

RESEARCH ARTICLE

COMPARISON OF THE FREQUENCY AND COMPLICATIONS OF INAPPROPRIATE ANTIDIURETIC HORMONE SECRETION IN PATIENTS WITH SEPTIC AND ASEPTIC MENINGITIS

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Abstract

Objective

Due to the high prevalence of syndrome of Inappropriate Antidiuretic Hormone Secretion (SIADH). This study was carried out to evaluate the prevalence and relevant parameters of SIADH in children with septic and aseptic meningitis hospitalized at Kashan Shahid Beheshti Hospital between 1996 and 2006.

Materials & Methods

This descriptive study was conducted on 230 patients with meningitis hospitalized in the pediatric wards of Kashan Shahid Beheshti Hospital between 1996 and 2006. Relevant information (age, gender, type of meningitis, serum sodium and potassium, urine specific gravity (USG), blood sugar, blood urea nitrogen, serum creatinin, hydration condition) was collected from patients' records. Data was analyzed using Mann-Whitney and K_2 tests.

Results

Out of 230 patients with meningitis, 33 had incomplete records and only 197 patients were recruited for this study. Sixty eight cases (34.5%) suffered from SIADH. It was more frequent among 1-2 year old children .

According to this research, SIADH was diagnosed in 57% of the 121 patients with hyponatremia, 58.7% of the 167 patients with USG > 1.004, 74% of the 93 patients with serum osmolality < 280 mOsm/L and 100% of the patients with BUN < 10 mg%.

Conclusion

Due to the high prevalence of SIADH in septic and aseptic meningitis and its complication, it is recommended to restrict fluid therapy and monitor serum sodium, urine specific gravity and other diagnostic tests for SIADH.

Keywords: Hyponatremia; Meningitis; SIADH, Septic, Aseptic

Introduction

The syndrome of Inappropriate Antidiuretic Hormone Secretion (SIADH) is a condition in which despite low plasma osmolality, Antidiuretic Hormone (ADH) secretion continues (1, 2). This syndrome is the complication of some diseases or medicines (3). It is diagnosed by hyponatremia, increases urine specific gravity, plasma hypervolemia and decreased serum uric acid (4, 5).

Meningitis is one of the common causes of SIADH. In the USA, 30-50% of the children with meningitis suffer from SIADH complications (5). Headache, nausea, vomiting, muscle-cramping, agitation, lethargy, seizure, coma, and even death can occur in misdiagnosed or untreated SIADH (3). The best treatment for SIADH

is fluid restriction and treatment of hyponatremia (5). Due to the differences in reported prevalence of this syndrome in some studies (7-75%) and the importance of early diagnosis and treatment (4,6,7,8), this study was carried out to evaluate its prevalence and relevant parameters in children with meningitis hospitalized at Kashan Shahid Beheshti Hospital between 1996 and 2006.

Materials & Methods

This descriptive study was conducted on 230 children with meningitis who were hospitalized at the pediatric wards of Shahid Beheshti Hospital in Kashan, Iran, between 1996 and 2006. Data on age, gender, type of meningitis, serum sodium, urine specific gravity, blood sugar, blood urea nitrogen, serum creatinin, and condition of hydration was collected from the participating patients' records. Data was analyzed using Mann-Whitney and K₂ tests.

Results

Out of 230 participating patients, 33 did not have complete records and were excluded from the study.

Out of 197 patients with complete records, 68 (34.5%) had SIADH. The highest and lowest prevalence was seen among 1 to 2 year-old (44.4%) and 2 to 4 year-old children (18.7%), respectively. Statistically there was no significant correlation between age and prevalence ($z = 1.2, p = 0.2$). The prevalence of the disease in boys and girls was 34.7% and 31.7%, respectively and the K₂ test showed no significant correlation between gender and SIADH ($p = 0.65$). Also, the prevalence of septic and aseptic meningitis was 39.1% and 33.1%, respectively. Just the same, K₂ test did not show any significant correlations between SIADH and the type of meningitis ($p = 0.452$).

Fifty nine out of 121 patients with hyponatremia and 89 out of 164 patients with urine specific gravity more than 1.004 had SIADH.

Table 1 shows SIADH in different types of meningitis. This study showed that SIADH was more frequent in septic meningitis than aseptic meningitis.

Table 2 shows SIADH versus serum sodium and urine specific gravity in patients with meningitis. This study showed 64% of the 107 patients with USG > 1.004 and Na < 135 Meq/l suffered from SIADH ($p < 0.001$).

Table 1. Frequency distribution of SIADH in types of meningitis among pediatrics patients at Kashan Hospitals between 1996 and 2006

Type of meningitis \ SIADH	Yes		No		Total		PV
	No.	Percent	No.	Percent	No.	Percent	
Septic	18	39.1	28	60.9	46	100	0.452
Aseptic	50	33.1	101	66.9	151	100	
Total	68	34.5	129	60.5	197	100	

Table 2. Frequency distribution of SIADH based on sodium and USG level in patients with meningitis at Kashan Hospital between 1996 and 2006

U _{SG} S _{Na} (meq/l)	SIADH		Yes		No		Total		PV
	No.	Percent	No.	Percent	No.	Percent	No.	Percent	
U _{SG} > 1.004	98	58.7	69	41.3	167	100			0.872
U _{SG} < 1.004	69	57	52	43	121	100			
Na < 135	69	64.4	38	35.6	107	100			0.001
Na > 135	-	-	8	22.7	8	100			

Discussion

In this study, SIADH prevalence in the children with meningitis was 34.5% which is compatible with the findings of other studies (2, 4, 12). The prevalence of SIADH was 37.2% in Berry’s study in the USA (2004) (2) and 36.7% in Patwari’s study (1995) (4). In our study, the highest SIADH prevalence was reported in 1 to 2 year-old children (44.4%) and was lower in older patients (18.7%). However, there was no significant correlation between age and SIADH prevalence ($Z = 1/2$, $P = 0/2$) which is also compatible with other related findings (7). The high prevalence of SIADH in younger children may be due to higher ratio of body fluid to weight or to their insufficient renal function which can cause an electrolyte imbalance, especially hyponatremia. This study showed that SIADH was more prevalent in septic meningitis (39.1%) than in aseptic meningitis (33.1%, P value=0.452) that was compatible with the findings of other studies (6, 10, 13). In a study by Padilla (1992), SIADH was studied in 18 patients with septic and aseptic meningitis and the ADH level in septic meningitis was found to be significantly higher than aseptic meningitis (10). The cause of the higher prevalence of SIADH in septic meningitis may be due to the pathology of the disease and brain complications (asphyxia, necrosis), which are more frequent than aseptic meningitis.

This study showed that the mean of serum sodium in patients with and without SIADH was 129.4 ± 3.3

mmol/l and 137.4 ± 4.2 mmol/l ($z = 10.69$, $p < 0.001$), respectively which was significant as mentioned in other studies (9, 11). In a study by Feigin and Kaplan in 1997, it was shown that 58% of the children with meningitis had hyponatremia (10, 14).

This study showed that 124 patients had BUN < 10 mg% out of whom 54.8% had SIADH. The mean of BUN in patients with SIADH was 7.32 ± 1.77 mg% ($p < 0.001$). The decrease in BUN level may result from plasma dilution and increased secretion of nitrogen compounds (6).

In conclusions, this study showed that SIADH was highly prevalent in septic meningitis cases. Due to the complications of this syndrome, fluid restriction, serum sodium monitoring and other diagnostic tests for SIADH are suggested to prevent complications such as brain edema, convulsion, and death.

Acknowledment

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