Science Journal of Clinical Medicine
2016; 5(5): 41-45
http://www.sciencepublishinggroup.com/j/sjcm
doi: 10.11648/j.sjcm.20160505.11
ISSN: 2327-2724 (Print); ISSN: 2327-2732 (Online)

Report

A Study of the Management of Hyponatremia at Mater Dei Hospital, Malta

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To cite this article:
Annalisa Montebello. A Study of the Management of Hyponatremia at Mater Dei Hospital, Malta.*Science Journal of Clinical Medicine.* Vol. 5, No. 5, 2016, pp. 41-45. doi: 10.11648/j.sjcm.20160505.11

Received: August 11, 2016; **Accepted**: August 29, 2016; **Published**: October 15, 2016

Abstract: Hyponatremia is a frequent electrolyte abnormality in hospital practice. The aim of this study is to assess the prevalence, investigations and outcome of hyponatremia at Mater Dei Hospital (MDH), Malta. All admissions throughout the month of January 2015 were analysed. Patients with low sodium on admission were audited and data collected from iSoft clinical manager and discharge letters to assess if the relevant investigations and treatment changes were performed to correct the hyponatremia. There were 1905 casualty admissions. 16.5% had hyponatremia on admission. 8.55% had mild (131-134 mmol/L), 5% moderate (125-130mmol/L) and 2.56% severe (<125mmol/L) hyponatremia. In the severe cohort 69.7% patients had glucose taken, 57.1% had thyroid function tests (TFTs), 46.5% had serum osmolality, 14% had urine osmolality and electrolytes taken and 18% had serum cortisol. Rise in sodium in 24 hrs ranged from 1 to 24 mmol with a mean of 8.72 mmol/L. In the moderate cohort 67% had glucose taken, 45.9% had TFTs and 43.5% serum osmolality. Rise in sodium in 24 hrs ranged from 1 to 14 mmol with a mean of 4.7 mmol/L. In the mild cohort 66.7% had glucose taken, 27.4% had TFTs and 35.5% had serum osmolality. Rise in sodium in 24 hrs ranged from 1 to 16 mmol with a mean of 4.1 mmol/L. This study shows the current poor management of severely hyponatremic patients in our medical and surgical wards. There is a definite need to set up local guidelines for the management of such a common electrolyte abnormality.

Keywords: Poor Management, Severe, Hyponatremia

1. Introduction

Hyponatremia is the commonest electrolyte disturbance seen in hospital practice [1-2]. Mild hyponatremia is usually asymptomatic but if it is severe, with a sodium level of less than 125mmol/L, it can be a life threatening condition. It can result in seizures and irreversible cerebral oedema [3].

Hyponatremia should be carefully investigated and treated. Serum osmolality, urine osmolality, urine electrolytes and plasma glucose are essential investigations in helping to classify and find out the cause of the hyponatremia. Thyroid function tests, serum cortisol and synachten tests should be done if syndrome of inappropriate ADH secretion (SIADH) is suspected [4].

The treatment of hyponatremia should be carefully managed due to the risk of central pontine myelinolysis if sodium correction is too fast. The rate of sodium correction should be no more than 10-12mmol/L in the first 24 hours and 8mmol/L in the subsequent 24 hours [4].

2. Aim

To assess the prevalence, investigation and clinical outcome of mild, moderate and severe hyponatremia by retrospective analysis in a hospital population.

3. Methods

All medical and surgical admissions throughout the month of January 2015 were analysed and their admitting sodium was noted. The patients with hyponatremia on admission were audited and data collected from iSoft clinical manager and

discharge letters to assess if the relevant investigations and treatment changes were done to correct the electrolyte abnormality.

4. Results

There were 1905 casualty admissions throughout the month of January 2015. Mean age of patients was 64.2 years. 52.6% (1003) were males and 47.3% (902) were females.

16.2% (308) patients had hyponatremia on admission. In this cohort of patients 53.2% (164) had mild hyponatremia, (Na level: 131-134 mmol/L) 30.8% (95) had moderate hyponatremia (Na level: 125-130mmol/L) 15.9% (49) had severe hyponatremia (Na level: <125mmol/L). (Figures 1and 2)

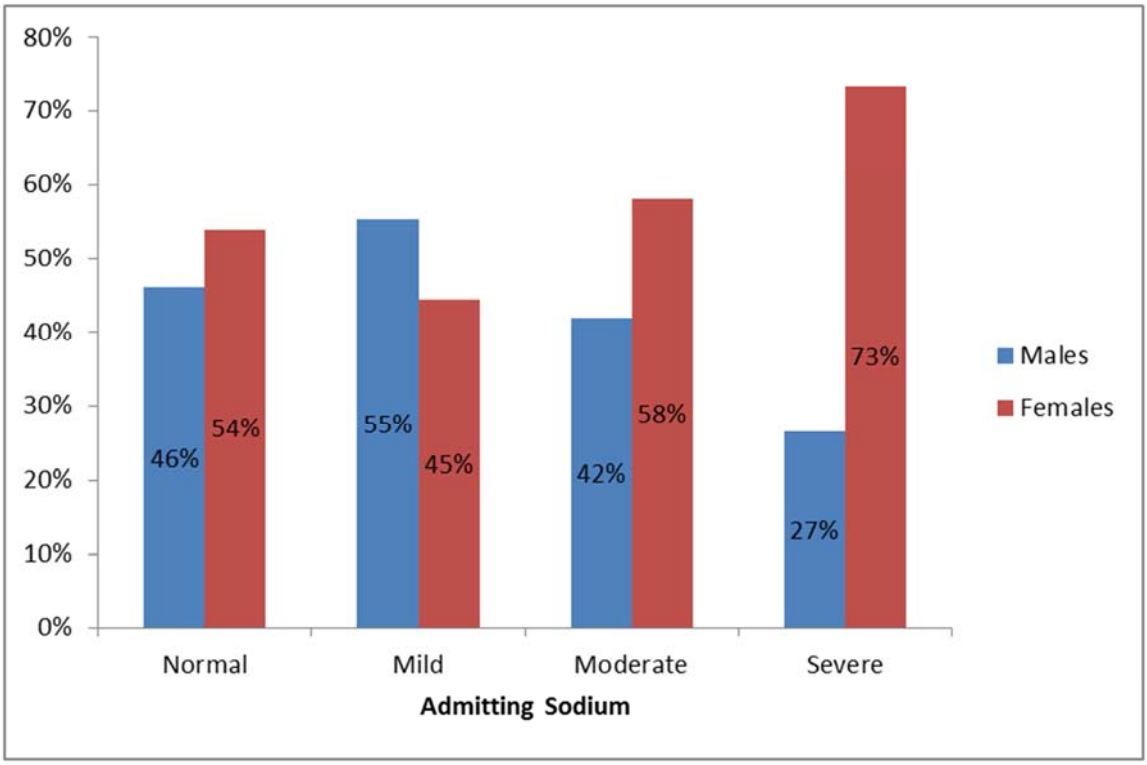

Figure 1. *Sodium level on admission.*

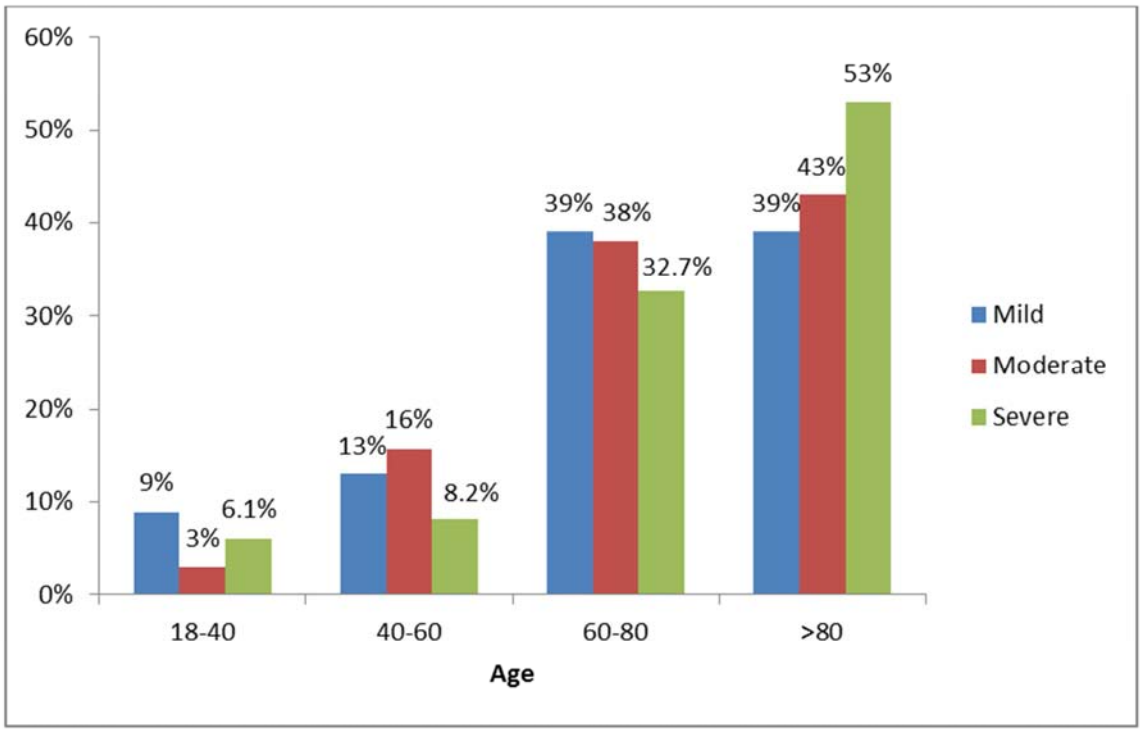

Figure 2. *Admissiting Sodium vs. Age.*

4.1. Severe Hyponatremia

49 patients admitted with severe hyponatremia were audited. There were 12.2% (6) patients who died during admission and these were not included in the study. Out of the 43 patients audited 69.7% (30) were female and 30.2% (13) were male. The age varied between 21 and 97 with a mean of 77.2 years. Sodium on admission ranged from 112mmol/L to 124mmol/L with a mean of 119. Sodium on discharge ranged from 120mmol/L to 142mmol/L with a mean of 134.5 mmol/L.

There were 86% (37) medical admissions and 14% (6) surgical admissions with severe hyponatremia. The most common causes for admission were congestive heart failure exacerbations at 19% (8) and pneumonia at 11.9% (5). Other causes for admission included 4.6% (2) with diabetic ketoacidosis (DKA), 4.6% (2) with urosepsis and 4.6% (2) with transient ischaemic attacks (TIAs). (Figure 3)

69.7% (30) patients had their glucose taken whilst 30.2% (13) patients did not. The glucose result ranged from 5.13 to 47.6 with an average of 11.2 and 80% of glucose levels being equal to or less than 12.2. 41.8% (18) patients had TFTs taken whilst 58.1% (25) did not. 46.5% (20) had serum osmolality taken whilst 53.4% (23) did not. Serum osmolality ranged from 249 to 321 with 80% of patients having a serum osmolality less than or equal to 279mmol/L. The reference range for serum osmolality at MDH lab is 282 - 300mmol/L. 14% (6) had urine osmolality and electrolytes taken whilst 86% (37) did not. Urine Na ranged from 31 to 125, K ranged from 4.9 to 57.5, Cl ranged from 22.5 to 144.1. Serum Cortisol was taken in 18.6% (8) patients whilst 81.4% (35) did not have a serum cortisol taken. The results for serum cortisol taken ranged from 267 to 1435. Synachten tests were not taken in 100%. (Figure 4)

Rise in sodium in 24 hrs ranged from 1 to 24 mmol with a mean of 8.72 mmol/L. Percentage rise in sodium ranged from 0.83% to 18.3%. 20.9% (9) had rapid over correction of sodium - more than 10mmol/L per 24 hours. A further decrease in serum sodium was noted in two cases (4.7%). In these cases the serum sodium further decreased by 2mmol/L and 3mmol/L respectively.

47% (20) were still on angiotensin converting enzyme inhibitors(ACE-I) or angiotensin receptor blockers (ARBs) on discharge, 40% (17) were still on diuretics, 30% (13) were still on proton pump inhibitors (PPIs), 21% (9) were on amlodipine, 4.7% (2) were on tricyclic anti depressants (TCAs), 2.3% (1) was on selective seorotonin reuptake inhibitors (SSRIs.)

4.2. Moderate

95 patients admitted with moderate hyponatremia were audited. There were 10.5% (10) patients who died during admission and these were not included in the study. Out of the 85 patients audited 59% (50) were female and 41% (35) were male. The age varied between 27 and 94 with a mean of 73.5 years. Sodium on admission ranged from 125mmol/L to 134mmol/L with a mean of 127.9. Sodium on discharge ranged from 124mmol/L to 148mmol/L with a mean of 135.2 mmol/L.

There were 77.6% (66) medical admissions and 22.3% (19) surgical admissions with severe hyponatremia. The most common causes for admission were pneumonia and abdominal pain at 16.4% (14) patients each. This was followed by congestive heart failure at 9.4% (8) patients, chest pain, fever and urosepis at 5.8% (5) patients each and DVT at 3.5% (3) patients. (Figure 3)

67% (57) patients had their glucose taken whilst 32.9% (28) patients did not. The glucose result ranged from 2.8 to 30 with an average of 8.78. 45.9% (39) patients had thyroid function tests - TFTs taken whilst 54% (46) did not have TFTs taken. 43.5% (37) had serum osmolality taken whilst 56.4 % (48) did not. Serum osmolality ranged from 250 to 331mmol/L. The reference range for serum osmolality at MDH lab is 282 - 300mmol/L. 4.7% (4) had urine osmolality and electrolytes taken whilst 94.3% (81) did not. Urine Na ranged from 22 to 159, K ranged from 4.9 to 29.9, Cl ranged from 17.8 to 113.Serum Cortisol was not taken in any of the patients. (Figure 4)

Rise in sodium in 24 hrs ranged from 1 to 14 mmol with a mean of 4.7 mmol/L. % rise in sodium ranged from 0% to 10.% with an average of 4%.A further decrease in serum sodium was noted in six cases (7%). In these cases the serum sodium further decreased by 1mmol/L to 3mmol/L.

31.7% (27) were still on ACE/ARBs on discharge, 55.2% (47) were still on diuretics, 38.8% (33) were still on PPIs, 10.6% (9) were on amlodipine, 1.1% (1) was on TCAs, and 8.2% (7) was on SSRIs.

4.3. Mild

164 patients admitted with moderate hyponatremia were audited. There were 17.7% (29) patients who died during admission and these were not included in the study. Out of the 135 patients audited 43.7% (59) were female and 56.2% (76) were male. The age varied between 22 and 97 with a mean of 71 years. Sodium on admission ranged from 130mmol/L to 134mmol/L with a mean of 132.5 Sodium on discharge ranged from 128mmol/L to 149mmol/L with a mean of 137.4 mmol/L.

There were 78.5% (106) medical admissions and 21.5% (29) surgical admissions with severe hyponatremia. The most common causes for admission were 14.8% (20) abdominal pain , 11.9% (16) presyncope , 11.1% (15) pneumonia and 8.8% (12) CHF, 8.1% (11) chest pain. (Figure 3)

66.7% (90) patients had their glucose taken whilst 54.8% (74) patients did not. The glucose result ranged from 1.5 to 31.8 with an average of 10.75. 27.4% (37) patients had thyroid function tests - TFTs taken whilst 72.6% (98) did not have TFTs taken. 35.5% (48) had serum osmolality taken whilst 64.4% (87) did not. Serum osmolality ranged from 283 to 327mmol/L. The reference range for serum osmolality at MDH lab is 282 - 300mmol/L. None had urine osmolality taken. Serum Cortisol was taken in one patient. (Figure 4)

Rise in sodium in 24 hrs ranged from 1 to 16 mmol with a mean of 4.1 mmol/L. % rise in sodium ranged from 0% to 10.8% with an average of 3.6%. A further decrease in serum sodium was noted in eight cases. In these cases the serum sodium further decreased by 1 to 8mmol/L.

37.7% (51) were still on ACE/ARBs on discharge, 41.5% (56) were still on diuretics, 28% (38) were still on PPIs, 9.6% (13) were on amlodipine, 8.14% (11) was on SSRIs.

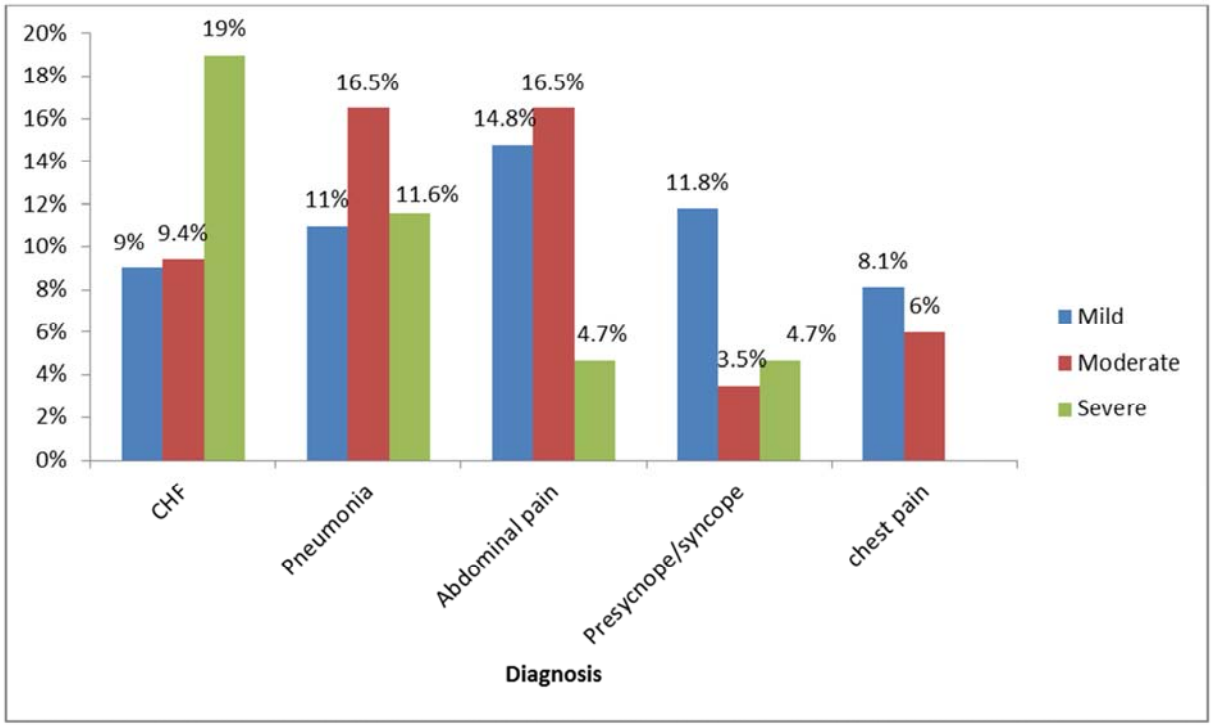

Figure 3. *Admitting Sodium vs. Diagnosis.*

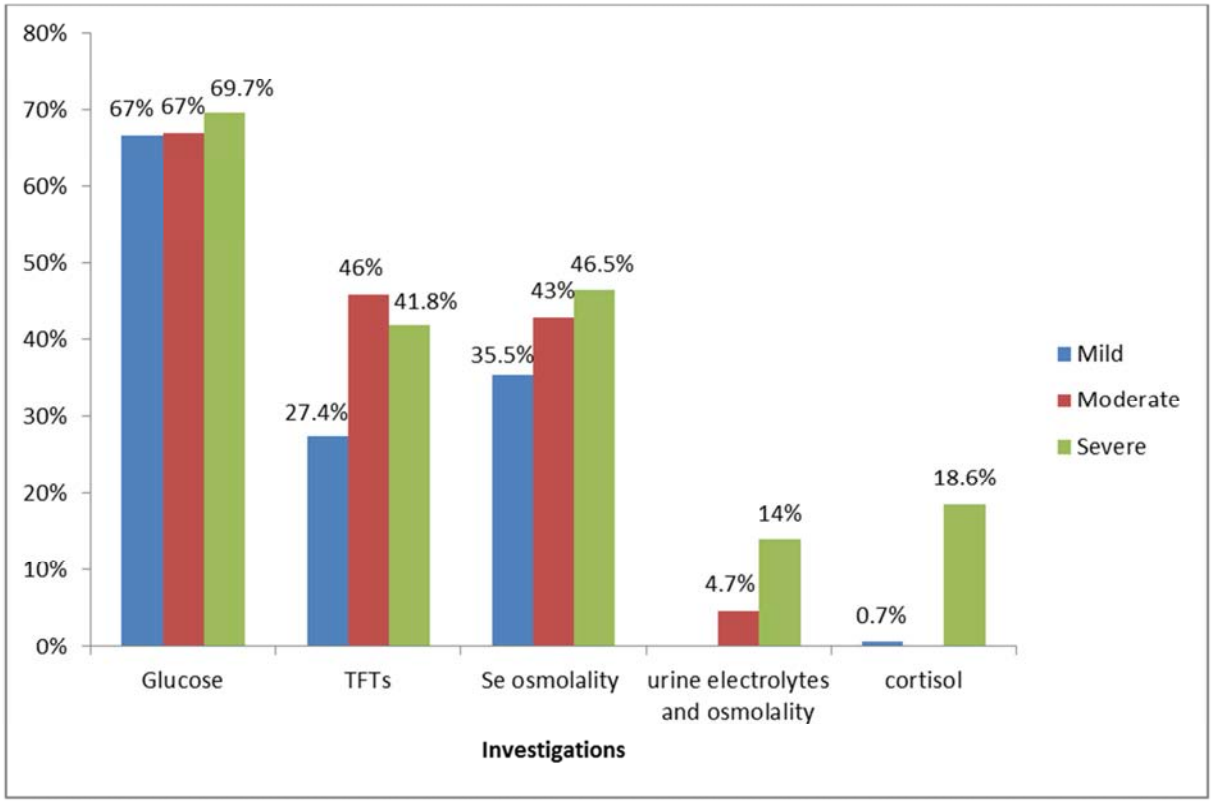

Figure 4. *Investigations performed in all classes of Hyponatremia.*

5. Discussion

This study shows how frequent hyponatremia is in our day to day hospital practice. It is usually a complication of other medical illnesses; most frequently heart failure, pneumonia, renal failure and liver failure [5]. Mild hyponatremia is the commonest abnormality. The majority of patients with severe hyponatremia are admitted under medical firms. Diuretics were found to be the major cause of hyponatremia as congestive heart failure was the most common reason for admission at in both the moderate and the severe hyponatremia groups.

We are still lacking behind in the correct investigations for hyponatremia. The majority of patients in all the classes of hyponatremia did not have serum osmolality, urine osmolality or urine electrolytes taken. These are the three most basic investigations necessary to classify hyponatremia into hypotonic, isotonic or hypertonic volume status [5]. Following this classification we can administer the appropriate treatment. Hypotonic hyponatremia can be treated with fluids. Hypertonic hyponatremia treatment depends on the underlying disorder [5]. Serum glucose is also an important investigation. In hyperglycemic patients the sodium concentration should be corrected for the effect of glucose to exclude hypertonic hyponatremia [6]. Acute hyponatremia (<48 hours) can be corrected more quickly than chronic hyponatremia.

In the severe hyonatremia cohort 20.9% had too rapid correction of sodium which can result in central pontine myelinolysis. Central pontine myelinolysis is a non inflammatory demyelization of the brain that occurs when there is too rapid correction of hyponatremia. 51.1% (22) patients in the severe hyponatremia class were still hyponatremic (<135mmol/L) on discharge whilst 37.6% (32) in the moderate and 25.9% (35) in the mild were also hyponatremic on discharge. This shows we are currently under treating all classes of hyponatremia and patients are being discharged with a low sodium level.

Of note, the majority of patients in all classes of hyponatremia were still on sodium lowering drugs on discharge. ACE inhibitors and diuretics were the most common drugs associated with hyponatremia in all the classes. Other common drugs causing hyponatremia include PPIs, amlodipine, TCAs and SSRIs.

6. Conclusion

This study clearly shows the current poor management of hyponatremic patients in our medical and surgical wards. One limitation in this study was that the medical notes were not reviewed in this audit to establish if the volume status was documented, to investigate inpatient management and to assess why sodium lowering drugs could not be stopped. There is a definite need to set up local guidelines for the management of hyponatremia in the local wards.

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