage is leading stroke subtype causing SIADH.

**Key words;** stroke, SIADH

## INTRODUCTION

Syndrome of inappropriate antidiuretic hormone secretion was initially described by Leaf and Mamby.<sup>1</sup> Syndrome of inappropriate antidiuretic hormone secretion consists of hyponatremia, inappropriately elevated urine osmolality, excessive urine sodium and decreased serum osmolality in a euvolemic patient without edema.<sup>2</sup>

Hyponatremia is the commonest electrolyte disturbance encountered in the neurological and neurosurgical intensive care units. It can present with signs and symptoms mimicking a neurological disease and can worsen the existing neurological deficits. Hyponatremia in neurological disorders is usually of the hypo-osmolar type caused either due to the SIADH<sup>3</sup> or Cerebral Salt Wasting Syndrome (CSWS) as a consequence of renal

salt wasting, most likely attributable to an increased secretion of Brain Natriuretic Peptide (BNP) and Artrial Natriuretic Peptide (ANP).<sup>4</sup>

It is important to distinguish between these two disorders, as the treatment of the two differs to a large extent. In SIADH, the fluid intake is restricted, whereas in CSWS the treatment involves fluid and salt replacement.<sup>5</sup>

Many central nervous system (CNS) disorders are associated with electrolyte disturbances Disorders like stroke, infection, trauma, hemorrhage and psychosis enhance ADH release.<sup>6</sup>

Stroke is the third most common cause of death and the first leading cause of disability in developed and developing countries.<sup>7</sup> The ADH levels were elevated significantly in the stroke patients. Stroke patients are at risk for developing electrolyte disturbances.<sup>8</sup> common cause of hyponatraemia SIADH<sup>9</sup> Hyponatraemia is associated with increased morbidity and mortality, but it is frequently under-recognized and undertreated.<sup>10</sup>

Early recognition of risk factors and expedited

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therapy may make hospital-acquired severe hyponatremia more preventable.<sup>11</sup> Errors in the diagnosis and management can precipitate the Osmolar Dysequilibrium Syndrome (ODS) and worsen the existing neurological condition.<sup>12</sup>

**MATERIAL AND METHOD**

We conducted this prospective observational study in medical A unit Hayat Abad Medical complex Peshawar from January 2011 to December 2011.

After detailed history examination and investigations review all diagnosed patients of neurological stroke were included in this study after informed consent. All patients were screened for presence of hyponatremia (serum sodium <135 mmol per liter)<sup>13</sup> by performing serum electrolyte. Those having hyponatremia were further looked for presence of SIADH by performing serum osmolality, urinary sodium, arterial blood gases and acid base balance. The diagnostic criteria for SIADH included.<sup>14</sup>

1. Hyponatremia
2. Low serum osmolality (< 280 mOsm/l)
3. High urinary sodium (>18 meq/l)
4. High ratio of urine:serum osmolality, often 2:1 or more
5. Normal renal, adrenal and thyroid function
6. Normal serum potassium and acid base balance

**EXCLUSION CRITERIA**

Stroke patients with congestive cardiac failure, renal failure, cirrhosis, Addison’s disease and patients with antipsychotic or diuretic medications were excluded from the study.

Patients were managed along the standard guidelines.

Demographic characteristics were recorded. Data was entered in objectively structured proforma. SPSS 14 version was used for statistical analysis.

**RESULTS**

A total of 110 stroke patients were enrolled in this study. Male patients outnumbered female. Male patients were 65(59%) and 45(41%) were female. Mean age was 64 years (range 31 to 95 years).

All patients had focal neurological deficit. Left hemiplegia was observed in 42(38%) patients while right hemiplegia was present in 37(33.6%) patients. Dysphasia alone was present in 12(11%) patients and 19(17.2 %) patients were comatose. (TABLE 1)

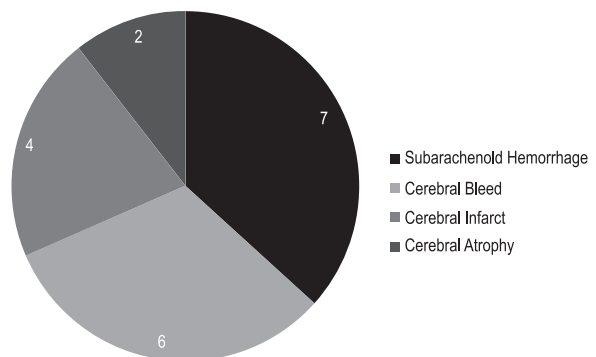
Right cerebral infarct was present in 33(30%) patients while 25(22.7%) patients had left cerebral infarct. Right cerebral bleed was documented in 16(14.5 %) patients and left cerebral bleed in 11(10 %) stroke

**TABLE 1; PATTERNS OF FOCAL DEFICIT**

TYPE OF FOCAL DEFICIT	NUMBER OF PATIENTS	PROPOTION
LEFT HEMIPLEGIA	42	38%
RIGHT HEMIPLEGIA	37	33.6%
ISOLATED DYPHASIA	12	11%
DEEP COMA	19	17.2%

**TABLE 2; PATTERNS OF CT BRAIN FINDINGS**

CT SCAN BRAIN FINDINGS	NO. OF PATIENTS	PROPORTIONS
RIGHT CEREBRAL INFARCT	33	30%
LEFT CEREBRAL INFARCT	25	22.7%
RIGHT CEREBRAL BLEED	16	14.5%
LEFT CEREBRAL BLEED	11	10%
SUBARACHENOID HEMORRHAGE	10	9%
ISOLATED BRAIN ATROPHY	15	12.6%



**FIGURE 1; SIADH AND STROKE SUBTYPES** patients and 10(9%) patients had subarachenoid hemorrhage while 15(13.6 %) patients had brain atrophy on brain imaging. (TABLE 2)

Hyponatremia due to SIADH was documented in 19(17%) patients, comprising 7(6.3%) patients of SAH, 6(5.45%) patients of cerebral bleed, 4(3.6%) patients of cerebral infarct and 2 (1.8%) cerebral atrophy. (FIG 1)

**DISCUSSION**

Sodium is the major extracellular cation and one

of the most important osmotically active solutes.<sup>15</sup> Hyponatraemia is the most common electrolyte disorder in hospitalized patients.<sup>16</sup> There is high association between severe hyponatraemia and increased morbidity and mortality rates.<sup>17</sup> This adverse outcome may be the result of the underlying disease and/or direct complications of hyponatraemia.<sup>18,19</sup>

Sodium disturbances are common in patients with brain injury because of the major role that the central nervous system plays in the regulation of sodium and water homeostasis. In addition, treatment of the injured brain can itself disturb regulation of sodium and water. Sodium disturbances can lead to serious complications and adverse outcomes, including death. Complications can be minimized by a systematic approach to recognition, diagnosis, and treatment of the sodium disturbance. The most common neurological causes of SIADH are subarachnoid haemorrhage (SAH), traumatic brain injury (TBI), brain tumour, and meningitis/encephalitis.<sup>20</sup>

Hyponatremia due to SIADH was reported in 17% stroke patients in our study while Ewout J et al reported in (36%)<sup>21</sup> and Adrogue have reported the prevalence of hyponatremia of more than 30% patients of neurological disorders.<sup>22</sup> Kleinfeld documented it in up to 11% of the hospitalized elderly<sup>23</sup>

Subarachnoid hemorrhage was the leading stroke sub type responsible for SIADH present in 36% of patients matching the study by Wijdicks et al.<sup>24</sup> while Dóczy et al reported it in 9.3% patients.<sup>25</sup>

## CONCLUSION

Syndrome of inappropriate antidiuretic hormone secretion is very common in stroke patients and subarachnoid hemorrhage is leading stroke subtype causing SIADH.

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