

PREVALENCE, CLINICAL PROFILE AND SHORT-TERM OUTCOME OF PATIENTS WITH HYPONATREMIA WHO ADMITTED TO MEDICAL WARD AND MEDICAL EMERGENCY DEPARTMENT OF JUMC, JIMMA TOWN, SOUTHWEST ETHIOPIA.

By Abeba Yeshitila (MD)

A THESIS REPORT TO BE SUBMITTED TO JIMMA UNIVERSITY POSTGRADUATE PROGRAM, FACULTY OF MEDICAL SCIENCE, AND SCHOOL OF MEDICINE, DEPARTMENT OF INTERNAL MEDICINE FOR PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE CERTIFICATE OF SPECIALTY IN INTERNAL MEDICINE.

May 2022

PREVALENCE, CLINICAL PROFILE, AND SHORT-TERM OUTCOME OF PATIENTS WITH HYPONATREMIA WHO ADMITTED TO MEDICAL WARD AND MEDICAL EMERGENCY DEPARTMENT OF JUMC, JIMMA TOWN, SOUTHWEST ETHIOPIA.

By Abeba Yeshitila (MD)

Advisors;

Dr. Maekel B. (Assistant professor of Internal medicine, Internist, Nephrologist)

Mr. Yibeltal S. (MPH, PHD Candidate, Asst. Professor)

A THESIS REPORT TO BE SUBMITTED TO JIMMA UNIVERSITY POSTGRADUATE PROGRAM, FACULTY OF MEDICAL SCIENCE, AND SCHOOL OF MEDICINE DEPARTMENT OF INTERNAL MEDICINE FOR PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE CERTIFICATE OF SPECIALTY IN INTERNAL MEDICINE.

May 2022

ACKNOWLEDGMENT

First of all, I would like to thank almighty GOD who provides strength for the completion of this journey. I would like thank my advisors Dr Maekel B (Internist, nephrologist) and Mr. Yibeltal Siraneh (PH, MPH, PHD Candidate) for their relevant constrictive comments and guidance. I too extend my thanks to JUMC Department of internal medicine for giving the chance to conduct this study.

ABSTRACT

BACKGROUND: Hyponatremia, defined as a serum sodium concentration $[Na^+] < 135 \text{ mEq/L}$. It is the most common electrolyte disorder encountered in clinical practice. There are multiple causes of hyponatremia among medical admissions. The etiology, clinical behavior and the prognosis of hyponatremia vary widely. Findings from various researches shows the prevalence of hyponatremia in hospitalized patients ranges between 15%–30%. The Clinical features and outcome of patients with hyponatremia differ among the severity, acuteness and other comorbid conditions. However, there was no evidence regarding its prevalence and clinical outcomes. Therefore, the objective of this study was to assess the prevalence, clinical profile of patients, risk factors and short term outcome of patients admitted with Hyponatremia in JUMC.

Materials and Methods: Hospital based cross-sectional study was conducted from October 25, 2021 to January 30, 2022 among eligible patients admitted to Jimma university medical center at medical ward and medical emergency. A total of 307 patients admitted in medical ward and medical emergency department were enrolled in the study. Detailed medical history and clinical examination were performed and a structured questionnaire was used to collect information on sociodemographic characteristics, clinical profile and short-term outcomes. Serum sodium level was also determined for every patient involved in the study. Descriptive analysis was performed.

Results: The mean serum sodium level among the participants was 137.5 mmol/L and the prevalence of hyponatremia was 24.8%. Among hyponatremic patients, the mean age was 44.87 (SD =17.88) years and the commonest age group ranges in between 24-44 years (40.7%). Mild hyponatremia as the commonest type seen in 73.7% of hyponatremic patients. Risk factor for hyponatremia was seen in 50 % of hyponatremic patients. Vomiting is the most frequent complain followed by salt restriction, medications. Hyponatremia was found to be more prevalent in those patients with underlying chronic illnesses that seen in 58 (76.3%) patients. Hypertension is the most frequently observed chronic illness. Majority of hyponatremic patients (61.8%) was asymptomatic and Nausea/vomiting was the most frequent symptom observed in 23(62.2%). Body swelling is observed in 36(47.4%) of patients and 19(25%) of patients had at list one record of hypertension. The mean length of hospital stay was 14.16(SD =10.18) days. Short term outcome; 72.3 % of patients was discharged improved while 5(6.6%) of them died in hospital.

Conclusion: Hyponatremia is found to be prevalent among hospitalized patients in Jimma University medical center medical ward and medical emergency, Jimma, Ethiopia. It is also identified that Hyponatremia is prevalent in patients with chronic illnesses, salt restricted patients and patients taking diuretics. we thus recommend that all hospitalized patients should have a serum sodium analysis during their admission and for those with identified risk factors we strongly recommend to be serially followed during their hospital stay and during their outpatient follow-up.

Contents

ACKNOWLEDGMENT	1
ABSTRACT	2
List of figures	6
LIST OF TABLES	7
ACRONYM	8
CHAPTER ONE	9
1. INTRODUCTION	9
1.1 Background	9
1.2 Statement of the problem	11
CHAPTER TWO	12
2.1 LITERATURE REVIEW	12
2.1.1. Prevalence of hyponatremia	13
2.1.2. Baseline characteristics	13
2.1.3. Classification of hyponatremia	14
2.1.4. Clinical profile of patients	15
CHAPTER THREE	18
3. OBJECTIVES	18
3.1 General objective	19
3.2 Specific objective	19
CHAPTER FOUR	19
4. STUDY METHODS AND MATERIALS	20
4.1 study area	20
4.2 study period	20
4.3 study design	20
4.4. Population	20
4.5. Eligibility criteria	20
4.6 Sample Size Determination	20
4.7 Data collection tools and method	21
4.8 Data processing and analysis	22

4.9 Study variables.....	22
4.10. Terms and Operational definitions:.....	22
4.11 Data quality assurance.....	23
4.12 Ethical consideration.....	23
5. RESULTS.....	24
5.1 Baseline characteristics.....	24
5.2 Prevalence of hyponatremia.....	25
5.3 Clinical profiles of patients with hyponatremia.....	28
5.4 Signs and symptoms among hyponatremic patients.....	31
5.5 Short term outcome.....	36
5.5.1. Length of hospital stay.....	36
5.5.2. Short term outcome.....	37
6. DISCUSSION.....	40
9. LIMITATIONS.....	42
8. CONCLUSION AND RECOMMENDATION.....	43
REFERENCES.....	43
ANNEXES.....	46
Annex A- questioner.....	46
Annex B- Amharic version of consent.....	50
Annex C- Afan Oromo version of consent.....	51
Annex D- List of medications that cause hyponatremia1.....	52

List of figures

FIGURE 1. DISTRIBUTION OF PARTICIPANT PATIENTS TO THEIR ADMISSION SIDES AT MEDICAL WARD AND MEDICAL EMERGENCY.....	25
FIGURE 2. SEX DISTRIBUTION AMONG STUDY POPULATION.....	25
FIGURE 3. PATTERNS OF SERUM SODIUM LEVEL AMONG THE STUDY POPULATION.....	26
FIGURE 4. PATTERN OF AGE DISTRIBUTION AMONG PATIENTS WITH LOW SERUM SODIUM LEVEL ADMITTED DURING THE STUDY PERIOD.....	27
FIGURE 5. COMMON COMPLAINS AND PATIENT REPORTS IN RELATION TO SUBCLASSES OF HYPONATREMIA.....	28
FIGURE 6. THE PREVALENCE OF PREEXISTING CHRONIC ILLNESSES AMONG PATIENTS WITH HYPONATREMIA.....	29
FIGURE 7. PATTERN OF PREEXISTING CHRONIC ILLNESSES AND ITS DISTRIBUTION AMONG SUBCLASSES OF HYPONATREMIA AND SEX.....	30
FIGURE 8. PATTERN OF CHRONIC ILLNESSES IN PATIENTS WITH HYPONATREMIA AND ITS DISTRIBUTION AMONG SUBCLASSES OF HYPONATREMIA.....	31
FIGURE 9. SYMPTOMS ASSOCIATED WITH HYPONATREMIA AND ITS DISTRIBUTION AMONG SUBCLASSES OF HYPONATREMIA.....	32
FIGURE 10. PATTERN OF EACH SYMPTOM AMONG HYPONATREMIC PATIENTS AND ITS DISTRIBUTION BASED ON THE SUBCLASSES OF HYPONATREMIA.....	32
FIGURE 11. SYSTOLIC BLOOD AMONG SUBCLASSES OF HYPONATREMIA.....	33
FIGURE 12. PATTERN OF EDEMA AMONG PATIENTS WITH HYPONATREMIA.....	34
FIGURE 13. GRADES OF EDEMA AMONG SUBCLASSES OF HYPONATREMIA.....	34
FIGURE 14. MENTATION OF PATIENTS ESTIMATED BY GCS SCORING IN RELATION WITH SERUM SODIUM LEVEL.....	35
FIGURE 15. LENGTH OF PATIENTS' HOSPITAL STAY IN RELATION TO THE SUBCLASSES OF HYPONATREMIA.....	37
FIGURE 16. SHORT TERM HOSPITAL OUTCOMES AMONG PATIENTS WITH HYPONATREMIA.....	38
FIGURE 17. SHORT TERM OUTCOME AMONG PATIENTS WITH HYPONATREMIA IN RELATION TO THE SEVERITY OF HYPONATREMIA.....	39

LIST OF TABLES

TABLE 1. SERUM SODIUM LEVEL AMONG PATIENTS WITH HYPONATREMIA ADMITTED TO JIMMA UNIVERSITY MEDICAL CENTER AT MEDICAL WARD AND MEDICAL EMERGENCY DURING THE STUDY PERIOD (OCTOBER 2021-JANUARY 2022).....	27
TABLE 2. SERUM SODIUM LEVEL BASED ON THE SEVERITY OF HYPONATREMIA AND ITS SEX DISTRIBUTION AMONG PATIENTS WITH HYPONATREMIA ADMITTED TO JIMMA UNIVERSITY MEDICAL CENTER AT MEDICAL WARD AND MEDICAL EMERGENCY DURING THE STUDY PERIOD (OCTOBER 2021-JANUARY 2022).....	28
TABLE 3. LENGTH OF HOSPITAL STAY AMONG PATIENTS WITH HYPONATREMIA ADMITTED TO JIMMA UNIVERSITY MEDICAL CENTER AT MEDICAL WARD AND MEDICAL EMERGENCY DURING THE STUDY PERIOD (OCTOBER 2021-JANUARY 2022).....	36

ACRONYM

BP= Blood pressure

BPM = Beat per minute, breath per minute

C⁰ = Degree centigrade

DM= Diabetes mellitus

GCS = Glasgow coma scale

HTN = Hypertension

JUMC= Jimma university medical center

MEqv= Milliequivalents

Na⁺ = Sodium ion

PR= Pulse rate

RBS = Random blood sugar

RR= Respiratory rate

SAH = Subarachnoid hemorrhage

T⁰ = Temperature

V/S= Vital signs

CHAPTER ONE

1. INTRODUCTION

1.1 Background

Hyponatremia, defined as a serum sodium concentration $[Na^+] < 135 \text{ mEq/L}$. It is the most common electrolyte disorder encountered in clinical practice. It affects all age groups and both sexes with comparable frequency (1,2,3).

Hyponatremia is not a homogenous disorder, depending upon the volume status, can be classified as euvolemic, hypervolemic or hypovolemic and depending upon severity it is grouped as mild, moderate or severe (1,4,5). Acute severe hyponatremia is a medical emergency. It is accompanied by severe neurological symptoms due to cerebral edema and can be lethal if not recognized and appropriately treated. Symptomatology varies markedly ranging from asymptomatic to being comatose with mortality 5-50 % depending on severity, acuity of onset and associated illnesses. (1,4,5).

There are multiple causes of hyponatremia among medical admissions (6). The etiology, clinical behavior and the prognosis of hyponatremia vary widely from hospital to hospital including the use of some medications, malignancies, infections, chronic heart failure, chronic liver disease, and chronic kidney disease (1, 5, 6). It frequently develops in hospitalized patients (1, 4) including patients in the pediatric and elderly age group and most commonly seen in patients admitted in the intensive care unit (1,6) . Hyponatremia also can be iatrogenic which observed many patients who advised for low salt intake by the treating physician as a part of the treatment for hypertension or even diabetes, or were on liquid feeds. (1, 4, 7)

Hyponatremia is associated with varying morbidity. Morbidity varies widely in severity; serious complications can arise from the disturbances itself as well as from the underlying causative conditions. Hyponatremia is associated with an increased in-hospital, short-, and long-term mortality both in hospitalized (8, 9) and ambulatory patients (9, 10). An increased morbidity and mortality rate was shown especially in hyponatremic patients with medical conditions such as heart failure, myocardial infarction, liver cirrhosis, cancer, pneumonia and stroke (10). Given the poor prognosis linked to hyponatremia, identification of modifiable factors in this context is of great interest. Despite the frequency and severity of some of the associated complications, research suggests hyponatremia is often neglected by clinicians (5, 10).

There are strong evidences that makes Hyponatremia clinically important like its substantial morbidity and mortality in case of acute severe hyponatremia. The Optimal management reduce in-hospital mortality and symptom severity and overly rapid correction of chronic hyponatremia which can cause severe neurological deficit and death (11). The management of these cases needs modification due to physiological changes with age affecting the renal and other systems. Even when comorbid conditions are taken into account, people with a mildly decreased serum sodium concentration have a 30% higher risk of death and are hospitalized 14% longer relative to those without hyponatremia (10,11). If acquired in hospital, it may take days before the electrolyte

disorder is investigated, potentially allowing a further decrease in serum sodium concentration and exposing patients to the dangers of profound hyponatremia (11).

Hyponatremia indicates a disruption in the body's water balance due to abnormal handling of water by the kidneys from antidiuretic hormone (ADH) secretion (appropriately or inappropriately) or an excessive water intake (6). Plasma osmolality (the total concentration of solutes in water) plays a critical role in the pathophysiology and treatment of sodium disorders. Hyponatremias diagnosed by findings from the history, physical examination, laboratory studies, and evaluation of volume status (1, 5).

The most common classification system for hyponatremia is based on volume status: hypovolemic (decreased total body water with greater decrease in sodium level), euvolemic (increased total body water with normal sodium level), and hypervolemic (increased total body water compared with sodium). Hyponatremia also classified based on the time of onset as acute (<48hr) or chronic (>48hr). (1, 3, 5, 11). According to joint Europeans guide line hyponatremia can be also classified based on the serum sodium concentration as mild; 130-134 mEq/L, moderate; 125-129 mEq/L and sever <125 mEq/L (5, 11).

Symptomatology varies markedly ranging from asymptomatic to being neurologic manifestations like change in mentation, seizure and coma (1,4,12) The clinical symptom and signs are dependent on the onset and progress of the electrolyte derangement and the severity of the hyponatremia as classified above. Acute (occurring over <48hrs) serious neurological complications can ensue as a result of cerebral oedema.4–6 Early symptoms of headache, muscular weakness, nausea, lethargy, ataxia and confusion can progress to seizures, irreversible neurological damage, coma and death, if unrecognized and untreated. In chronic hyponatremia, cerebral wasting of intracellular potassium followed by organic osmolytes reduces cerebral swelling, delaying the onset of symptoms (1,13) and associated with poor health outcomes. More recently, chronic hyponatremia has been shown to exacerbate multiple manifestation of senescence in aged rats, including senile osteoporosis, sarcopenia, cardiac fibrosis, and hypogonadism (8).

Mild hyponatremia has traditionally been considered as an asymptomatic or mildly symptomatic condition. However, recent reports indicated that even mild chronic hyponatremia can have long-term adverse effects, such as deficits in gait and attention falls, bone loss and fractures, especially in the elderly (1, 8).

Severe symptomatic hyponatremia occurs when sodium levels decrease over less than 24 hours. Severe symptoms (e.g., coma, seizures) typically occur when the sodium level falls below 120 mEq/L, but can occur at less than 125 mEq/L. Severe symptomatic hyponatremia must be corrected promptly because it can lead to cerebral edema, irreversible neurologic damage, respiratory arrest, brainstem herniation, and death (1, 4).

1.2 Statement of the problem

Hyponatremia is a common electrolyte abnormality in hospitalized patients. It is independently associated with increased short-term and long-term morbidity and mortality (9). The Morbidity varies widely in severity. As highlighted by previous studies, hyponatremia per se may contribute to adverse outcome, which is reflected by a positive correlation of mortality and severity of hyponatremia (10). Conversely, other studies observed a paradoxical fall in mortality rate as s-sodium values decreased below a certain level (10-12) serious complications can arise from the disturbances itself as well as from the underlying causative conditions. The presence of hyponatremia can also interfere with administration of appropriate therapy and can be iatrogenic (12).

Despite of the huge effect of hyponatremia on morbidity, mortality and prolonging hospital stay of patients, hyponatremia is often overlooked in low-income settings. Data regarding the incidence and its significance on morbidity and mortality is limited in Africa. Especially in sub-Saharan Africa, there are few previous studies have done on hyponatremia and its impact on the healthcare system. Until now little has been known about the prevalence of hyponatremia, factors associated with hyponatremia, its impact on both long term and short-term morbidity and mortality and length of hospital stay. To the best of investigator knowledge there is no evidence on the same topic in Ethiopia.

Because of its magnitude and crucial significance on the outcome of the patient as indicated by studies done worldwide, it is important to determine the magnitude of hyponatremia and to understand the frequent complains and patient reports among hyponatremic patients. This study helps to produce a knowledge about the magnitude of hyponatremia, associated factors and short-term outcome of hospitalized patients in the study area. The result of this study can be used as a standing base for researchers interested to work on the topic.

CHAPTER TWO

2.1 LITERATURE REVIEW

2.1.1. Prevalence of hyponatremia

In general, the prevalence of hyponatremia greatly varies with different studies. The prevalence varied based on the age, severity of the hyponatremia and underlying disease condition. (5). Different studies estimate the prevalence of hyponatremia in a range between 2.8 and 26.5% (15). While multiple studies in western hospitals showed the overall prevalence of hyponatremia ranges between 15%–30% (2). Study Hao J et al. found the prevalence of hyponatremia to be 17.5%. (13). A meta-analysis performed including studies published by English language up to October 1st 2012, showed the prevalence of hyponatremia among hospitalized patients was 17.4 % (8). A study done in India also shows hyponatremia occurs in up to 8% of the general population and in up to 60% of hospitalized patients (11). While other studies estimate the prevalence of hyponatremia in hospitalized patients to be about 1%–6%. (3, 12). Hyponatremia occurs in 27.6% of hospitalized medical patients in Ghana (6) and this figure is also supported by a retrospective study from Nottingham, UK. On the other hand, the prevalence of hyponatremia among elderly patients seen up to 25.98% (2) which is comparable to Rao et al. of 20%–36% (16). This variation was also seen with the severity of the hyponatremia. For instance, a prospective observational 12-month follow-up study in Switzerland found mild hyponatremia the prevalence is up to 30–42%, while the severe hyponatremia is less common with a prevalence of 2–3% (10). Study Corona et al. showed Mild hyponatremia occurred in about 15– 30% of hospitalized patients, whereas the prevalence of moderate to severe hyponatremia was 7% among in-hospital patients (8). A prospective, hospital-based cohort study at Jimma University Hospital found the prevalence of hyponatremia among hospitalized patients with heart failure was found to be 28.9% (9).

2.1.2. Baseline characteristics

Age

Different studies showed hyponatremia is common in elderly people which can be attributed by mainly two reasons associated with aging. One, the impaired ability to maintain water and electrolyte homeostasis in response to dietary and environmental changes (2). Secondly, the comorbid conditions in elderly such as diabetes, hypertension and ischemic heart disease (1,2,4,5,15). Jain et al in 2003 from India have reported increasing age is a strong independent risk factor for hyponatremia (2).

A study from India showed the commonest age group was 45-64 years and the mean age was 57 years (7, 13), while a study done at tertiary care center in Pakistan shows the mean age of patients with hyponatremia was 54.8 ± 14.8 years (14). Study Sastry AS et al. showed among hospitalized patients hyponatremia is more commonly seen in the middle age groups (40-60years) with mean age of 50.12 ± 8.8 years (1). Findings from studies by Agarwal SM et al, mean age of

patients with hyponatremia 48.1 ± 16.1 years (19) and by Rahil A I et al, in Qatar mean age of patient with hyponatremia 56 ± 20 years, also supported the findings as hyponatremia is more prevalent in elderly patients (26). A 12 months prospective follow-up study in Switzerland also showed patients with normal sodium level are younger than those with hyponatremia with the mean age of 48.8 ± 15.9 for normonatremic patients vs 55.6 ± 17.2 , 58.8 ± 17.3 , 60.1 ± 16.7 , 59.9 ± 17 years in hyponatremic patients with serum sodium (mmol/L) level of 130–134, 125–129, 120–124 and <120 respectively (13). However, A descriptive, prospective, hospital-based cohort study among heart failure patients at same hospital to the present study showed heart failure patients with hyponatremia were younger than those with normal serum sodium level with the mean age of 50.9 (SD =18.0) years vs 52.9 ± 17.11 years respectively (9).

Sex

Regarding the sex preponderance, most studies showed hyponatremia is more common in Male than female. A two years prospective and retrospective study on Clinico-aetiological profile of hyponatremia in adults from India showed preponderance with the Male to female ratio of 1.7:1 (7). A retrospective study on hyponatremia in tetraplegia/paraplegia patients by Soni BM (27), also showed hyponatremia is male predominance. This is also supported by Sastry AS et al with a ratio of male and female of 7:3 (1), Chatterjee et al. 62.69% with predominance of male (18). Finding from Lalit Prashant Meena, et al well correlate with this finding too with the ratio 1.8;1 (15). On the other hand, a Study conducted at a teaching referral hospital at Sikkim, India; states the prevalence of hyponatremia was almost equal in male and female patients with the ratio of 1:0.96 with male predominance (2). This is also comparable with the study by Rao et al (16). A retrospective study from Pakistan underwent in a tertiary hospital also supported these findings showing 50% patients were male (14). Study Hawkins RC et al. reported that gender is not an important risk factor for disturbances in serum sodium concentration (24) this data is also supported by study Rahil AI, Khan F Y et al (26).

2.1.3. Classification of hyponatremia

Among the three types volume status in hyponatremia (hypovolemic, hypovolemic, euvoletic), hypervolemia is the commonest type as stated in some researches. Sastry AS et al reported hypervolemia type of presentation being most common. It was seen in 50% of the cases while hypovolemic 34% of the cases, and patients with euvoletic type of presentation seen in 16% of the cases (1). This was also supported by Nauman Tarif study (14). However, this a study Nandakumar et.al goes in contrary to this finding showing the hypervolemic hyponatremia is the least common type (12.5%) while euvoletic hyponatremia is the commonest type (48%) and 40% them were hypovolemia (7). A study by Jain and Nandy: A hospital based study among elderly patients in Sikkim India also showed euvoletic hyponatremia was the commonest type with 48%, followed by hypervolemic hyponatremia (28%) and the least common hypovolemia hyponatremia (24%) (2). Bhattacharjee et al.; also showed euvoletic hyponatremia is the commonest subtype followed by hypervolemic hyponatremia and hypovolemia hyponatremia (47%, 33% and 20% respectively) (22). Rai et al also found euvoletic hyponatremia is the commonest type (71%) followed by hypervolemic (27%) and hypovolemic hyponatremia (2%). These findings are in line with reported by Patni et al. (45%) (29), Minneke Jet al. (30) and Rahil AI, Khan F Y et al (26).

Hyponatremia also can be classified based on measured serum sodium level as mild (serum sodium concentration 134-130 mmol/L), moderate (serum sodium concentrate 129–125 mmol/L) and sever (serum sodium concentrate <125 mmol/L). Findings from most of studies are suggestive of mild hyponatremia is the commonest type. Nandakumar et.al; A retrospective and prospective study on Clinico-aetiological profile of hyponatremia in adults supportive of the preponderance of mild hyponatremia (7). Sastry AS et al. also showed the predominance of mild hyponatremia with 80% while the moderate is 16% and 4% sever hyponatremia (1). This finding is also in accordance with A prospective observational 12-month follow-up study in Switzerland (10). Corona et al., Rahil AI et al. and Bhattacharjee et al. are also in support of the predominance of mild hyponatremia. (8,22,26).

2.1.4. Clinical profile of patients

Preexisting chronic illnesses, complains and patient reports

Hyponatremia occurs in patients with varieties of Clinical profiles that are considered as predisposing factors and causes ranging from simple G.I. loss (vomiting and diarrhea), to chronic illnesses like hypertension, diabetes mellites, CCF, liver and renal failure and infectious causes (1,2,15,22).

Different Studies showed majorities of patients with hyponatremia has preexisting chronic illnesses. AK Jain et al. showed among the hyponatremic patients in the study, the common preexisting illnesses were hypertension, Diabetes mellitus and Chronic renal disease (68%, 46% and 19% respectively) (2). This result was also supported by Lomte et al. Showing hypertension is the commonest comorbid condition accounting 29% followed by Chronic renal disease 16% (4). Bhattacharjee, et al. is also in accordance with findings showing hypertension seen in 57% followed by diabetes mellitus 42% (22). This results in line with some other studies; Nandakumar, Hiremath P.B et al. (7) J. R. Rawal, H. S. Joshi et al (30), Sumit Mohan, Sue Gu et al. (4).

However, Study by Sastry AS et al showed chronic kidney disease is the commonest chronic illness (24%) followed by Chronic liver disease and heart diseases each 16%. In this study, Hypertension was accounted only in 8% of cases. Infectious cause like Tuberculosis was seen in 8% of hyponatremic patients (1). On the other hand, Nandakumar et.al in their study showed diabetes mellitus is the commonest comorbid condition which was seen in more than half of hyponatremic patients while one eighth of patients were hypertensive.

Study by Chatterjee, et al. showed the most common underlying predisposing factor for hyponatremia was gastrointestinal fluid loss (vomiting/diarrhea) followed by cerebrovascular accident (CVA) and pulmonary sepsis (18). Rahil A I , Khan F Y,et al. also found extra-renal fluid loss including vomiting, diarrhea, or diaphoresis as the most frequent cause of hyponatremia which was seen in 33.9% patients (26).A hospital based study by Jain and Nandy on Clinico etiological profile of hyponatremia among elderly patients showed drugs is the most common predisposing factor (34%), followed by vomiting (32%), and poor intake (31%) (2, 15). Nandakumar et.al also found drugs like diuretics and ACE-I are a predisposing factor for hyponatremia (7). A comparative study on the clinico-aetiological profile of hospitalized patients by AGARWAL &

AGRAWAL, identified most of the patients had multiple predisposing factors and decreased intake was the most common (82.9%), followed by increased losses (65.7%) and miscellaneous factors (70.0%). Drugs like diuretics, fluid overload and inappropriate Ryle's tube feeds more commonly precipitated hyponatremia in in-hospital patients (19).

The clinical presentation of hyponatremia has a wide spectrum, varying from asymptomatic to very lethal presentation as seizures and coma (22). This variation on their presentation depends on the severity, acuteness and other comorbid conditions (3,5,15,12). Most studies done on clinical presentation of hyponatremia found majority of patients with hyponatremia are asymptomatic (1,2,5,9); Bhattacharjee, et al. 70% (22), Chatterjee, et al 48.21% (18), Paniker and Joseph 60% (12). Among the asymptomatic patients, most of them are in the mild range of hyponatremia. Nausea and malaise are the earliest symptoms typically seen when the plasma sodium concentration in mild to moderate hyponatremia. As the plasma Na⁺ concentration falls, the symptoms progress to include headache, lethargy, confusion and obtundation. Stupor, seizures and coma usually occur when the plasma Na⁺ concentration fall acutely and severe range (5,7,12). Rahil A I , Khan F Y,et al is in accordance with this finding showing 24.5% of hyponatremic patients presented with impaired level of consciousness that ranged from confusion to coma and most of them had serum sodium of less than 115meq/l (26).

Nandakumar et.al found One third of patients with mild and one fifth of patients with moderate hyponatremia were asymptomatic. Among symptomatic patients, drowsiness was commonest symptom (53.2%) followed by vomiting, hiccoughs and seizures. The seizure was exclusively seen in patients with severe range of hyponatremia (7). Panicker, Georgy Itty, S. Joseph et al reported that once the level of serum sodium falls below 125 mEq/L neurologic symptoms predominate (12). Ivor Douglas reported altered sensorium was seen in 51.7% of hospitalized patients with severe hyponatremia (32). Sastry AS et al. found CNS manifestations like altered sensorium, seizures, etc. were more common with serum sodium level of < 125 mEq/L (80%) (1). Similar findings were also seen by Jain and Nandy (2) and Soni BM et al. (27). In Rai et al. Drowsiness was present in half of patients. Vomiting, seizures and hiccups were each seen in about 10% of the patients (15). While Agarwal & Agrawal showed nausea was significantly more common in patients presenting with hyponatremia (19).

All the patients with severe hyponatremia were symptomatic. Hiccough was seen in moderate and severe hyponatremia and not in mild hyponatremia. Seizures were seen in severe hyponatremia (13). As finding by AK Jain et al., 81% of elderly patients with hyponatremia were symptomatic. Lethargy, drowsiness and abnormal behavior (50%, 40% and 39% respectively) were the common symptoms (2). Most of patients with neurological manifestation had severe range of hyponatremia (most of the < 125 mEq/L). Most of the asymptomatic patients had mild hyponatremia. Nandakumar, Hiremath PB et al also reported drowsiness was the commonest symptom in the study. Vomiting and seizure was also seen in 10% of the patients (7). While Aqeel Rahem, Al- Barqawi et al states the symptoms attributed to hyponatremia like mental confusion, anorexia, nausea, vomiting and headache are nonspecific (4). A study finding from Lomte SS, Jalgaonkar PD, Kumar S, et al. also shows drowsiness (36%) is the commonest neurologic symptom which followed by focal neurologic deficit (38%) and disorientation (22%). While vomiting is the commonest gastrointestinal symptom (17%) (4).

2.1.5. Outcomes

Irrespective of the cause, hyponatremia is associated with substantial morbidity and mortality. (1,5,7,15). However, Similar to the Clinical futures, the outcome of patients with hyponatremia also differs among the severity acuteness and other comorbid conditions. A meta-analysis performed including studies published by English language up to October 1st 2012, showed the hyponatremia-related risk of overall mortality was inversely correlated with serum level (10). Severe hyponatremia, particularly of rapid onset, is associated with substantial morbidity and can be life threatening and it bears a substantial associated morbidity and mortality (3,32). Hyponatremia is also an important predictor of mortality in heart failure, cirrhosis, and acute pancreatitis (8,12,33,34). In general, based on findings from different studies, the overall mortality among patients with hyponatremia estimated to be 5-50 % depending on severity, acuity of onset and associated illnesses (1). Khalid Ali et al. also showed Hyponatremia is independently associated with increased short-term and long-term morbidity for both hospitalized and ambulatory HF outpatients, and nearly doubling the risk of mortality in this group. In this study the in-hospital mortality rate was found to be higher in those with hyponatremia than those with normal serum sodium, 11.4% vs 1.0% respectively. Hao et al. compared the mortality rate among patients with hyponatremia vs amongst patients without hyponatremia 6.15% and 0.48% respectively (13). Study Huda MS, Watson I, et al. also showed overall mortality rate among patients with severe hyponatremia was 27% and study Douglas I. et al. found 20% (32). Jain and Nandy at tertiary care hospital among elderly patients with hyponatremia showed the mortality rate was 20% (2) and study Lomte SS, Jalgaonkar PD, Kumar S, et al. 10% (4).

Paniker and Joseph found the mortality rate of hyponatremic patients among admitted to ICU was 4% and was seen only in the group with severe hyponatremia. Mortality among hyponatremic patients was not directly related to hyponatremia but to the severity of the underlying medical condition in the patients (2,12). Even if the mortality and morbidity among hyponatremic patients increases in patients with severe range of hyponatremia (3,32), studies also showed that mild and moderate hyponatremia are also associated with patients poor outcomes. This finding was seen by Corona et al. showing even a moderate serum sodium level decrease is associated with an increased risk of mortality in commonly observed clinical conditions (8). Braun MM et al. also found mild hyponatremia in the ambulatory setting is associated with increased mortality compared with normal sodium levels (5). Interestingly, researches also show a significant association of hyponatremia severity and recurrent profound hyponatremia; patients with initial s-sodium level ≤ 120 mEq/L recurred more often compared with those with initial levels above 120 mEq/L (10).

Different studies also showed hyponatremia prolongs length of hospital stay of patients (1, 15). This finding is in accordance with Study Khalid Ali et al. that showed the mean length of hospital stay was longer among with hyponatremic patients in a comparison with patients with normal level of serum sodium, 16.6 ± 9.4 days vs 12 ± 7 respectively (9). Study Huda MS, Watson I, et al. also found the mean length of hospital stay 16 days (35). However other studies observed a paradoxical fall in mortality rate as s-sodium values decreased below a certain level (e.g. < 120 mmol/L). This indicates the presence of factors other than hyponatremia itself affecting mortality, e.g. etiology of hyponatremia, comorbidities or therapeutic issues (10).

2.2. SIGNIFICANCE OF STUDY

Hyponatremia is clinically important because of its prevalence, its role to cause substantial morbidity and mortality. Different studies showed the presence of hyponatremia suggests a worse prognosis and is an important predictor of mortality in patients with chronic illnesses like liver cirrhosis, pulmonary hypertension, myocardial infarction, chronic kidney disease (5,12). Recent studies have demonstrated that chronic and mild hyponatremia also may negatively affect health status, with deleterious effects that affect, particularly, the central nervous system and the bone, causing gait instability, attention deficits, falls, osteoporosis, and fractures (36). Several studies have demonstrated the impact of hyponatremia is not only with the increased mortality and morbidity but also associated with an increased length of hospital stay, a higher risk of readmission to the hospital and hospital resource utilization. As a result, Hyponatremia may represent one important determinant of the hospitalization costs (36).

Despite the frequency and severity of some of the associated complications, research suggests hyponatremia is often neglected by clinicians (13) and usually under diagnosed and the management is often inadequate and below the standard (14). Researches also states it is not only on clinical practice but also regarding researches and publications, there is lack of published data regarding the prevalence, clinic-etiology behavior, outcome and prognosis of hyponatremia in specially in low-income countries like Ethiopia.

This study will prospectively explore the clinical profile of patients with hyponatremia and common in-hospital and pre-hospital complains of patients with hyponatremia. The result from this study will be a great benefit by giving a good insight for clinical practitioners to understand the burden of hyponatremia in regarding to our country set-up.

This study will also provide information regarding the short-term outcome and common comorbidities of patients with hyponatremia which can be a component for further study on the economic burden of hyponatremia among hospitalized patients and can be an input for guideline developers.

Data given from this study will be a great benefit for researchers as a stepping stone for further in-depth investigation regarding the sodium abnormalities. It also will be a complement to fill the huge gap regarding scarcity of studies on hyponatremia in Ethiopia as well as in sub-Saharan Africa. In general, this study and its finding will mainly benefit in filling the gap in terms of clinical practice and researches scarcity on the topic hyponatremia.

CHAPTER THREE

3. OBJECTIVES

3.1 General objective

- To determine the prevalence, clinical profile and outcome of hyponatremia among patients admitted to JUMC medical ward- medical emergency Jimma, Oromia,Ethiopia. Dep't, Jimma Town, Southwest Ethiopia.

3.2 Specific objective

- To determine Prevalence of hyponatremia among patients admitted to JUMC medical ward medical emergency dep't.
- To assess the clinical profile of hyponatremia patients among patients who admitted to JUMC medical ward medical emergency dep't.
- To assess short-term outcome of hyponatremia among patients admitted to JUMC medical ward and medical emergency dep't.

CHAPTER FOUR

4. STUDY METHODS AND MATERIALS

4.1 study area

The study was be conducted at Jimma university medical center. Jimma city is located in the southwestern of the country in Jimma zone Oromia region; it is located about 352 km from the capital city Addis Ababa. Jimma university medical center is one of the oldest health institutions in Ethiopia which was established in 1930. The hospital is located in Jimma town and situated at the east of the town about 3km from the center. Currently it is one of the three teaching and referral hospital in the southwestern part of the country, providing services for approximately 15,000 inpatient, 160,000 outpatient attendants, 11,000 emergency cases and 4500 deliveries in a year coming to the hospital from the catchment population of about 15 million people. Due to the fast growing service and teaching role of the hospital, the federal government considered construction of a new and level- best 600 bedded hospital and it is functional since September 2015.

4.2 study period

The study was conducted from October 15, 2021 up to January 30, 2022

4.3 study design

A hospital based cross sectional study was conducted.

4.4. Population

4.4.1 Source population

- All patients admitted to medical ward and all patients kept at medical emergency.

4.4.2 Study population

- Patients admitted to medical ward and medical emergency during the study period and those who have fulfilled the inclusion criterions mentioned below.

4.5. Eligibility criteria

4.5.1 Inclusion criteria

- Patients admitted to Jimma university medical ward
- Patients who are kept at emergency and expected to stay >24 hrs.

4.5.2 Exclusion criteria

- Patients who have psychiatric problem

- Patients whose medical records are incomplete

4.6 Sample Size Determination

By using a single population proportion; known magnitude of hyponatremia in study conducted at Komfo Anokye teaching Hospital, Ghana, showed that rate of hyponatremia among medical admissions is 27.6%(26). And with 95% confidence level as well as 5% margin of error the sample size was calculated using single population proportion as follow:

$$n = \frac{Z^2_{1-\alpha/2} P(1-P)}{d^2}$$

Where: n= the maximum sample size

Z= standard normal distribution curve value for 95% CI which is 1.96 (where $\alpha = 0.05$)

P= 27.6% (Komfo Anokye teaching Hospital, Ghana)

CI= 95% confidence level, 5% margin of error.

Hence;

$$n = \frac{(1.96)^2 \times 0.276(1 - 0.276)}{(0.05)^2}$$

$$n = 307$$

4.7 Data collection tools and method

4.7.1 Data collection tools

A structured and pre-tested questioner (Appendage 1) was used. The questioner was adapted from different relevant literatures. The questioner had two parts. The first part contains question on basic sociodemographic variables and part two contains questions about clinical characters, short term outcomes and other relevant details on hyponatremia. Each questioner was clearly labeled in serial numbers and administered in privacy

4.7.2 Data collection method

Data was collected by face-to-face interview and patient record review. Data collector visited patients admitted at medical ward and kept at medical emergency. The patients were assessed for inclusion to the study. For those who included in the research, the patients were interviewed consecutively by trained enumerators and for those patients who don't have serum sodium, blood

sample was taken by a laboratory technicians assigned for the purpose. The sample was taken immediately to Jimma university laboratory for workup of the status of serum sodium level. The vital signs and other clinical information were recorded by medical interns assigned by the principal investigator. The questioner was filled in two rounds for each patient. In the first round the socio- demographic variables, the clinico-etiology of patients and serum sodium level was recorded. At the second round the short-term outcome of the patient was recorded.

4.7.3 Document review

The patient's medical record was reviewed using the questioner to assess the admission diagnosis, presence of previous admission, serum sodium level, outcome and patient progress recorded by physicians.

4.7.4 Data collectors

The data collection was undertaken by total of four personnel; one laboratory technician ,3 medical interns after providing them a half day training on objective of study, variables on questionnaire, its implication and relevance of the study. The data collection activity was supervised by principal investigator.

4.8 Data processing and analysis

The data was collected from randomly selected 307 eligible patients by using structured questionnaire and in-depth interview. The collected data was checked for its completeness and was entered, edited, cleaned and analyzed by SPSS Verssion26. Descriptive analysis was done.

4.9 Study variables

- Sociodemographic factors: age, sex, education
- Clinical profile of patients: preexisting chronic illnesses, symptoms, severity of hyponatremia
- Length of hospital stay
- Short term outcome of hyponatremia

4.10. Terms and Operational definitions:

- Hyponatremia: - According to the European society of endocrinology, hyponatremia defined as serum sodium level of <135 mmol/L. The Europeans guideline also further classifies hyponatremia based on the serum sodium level as mild; 130-134 mmol/L, moderate; 125-129 mmol/L and sever <125 mmol/L (37).
- Determining serum sodium level – The blood sample drown from the patient was send to Jimma university medical center main laboratory. The serum sodium level was determined by the chemistry machine in the laboratory operated by the laboratory technicians.

- Short term Outcome: The World Health Organization defines an outcome measure as a “change in the health of an individual, group of people, or population that is attributable to an intervention or series of interventions.” According to WHO there are seven top health care outcome measurements listed as mortality, readmission, safety of care, effectiveness of care, patient experiences, timelines of care and efficient use of medical imaging. In this study we used three of the seven parameters; mortality, timelines of care and effectiveness of care listed as death, improved, and the same.
- In-hospital mortality – death from any cause occurring before hospital discharge.
- Length of in hospital stay– duration of patient in hospital from their first visit to the time they discharged from the hospital.
- Prevalence determination: point prevalence calculated by the formula

$$\frac{\text{number of patients with serum sodium level} < 135 \text{ mmol/L}}{\text{number of Patients admitted to medical ward and medical emergency during the study period}} \times 100$$

4.11 Data quality assurance

To ensure data quality pre-testing of data collection tools was made. Adequate training was provided for data collectors. The compilation format was prepared in English and Afan Oromo to maintain clarity and easier understanding by the data collectors and patients. The collected data was checked for completeness and consistency on the day of collection by principal investigator. Any inconsistency, inaccuracy or missing data implied was returned for correction on same day. Technical support was provided by a senior advisor. Demonstration and practical session on interviewing and record reviewing was underwent for the clarity of the practice. The participants were given appropriate manuals and guidelines during the training. Onsite supervision was also done by principal investigator.

4.12 Ethical consideration

Ethical clearance was obtained from the ethical review board of Jimma University before official commencement of the data collection process. A letter of recommendation was obtained from responsible office to the head of out-patient medical ward and medical emergency side. Written informed consent was obtained from all patients before data collection. Patient’s confidentiality, equity of services and interests of the patients as ensured during the study period. This study doesn’t involve any personally harmful intervention to the patient. All patients participating in this study was offered clinical care equally with others.

Assessment of patient’s serum sodium as done using venous blood and the results was attached to the patient’s clinical records and all findings was communicated to the patients or parents and the managing physician to make use for intervention in case of abnormality.

5. RESULTS

5.1 Baseline characteristics

During the study period December 2014 to march 2014., a total of 307 patients who was admitted to medical ward (which includes the general ward (58.0%), the cardiac (9.1%), the stroke (6.8%), the isolation (1.6%), medical ICU (3.6%), pulmonology side (3.3%) and patients who are candidate for admission but kept at emergency side (17.6%) for different reasons were included in the study.

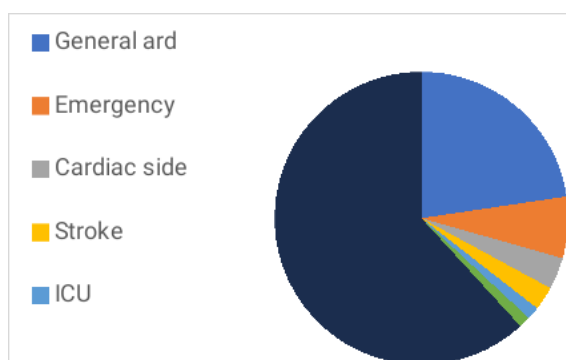


Figure 1. Distribution of participant patients to their admission sides at medical ward and medical emergency

The study included 152(49.5.4%) males and 155 (50.5%) females.

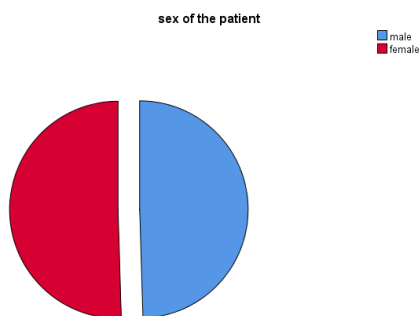


Figure 2. Sex distribution among study population

5.2 Prevalence of hyponatremia

The mean admission serum sodium was 137.5 mmol/L (SD =6.29) with a minimum serum sodium level of 115 mmol/L and maximum 162 mmol/L. Hyponatremia defined as serum sodium <135 mmol/L was observed in 76 (24.8%) patients. While 23 (7.5%) of the them had hypernatremia (serum sodium >145 mmol/L) and the rest 208 (67.8%) of participants had a normal serum sodium within the range between 135 mmol/L -145 mmol/L.

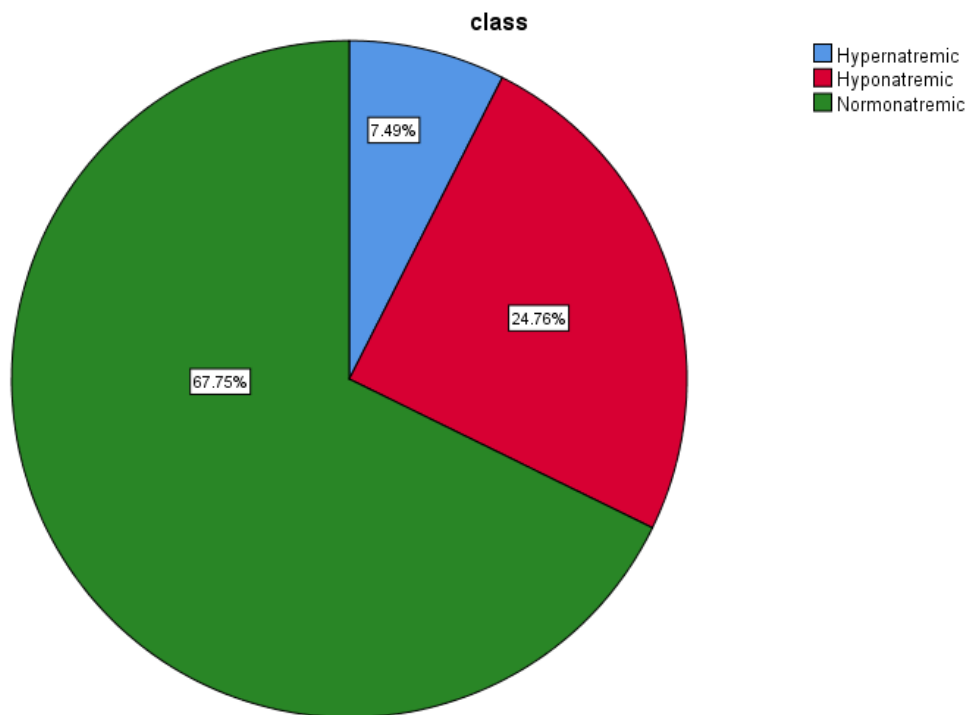


Figure 3. Patterns of serum sodium level among the study population.

Among 76 patients with low serum sodium level, the mean age was 44.87 (SD =17.88) years with the maximum age of 93 and minimum 15 years. The commonest age group ranges in between 24 -44 (40.7%) followed by 45-60 (30.2%).

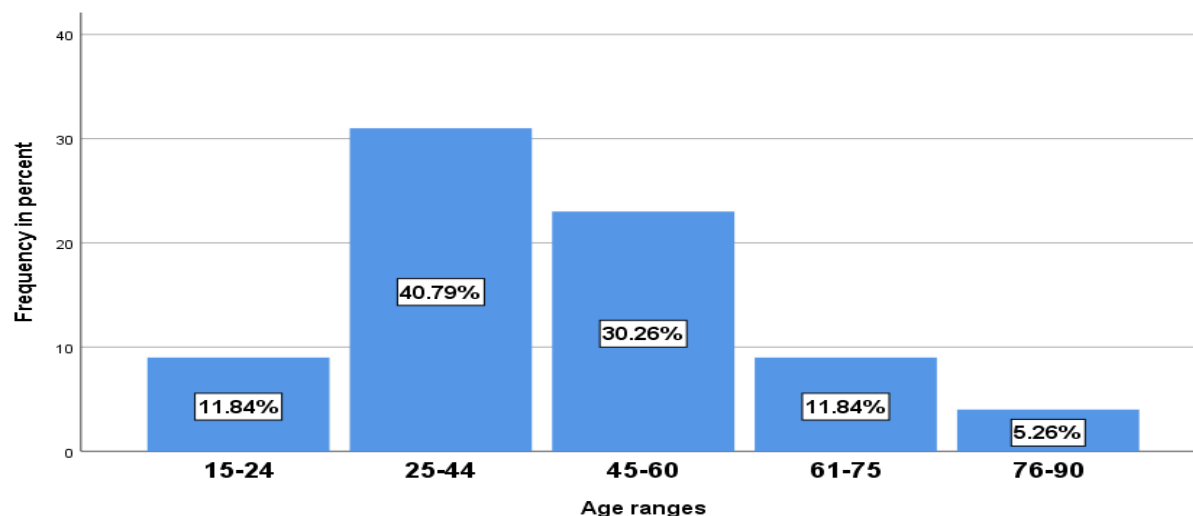


Figure 4. Pattern of age distribution among patients with low serum sodium level admitted during the study period.

Regarding the sex distribution, among 76 patients with hyponatremia, both male and female had equal distribution of each 50%. Mild hyponatremia, defined as serum sodium level of (130 mmol/L – 134mmol/L) was seen in 56 (73.3%) of patients. While 12 (15.8%) of the patients had moderate range of hyponatremia(129-125mmol/L) and 8 (10.5%) participants with sever hyponatremia (<125 mmol/L).

Table 1. Serum sodium level Among patients with hyponatremia admitted to Jimma University medical center at medical ward and medical emergency during the study period (October 2021- January 2022).

	Sex	Serum sodium level (mmol/L)													
		115	118	121	122	123	126	128	129	130	131	132	133	134	Total
Frequency	M	0	1	0	2	0	1	4	1	4	3	7	4	11	38
	F	2	0	2	0	1	2	1	3	5	6	2	9	5	38
Total		2	1	2	2	1	3	5	4	9	9	9	13	16	76

Table 2. Serum sodium level based on the severity of hyponatremia and its sex distribution
Among patients with hyponatremia admitted to Jimma University medical center at medical ward and medical emergency during the study period (October 2021-January 2022).

Serum sodium	Sex of the patient			Percent
	Male	Female	Total	
130meqv-134meqv (Mild hyponatremia)	29	27	56	73.7%
125meqv-129meqv (Moderate hyponatremia)	5	7	12	15.8%
<125meqv (Sever hyponatremia)	4	4	8	10.5%
Total	38	38	76	100%

5.3 Clinical profiles of patients with hyponatremia

Among the common complains of patients, vomiting was the most frequent which was seen in 32.4% of hyponatremic patients. Salt restriction, medications, diarrhea, malignancy and poor intake was reported in 16.2%,11.8%, 10.3%, 5.9% and 2.9% respectively).

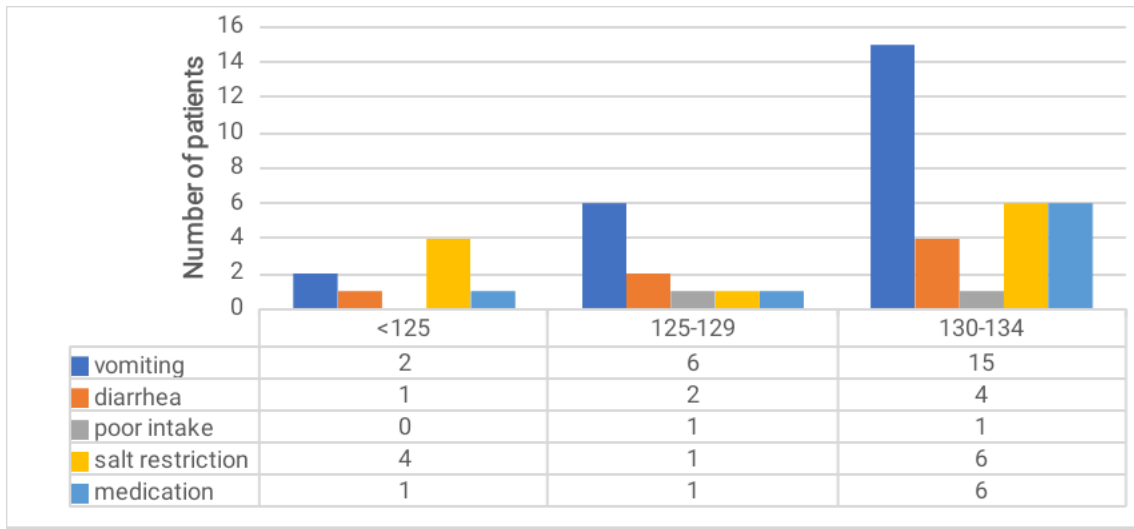


Figure 5. Common complains and patient reports in relation to subclasses of hyponatremia.

Hyponatremia was found to be more prevalent in those patients with underlying chronic illnesses 58 (76.3%). Hypertension is the most frequently observed chronic illness followed by heart failure, diabetes mellites, renal disease, liver disease, tuberculosis, malignancy other infectious causes like HIV-AIDS and old stroke in decreasing order of frequency.

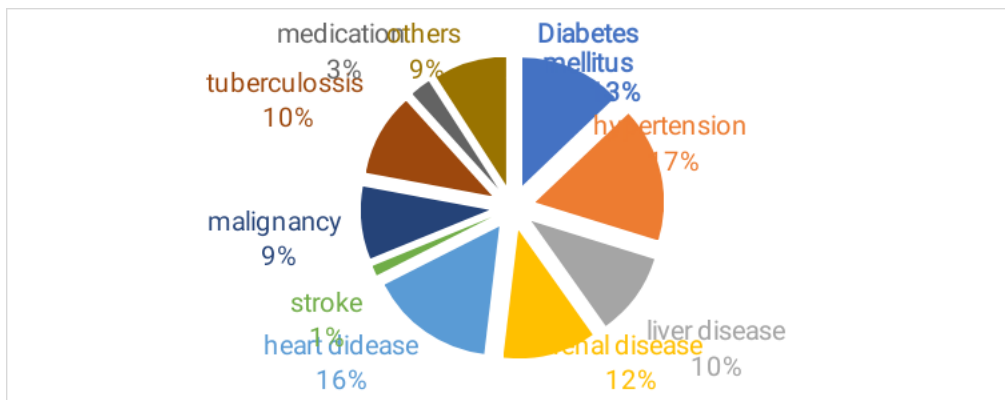


Figure 6. The prevalence of preexisting chronic illnesses among patients with hyponatremia

Among 58 patients who had preexisting chronic illness , 42 of them were in the range of mild hyponatremia, 8 of in moderate range and othe 8 In sever hyponatremia. Eightin Hyponatremic patients without preexisting chronic illness;14 of them were in mild range and 4 of them in moderate range.

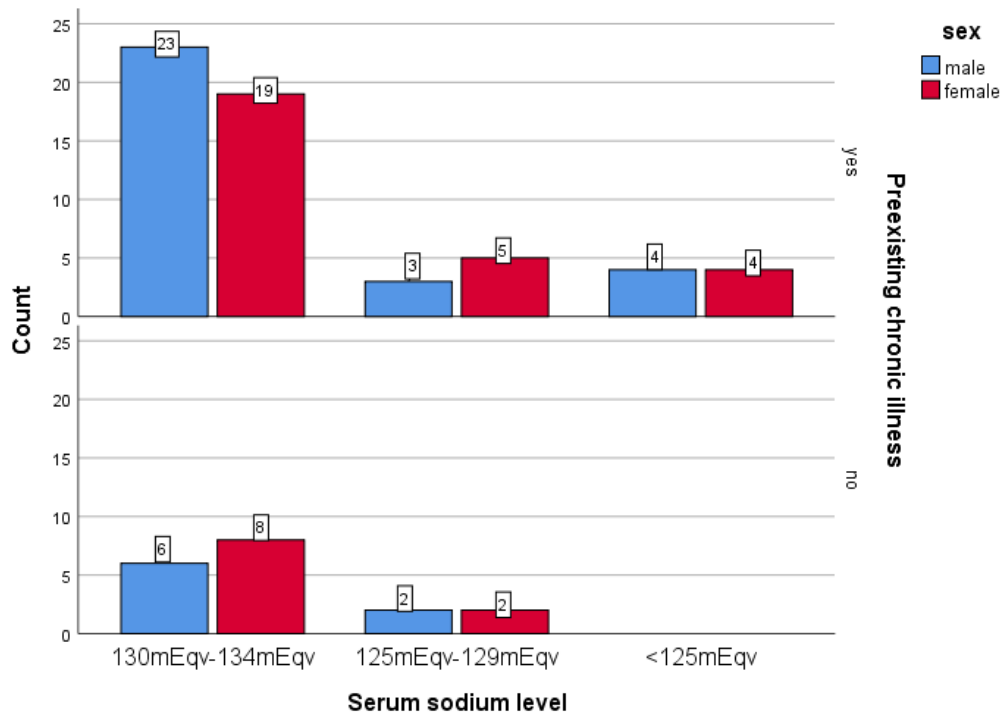


Figure 7. Pattern of Preexisting chronic illnesses and its distribution among subclasses of hyponatremia and sex.

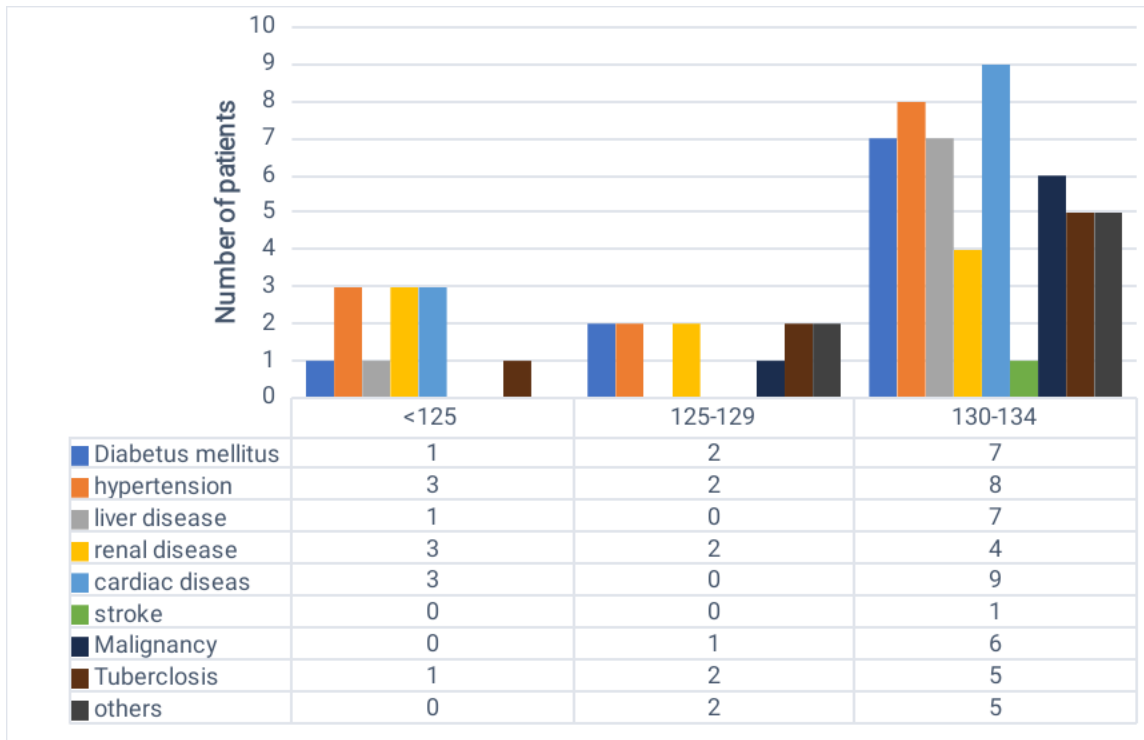


Figure 8. Pattern of chronic illnesses in patients with hyponatremia and its distribution among subclasses of hyponatremia.

Anemia was seen in about 45 (59.2%) of patients is the commonest concomitant illness seen among patients with hyponatremia.

5.4 Signs and symptoms among hyponatremic patients

Symptoms of hyponatremia: headache, seizure, nausea/vomiting, lethargy/drowsiness, loss of consciousness was seen in 29 (38.2%) of patients. Nausea/vomiting was the most frequent symptom observed in 23(62.2%) of patients. The symptoms more frequently occurred in patients with mild range of hyponatremia.

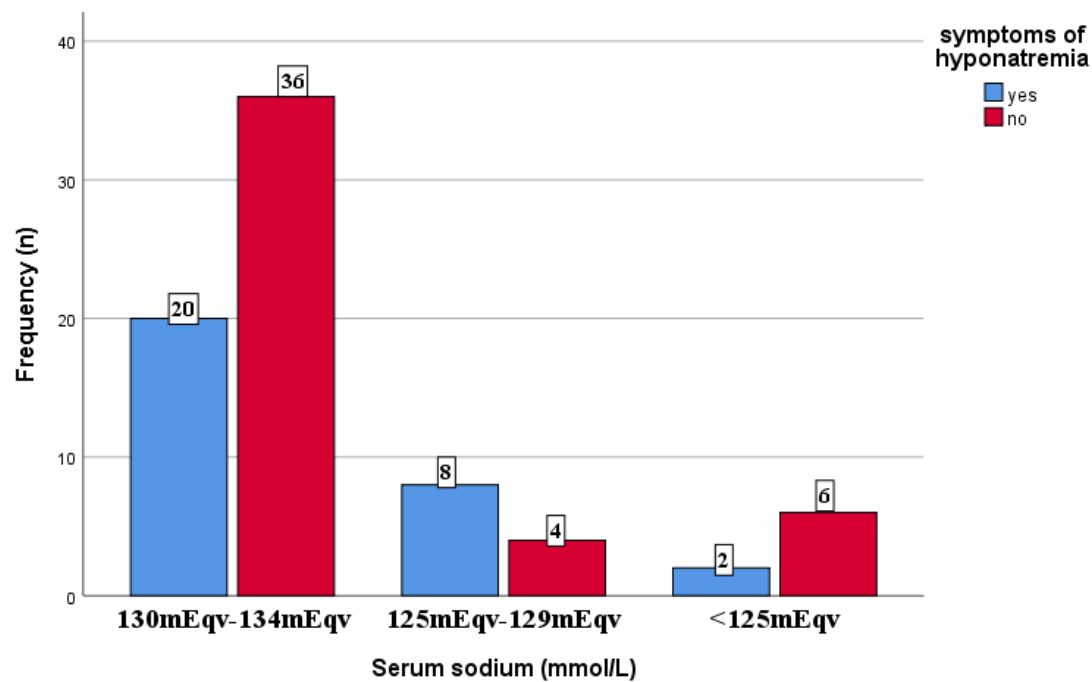


Figure 9. Symptoms associated with hyponatremia and its distribution among subclasses of hyponatremia.

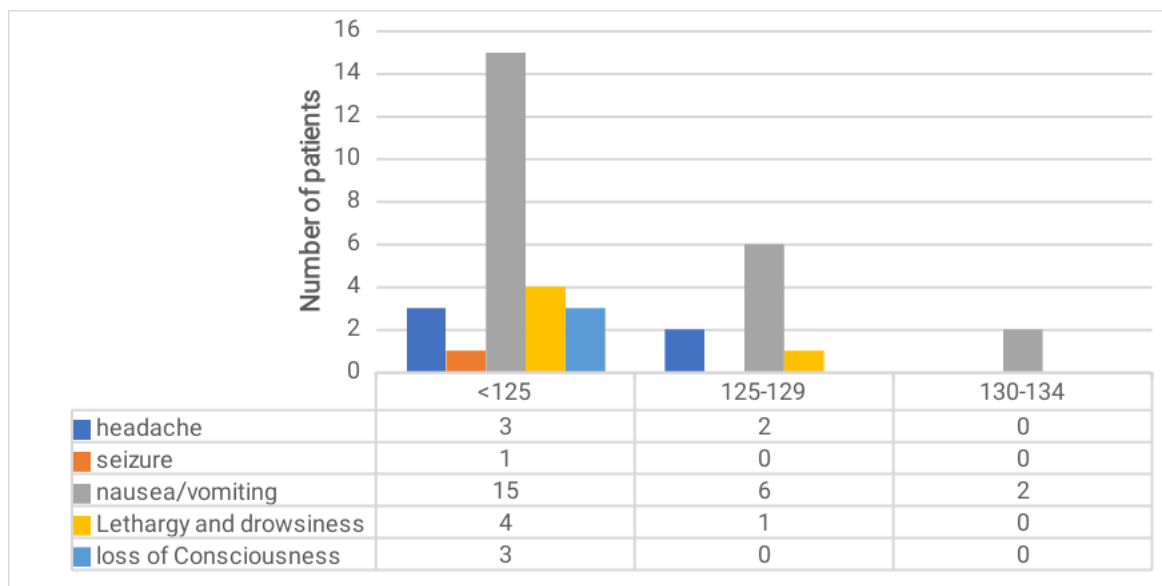


Figure 10. Pattern of each symptom among hyponatremic patients and its distribution based on the subclasses of hyponatremia.

Among the 76 patients with hyponatremia, 19(25%) of them has at list one record of hypertensive range of blood pressure (systolic blood pressure taken from the brachial artery >120mmHg).

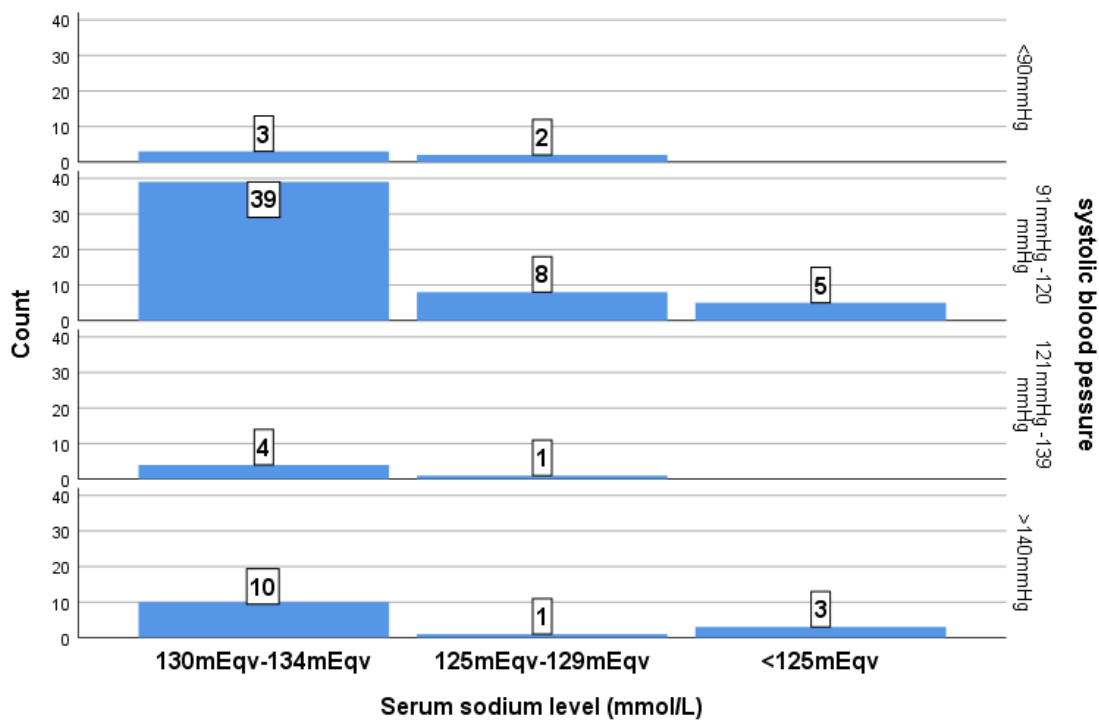


Figure 11. Systolic blood among subclasses of hyponatremia

Body swelling is observed in 36(47.4%) of patients with hyponatremia. Regarding the grading of the edme:12 out of 36 of them were presented with grade 4 edema, 11 with grade 3, 10 of them with grade 2 and 3 of them with grade one edema.

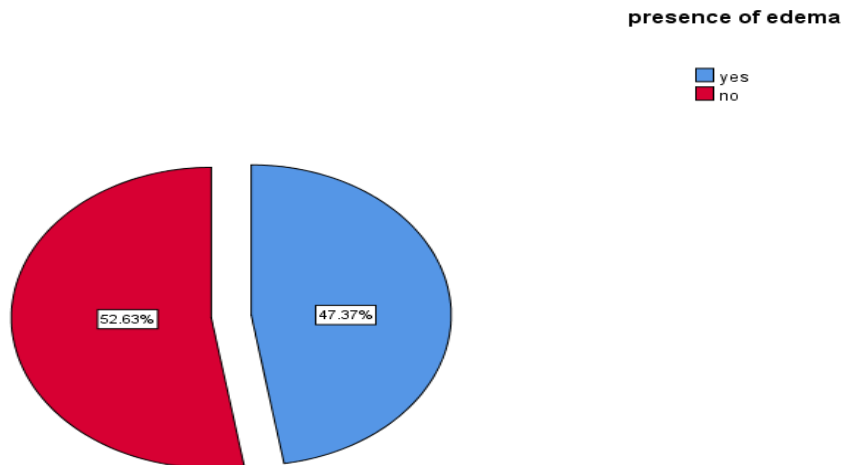


Figure 12. Pattern of edema among patients with hyponatremia

Majority of edematous patients was in the mild range of hyponatremia and out of the 12 grade 4 edema patients, 9 of them were with in mild hyponatremia. Similarly, 8 out of 11 patients with grade 3 edema, 8 out of 10 patients with grade 2 edema, were with in mild range of hyponatremia.

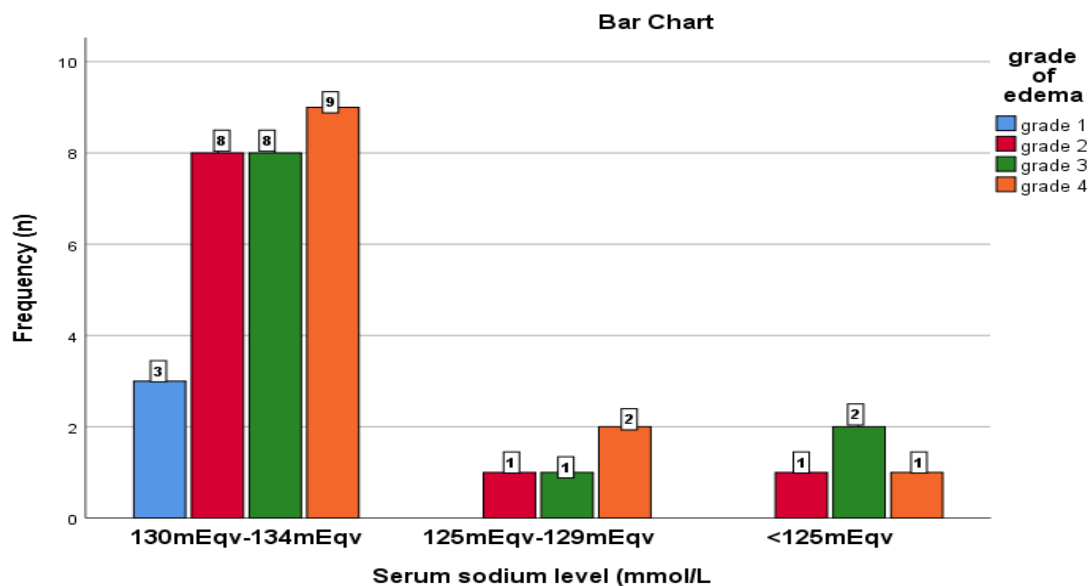


Figure 13. Grades of edema among subclasses of hyponatremia

Altered mentation (derangement in GCS) was observed in 7 (9.2%) of patients with

hyponatremia. Lowest GCS was observed in patients with mild range of hyponatremia and none of patients with severe hyponatremia had change in mentation.

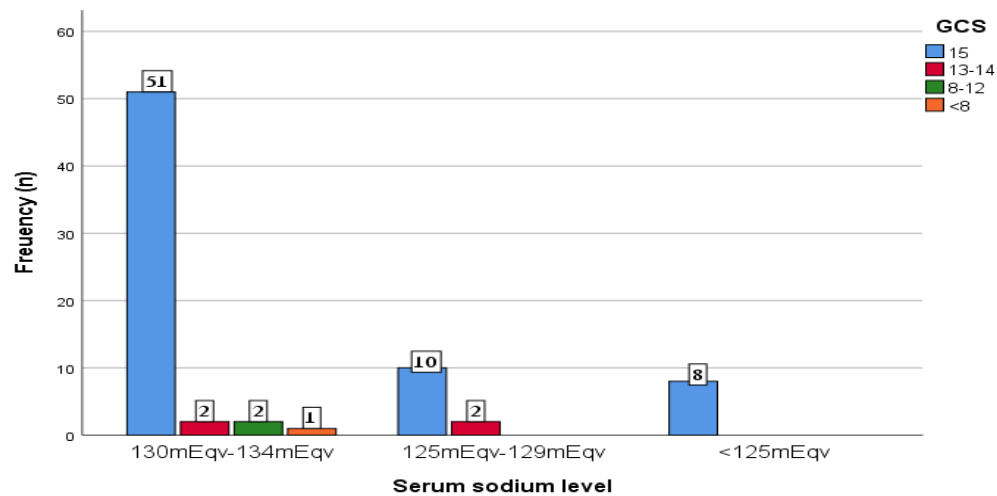


Figure 14. Mentation of patients estimated by GCS scoring in relation with serum sodium level.

5.5 Short term outcome

5.5.1. Length of hospital stay

The mean length of hospital stay Table among patients with hyponatremia was 14.16(SD =10.18) days. With minimum of 02 days and maximum of 59 days.

Table 3. Length of hospital stay Among patients with hyponatremia admitted to Jimma University medical center at medical ward and medical emergency during the study period (October 2021-January 2022).

	Number of patients		
Length of hospital stay (days)	Male	Female	total
2	1	2	3
3	1	0	1
5	3	1	4
6	2	4	6
7	1	5	6
8	6	0	6
9	1	1	2
10	2	5	7
11	3	1	4
12	0	1	1
13	0	2	2
14	2	1	3
15	5	1	6
16	1	0	1
17	1	1	2
18	1	3	4
20	4	6	10

22	0	1	1
30	1	2	3
32	1	0	1
47	2	0	2
59	0	1	1
Total	38	38	76

Majority, 35 of the patients (30 of them in the range of mild serum sodium level) was discharged in the first ten days while 34 (24 of them in the range of mild serum sodium level) discharged in the next ten days. Only one patient (who was with sever hyponatremia) was stayed for 59 days which was the maximum stay among the study population.

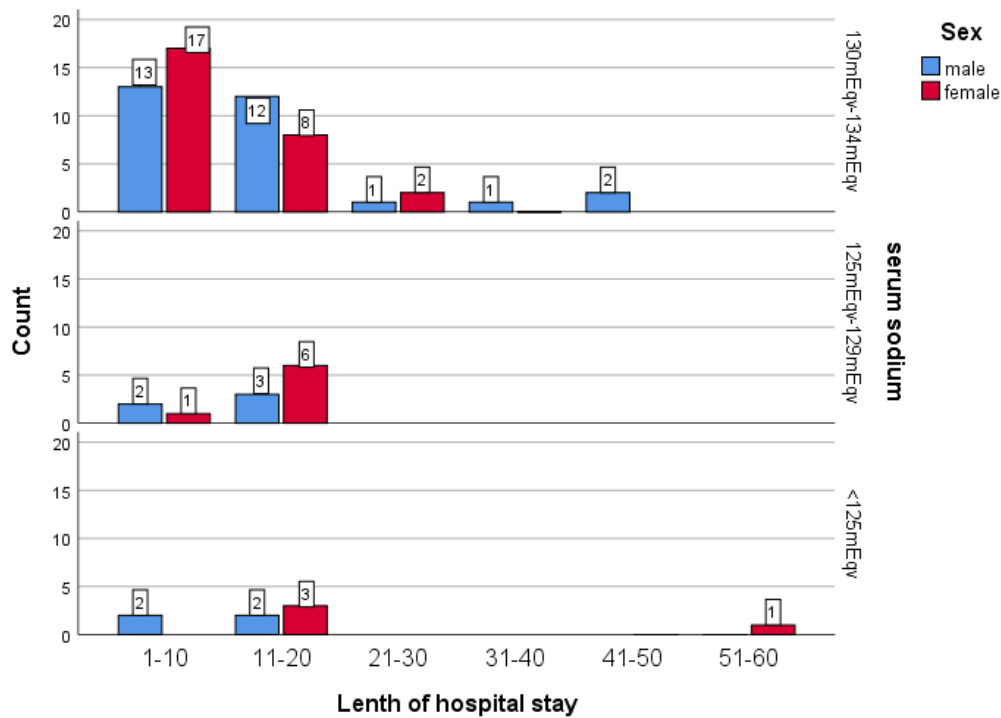


Figure 15. Length of Patients' hospital stay in relation to the subclasses of hyponatremia.

5.5.2. Short term outcome

Approximately three fourth of the patients (55patients) with hyponatremia was discharged improved while 5(6.6%) of them died in hospital. Eleven (14.5%) of patients left against medical advice, 3(3.3%) of them referred for different reasons and 2(2.6%) of them transferred to other ward in Jimma hospital.

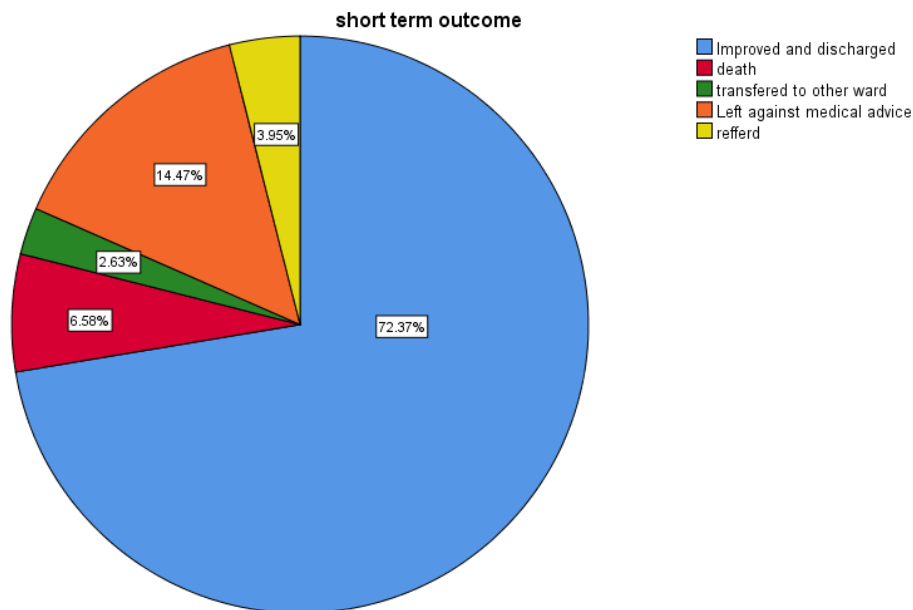


Figure 16. Short term hospital outcomes among patients with hyponatremia.

Among 55 patients discharged improved 39 of them were in the range of mild serum sodium level while 11 of them were moderately hyponatremic and 5 with sever hyponatremia. Out of the 5 deaths 4 of them were mildly hyponatremic while one was in sever range of hyponatremia. Nine of the eleven patients who left the hospital against medical advice was in mild range of hyponatremia. The sex distribution is somewhat comparable with in the category.

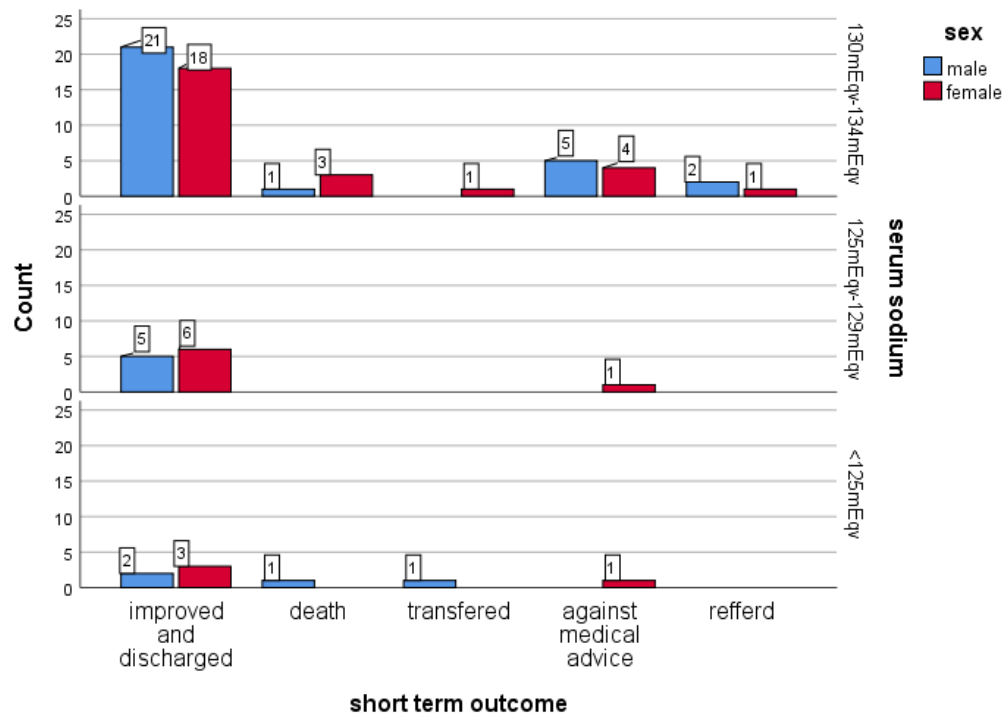


Figure 17. Short term outcome among patients with hyponatremia in relation to the severity of hyponatremia.

6. DISCUSSION

The finding from this study estimates the overall prevalence of hyponatremia at some point during hospitalization was 24.8%. This estimate is in accordance with the estimated range of hyponatremia reported in western hospitals ranged between 15%-30% (2). This finding is slightly lower than the finding from Ghana; 27.6% in a retrospective single-centered study on Outcomes of medical admissions with hyponatremia (6). and 28.9% in Hyponatremia in patients hospitalized with heart failure a prospective, hospital-based cohort study of patients at Jimma University Hospital (9). On the other hand, the estimation from this research is somewhat higher than the finding reported from China, a 5 year an observational retrospective study at a teaching hospital in Beijing which estimates the prevalence of 17.5%. (13). This discrepancy is more pronounced in comparison with finding in Boston, 14.5% (15).

This study showed the mean age among hyponatremic patients is 44.87 ± 17.88 . This mean is lower than the finding from a prospective 12 months follow-up study on Long-term outcome of profound hyponatremia 50.12 ± 8.85 (range 18-75 years) (1) and Rai et al. showing mean age 51 ± 17.5 (15). Nandakumar et.al also states majority of the hyponatremic patients in their retrospective study on Clinicopathological profile of hyponatremia in adults were in the age group of >55 years, the mean age was 57 years (7). Thomas Abraham Vurgese et al. from Kuwait reported similar finding in to Nandakumar et.al, where the commonest age group was 45-64 years and the mean age was 57 years (23). Among 307 hospitalized patients, hyponatremia was more commonly seen in the younger age groups (25-44 years) which accounts 40.8 % of the patients with low sodium followed by 30.3% in middle age group (45-65). The findings from this study are not supported by most of other studies which demonstrated the commonest age to be elderly (3,7,14). This finding can be a ground for further study if this discrepancy is because of the underlining clinical conditions of the patients, the lack of the appropriate documentation system in our society, relatively younger age of the hospitalized population or some other factors.

Regarding the sex distribution among patients with low serum sodium level, the finding from this study showed there is no difference among male versus female in terms of general prevalence. This finding supports Hawkins from Singapore who reported gender is not an important risk factor for disturbances in serum sodium concentration (24). This data is also supported by another studies Rahil Al, Khan F Y et al (17), Nandini Chatterjee, Nilanjan Sengupta et al (18). However, there are also studies that showed hyponatremia is more common in Male than female. Nandakumar et.al. showed hyponatremia is common in male which accounts about 63.3%. Rai et al. showed this difference with the ratio 1.8:1 (15). Sastry AS et al demonstrated this difference is more significant which is evidenced with a ratio of 7:3. (1). Chatterjee et.al, Paniker and Joseph also supported the predominance of hyponatremia in male. (18 ,12). On the other hand, a study conducted by Rao et al. hyponatremia is more in female patients than male (16).

Among the hyponatremic patients in this study the mean serum sodium level was 130 ± 4.3 . The serum sodium level in this study is much higher than the finding mentioned by Rai et al.; which was 118.2 mEq/l. Rao et al. and Chatterjee et al. study also had mean sodium level of 113.89 mEq/l and 126.34 mEq/l respectively (15, 18).

Among the subtypes of hyponatremia, classified based on the measured serum sodium level; (mild, moderate and severe) the mild subclass is the most frequently observed in this study (73.7%) followed by moderate and severe (15.8% and 10.5% respectively). This finding supported by Sastry AS et al showed the predominance of hyponatremia with 80% while the moderate is 16% and 4% severe hyponatremia (1). This finding is also in accordance with A prospective observational 12-month follow-up study in Switzerland (10).

This study demonstrated as high as 76.3% of patients with hyponatremia has preexisting chronic illnesses. Hypertension is the commonest preexisting illness followed by heart failure, diabetes mellitus, renal disease, liver disease, tuberculosis, malignancy, other conditions like HIV AIDS and old stroke (17.3%, 16%, 13.3%, 12%, 10.7%, 10.7%, 9.3%, 1.3% respectively). This finding is similar with AK Jain et al. a study which showed hypertension, Diabetes mellitus and Chronic renal disease are the most frequently observed chronic illnesses in patients with low sodium in decreasing order (68%, 46% and 19% respectively) (2). However, the study also showed significant difference among the frequency of each illness in contrary to the finding seen on this study. Lomte et al. also supported the finding: hypertension is the commonest preexisting illness which followed by renal disease (29%, 16% respectively) (4). The dominance of hypertension and heart failure as preexisting illness may contribute to salt restriction to be mentioned as one of the predisposing factor. This issue also can be a standing stone for further researches to know the significance of iatrogenic causes of hyponatremia.

Anemia of different degree was seen in more than half (60.5%) of patients with hyponatremia. This finding was comparable with study Ali et al. which showed about 59.2% of heart failure patients with hyponatremia had some degree of anemia. This significant prevalence of anemia in hyponatremic patients of different degree may be correlated with the underlying chronic illness among hyponatremic patients. As to the best of the investigator reading, there is no a study which showed a direct correlation between anemia and hyponatremia. Since anemia is seen in a huge number of the patients, this area needs further study to work on.

Coming to the study on predisposing factors for hyponatremia, among the factors that causes hyponatremia, vomiting (45%) is the most common factor demonstrated in this study. Salt restriction is the next common factor which is followed by half lower than the vomiting 21.7%. medications specially diuretics take the third place followed by diarrhea, and poor intake (13.7% and 3.9% respectively). Jain and Nandy put drugs (34%), the commonest predisposing factor followed by vomiting (32%), and poor intake (31%) (2). Agrawal SM et al, also supports the significance of decreased salt intake as a predisposing factor for hyponatremia (19). Correlating to points discussed above, the dominance of hypertension and heart failure as preexisting illness may contribute to salt restriction to be appeared as one of the predisposing factors. This issue also can be a standing base for further researches to entertain the significance of iatrogenic causes of hyponatremia.

Regarding the symptoms of hyponatremia, this study demonstrated about 38.2% of patients experienced possible symptoms of hyponatremia with the dominance of nausea/vomiting in 62.2%, lethargy /drowsiness in 13.5%, loss of consciousness in 1.3 % and seizure in 2.7 %. According to this study majority of patients with hyponatremia (61.8%) were asymptomatic. This

finding is in accordance with most studies which states Majority of patients with hyponatremia are asymptomatic (5,9,12). However, this finding is not supported by AK Jain et al; a prospective study on Hyponatremia in elderly hospitalized patients in a tertiary care hospital that demonstrated about 81% were symptomatic with most of the patients (62%) having more than 1 symptom (2). This finding can be attributed to the higher range of the age of the patients in the study; which is older than this study.

In relation to the subclasses of hyponatremia (based on the severity) and symptoms observed in hyponatremic patients, the finding from this study deviates from findings of most studies; the finding from this study showed majority of patients appeared to be symptomatic are patients with mild hyponatremia. For instance, out of 5 patients who complained headache 3 of them has hyponatremia of mild range while 2 of them are with in moderate range. Seizure is also observed in one patient who is in mild range of hyponatremia. Out of 7 Patients who experienced lethargy and drowsiness, 4 of them had a mild range of hyponatremia, two of them in moderate range and one with sever hyponatremia. Only one patient was presented with loss of consciousness and his serum sodium level was under the mild hyponatremia range. All these findings are in contrary with other studies and scientific explanations that states most of the above listed symptoms occur mainly in patients with severe range of hyponatremia (12,15,16,18). This discrepancy from other studies can be attributed to the symptoms complained by the patients may be caused by the underlying illness than the hyponatremia perse. .

Approximately half of the patients with hyponatremia (47.4%) has edema. Grade 4 edema which defined as generalized body swelling is the most frequently observed (33.3%) followed by grade three edema which spare the face (30.6%), grade two edema which localized over the leg (27.8 %) and grade one edema /pedal edema/ in 8.3%. This finding has a significance on further classification of hyponatremia based on the volume status: hypovolemic, hypervolemic, euvolemic. Even if the presence of edema /body swelling can be mentioned as a clue for Hypervolemic state of hyponatremia, which is the commonest subtype in this study, further laboratory investigation should be entertained to classify the hyponatremia based on the volume status accurately (5).

The mean length of hospital stay demonstrated in this research is 14.16 ± 10.1 . This finding is almost comparable with the Overall mean length of hospital stay 13 ± 8 days and lower than the mean length of in hospital stay among patients with hyponatremia 16.6 ± 9.4 : as mentioned by Ali et al, in a descriptive, prospective, hospital-based cohort study of patients with HF admitted to Jimma University Hospital (9).

The in-hospital mortality rate shown to be 6.6 % which is much lower than mentioned in patients with heart failure and hyponatremia (11.4%) and much higher than among patients with normal serum sodium,(1.0%) as observed by Ali et al.. Soiza et al and Rai et al. also showed hyponatremia is associated with increased length hospital stay and mortality (15, 25).

9. LIMITATIONS

This study has its limitations. Most importantly, during the study period the serum sodium level was determined for patients who had different length of hospital stay. This study has a limitation to differentiate patients who had hyponatremia at admission from those who developed hyponatremia during their hospital stay. Second, serum sodium level was determined only once and as a result, the risk of developing hyponatremia in hospital stay and the outcome of the management was not assessed. Moreover, since the study was undergone in a single medical center, the sample size is relatively small. Lastly, due to resource constraint this study has a limitation to determine the subclasses of hyponatremia classified based on volume status and duration (acute vs chronic).

8. CONCLUSION AND RECOMMENDATION

Hyponatremia is found to be prevalent among hospitalized patients in Jimma University medical center medical ward and medical emergency, Jimma, Ethiopia. It is also identified that Hyponatremia is prevalent in patients with chronic illnesses, salt restricted patients and patients taking diuretics. In hospital mortality was found significant in a comparison to patients with normal serum sodium level. We thus recommend that all hospitalized patients should have a serum sodium analysis during their admission and for those with identified risk factors we strongly recommend to be serially followed during their hospital stay and during their outpatient follow-up.

REFERENCES

1. Sastry AS, Praneetha B. Study on clinical profile of hyponatremia in patients admitted to the MIMS in Northern Andhra Pradesh, India. *Int J Res Med Sci* 2019;7:2055-61.
2. Jain AK, Nandy P. Clinico-etiological profile of hyponatremia among elderly age group patients in a tertiary care hospital in Sikkim. *J Family Med Prim Care* 2019;8:988-94 .
3. Clayton JA, Le Jeune IR, Hall IP. Severe hyponatraemia in medical in-patients: aetiology, assessment and outcome. *QJM*. 2006 Aug;99(8):505-11. doi: 10.1093/qjmed/hcl071. Epub 2006 Jul 22. PMID: 16861720.
4. Lomte SS, Jalgaonkar PD, Kumar S, et al. Clinical profile of hyponatraemia in a tertiary care hospital. *J. Evid. Based Med. Healthc.* 2017; 4(60), 3607-3613. DOI: 10.18410/jebmh/2017/719.
5. Braun MM, Barstow CH, Pyzocha NJ. Diagnosis and management of sodium disorders: hyponatremia and hypernatremia. *Am Fam Physician*. 2015 Mar 1;91(5):299-307. PMID: 25822386.
6. Tannor EK, Akumiah EO, Norman BR. Outcomes in medical admissions with hyponatraemia in Ghana—a single-centre study. *African Journal of Nephrology*. 2019;22(1):40–5.
7. Nandakumar, Gane B, Hiremath PB. Clinicoaetiological profile of hyponatraemia in adults. *Int J Biol Med Res* 2013;4(1):2802-2806.
8. Corona G, Giuliani C, Parenti G, Norello D, Verbalis JG, et al. (2013) Moderate Hyponatremia Is Associated with Increased Risk of Mortality: Evidence from a Meta-Analysis. *PLoS ONE* 8(12): e80451. doi:10.1371/journal.pone.0080451.
9. Ali K, Workicho A, Gudina EK. Hyponatremia in patients hospitalized with heart failure: a condition often overlooked in low-income settings. *Int J Gen Med*. 2016;9:267–73. ..(pink)
10. Winzeler B, Jeanloz N, Nigro N, Suter-Widmer I, Schuetz P, Arici B, Bally M, Blum C, Bock A, Huber A, Mueller B, Christ-Crain M. Long-term outcome of profound hyponatremia: a prospective 12 months follow-up study. *Eur J Endocrinol*. 2016 Dec;175(6):499-507. doi: 10.1530/EJE-16-0500. Epub 2016.
11. Diagnosis and treatment of hyponatremia: a systematic review of clinical practice guidelines and consensus statements. *BMC Medicine* 2014 12:231.
12. Panicker GI, Joseph S. A prospective study on clinical profile of hyponatremia in ICU hospitalized patients. *Int J Biomed Adv Res* 2014;5:297 303.
13. Hao J, Li Y, Zhang X, Pang C, Wang Y, Nigwekar SU, Qiu L, Chen L. The prevalence and mortality of hyponatremia is seriously underestimated in Chinese general medical patients: an observational retrospective study. *BMC Nephrol*. 2017 Oct 31;18(1):328. doi: 10.1186/s12882-017-0744-x. PMID: 29089024; PMCID: PMC5664828.
14. Tarif N, Sabir O, Niaz A, Akhtar R, Rafique K, Rizvi N. Hyponatraemia: Epidemiology and aetiology in a tertiary care centre in Pakistan. *J Pak Med Assoc*. 2016 Nov;66(11):1436-1439. PMID: 27812063.

15. Rai NK, Meena LP, Chakravarty J, Rai M, Sundar S. A study to assess the etiology and clinical profile of patients with hyponatremia at a tertiary care hospital. *Natl J Physiol Pharm Pharmacol* 2018;8(4):497-500.
16. Rao MY, Sudhir U, Kumar TA, Saravanan S. Hospital-based descriptive study of symptomatic hyponatremia in elderly patients. *J Assoc Physicians India* 2010;58:667-9.
17. Timerga A, Kelta E, Kenenisa C, Zawdie B, Habte A, Haile K. Serum electrolytes disorder and its associated factors among adults admitted with metabolic syndrome in Jimma Medical Center, South West Ethiopia: Facility based crossectional study. *PLoS One*. 2020;15(11):e0241486. Published 2020 Nov 5. doi:10.1371/journal.pone.0241486.
18. Chatterjee N, Sengupta N, Das C, Chowdhuri AR, Basu AK, Pal SK. A descriptive study of hyponatremia in a tertiary care hospital of Eastern India. *Indian J Endocrinol Metab*. 2012;16(2):288-291. doi:10.4103/2230-8210.93757.
19. Agarwal SM, Agrawal A. A comparative study of the clinico-aetiological profile of hyponatremia at presentation with that developing in the hospital. *Indian J Med Res*. 2011 Jul;134(1):118-22. PMID: 21808144; PMCID: PMC3171905.
20. Padhi R, Panda BN, Jagati S, Patra SC. Hyponatremia in critically ill patients. *Indian J Crit Care Med* 2014;18:83-7.
21. Berghmans T, Paesmans M, Body JJ. A prospective study on hyponatraemia in medical cancer patients: epidemiology, aetiology and differential diagnosis. *Support Care Cancer*. 2000 May;8(3):192-7. doi: 10.1007/s005200050284. PMID: 1078995.
22. Bhattacharjee P, Das P, Das D, Jog A, Jain M. Clinical and etiological profile of patients presenting with hyponatremia in a tertiary care teaching hospital of North Eastern India. *Int J Contemp Med Res*. 2017;4:1038–41.
23. Thomas A, Sunil B, Abdul WO. Frequency and etiology of hyponatremia in adult hospitalized patients in medical wards of a general hospital in Kuwait. *Kuwait Med J* 2006;38:211-3.
24. Hawkins RC. Age and gender as risk factors for hyponatremia and hypernatremia. *Clin Chim Acta* 2003;337:169-72.
25. Soiza RL, Hoyle GE, Chua MP. Electrolyte and salt disturbances in older people: Causes, management and implications. *Rev Clin Gerontol* 2008;18:143-58.
26. Rahil AI, Khan FY, Al Badri MM. Clinical profile of hyponatraemia in adult patients admitted to Hamad general hospital, Qatar: Experience with 53 Cases. *J Clin Diag Res*. 2009;3:1419-25.
27. Soni BM, Vaidyanthan S, Watt JW, Krishnan KR. A retrospective study of hyponatremia in tetraplegic/paraplegic patients with a review of the literature. *Paraplegia* 1994; 32:597–607
28. Jalan Tan TockSeng. Age and Gender risk factors for hyponatremia and hypernatremia. *ClinChimActa* 2003;337(1-2):169-72.

29. Patni M, Humaney N, Jeswani J, Deoke S. Clinico-etiological profile of hyponatremia in patients admitted in Intensive Care Unit of tertiary health care rural center. *JMSCR* 2015;3:6975-82.
30. Rawal JR, Joshi HS, Jain SR, et al. Evaluation of hyponatraemia in heart failure patients admitted in critical care unit: single center experience. *Indian Journal of Applied Basic Medical Sciences* 2013;15(21):20-24.
31. Mohan S, Gu S, Parikh A, et al. Prevalence of hyponatraemia and association with mortality: results from NHANES. *Am J Med* 2013;126(12):1127-1137.
32. Douglas I. Hyponatraemia: why it matters, how it presents, how we can manage it. *Cleve Clin J Med* 2006;73(Suppl 3):S4-12.
33. Lee WH, Packer M. Prognostic importance of serum sodium concentration and its modification by converting enzyme inhibition in patients with severe chronic heart failure. *Circulation* 1986;73:257-67.
34. Papadakis MA, Fraser CL, Arieff AI. Hyponatraemia in patients with cirrhosis. *Q J Med* 1990;76:675-88.
35. Huda MS, Boyd A, Skagen K, Wile D, van Heyningen C, Watson I, et al. Investigation and management of severe hyponatraemia in a hospital setting. *Postgrad Med J* 2006;82:216-9.
36. Corona G, Giuliani C, Parenti G, Colombo GL, Sforza A, Maggi M, Forti G, Peri A. The Economic Burden of Hyponatremia: Systematic Review and Meta-Analysis. *Am J Med*. 2016 Aug;129(8):823-835.e4. doi: 10.1016/j.amjmed.2016.03.007. Epub 2016 Apr 5. PMID: 27059386.
37. Ann Tinker, MSN, RN The Top Seven Healthcare Outcome Measures and Three Measurement Essentials October 30, 2018 <https://www.healthcatalyst.com/>

ANNEXES

Annex A- questioner

JIMMA UNIVERSITY MEDICAL CENTER DEPARTMENT OF INTERNAL MEDICINE

Data collector name _____signature _____Date of data collection_____

Supervisor's name _____signature _____Date of data collection_____

1. Questionnaire Code_____
2. Medical card record number _____

This questioner is prepared for the study on the PREVALENCE, ETHIOLOGY CLINICAL PROFILE AND OUTCOME OF HYPONATREMIA AMONG PATIENTS ADMITTED TO JUMC MEDICAL WARD MEDICAL AND EMERGENCY.

My name is _____ working as a data collector for Dr Abeba Y. She is conducting a study on PREVALENCE, ETHIOLOGY CLINICAL PROFILE AND OUTCOME OF HYPONATREMIA AMONG PATIENTS ADMITTED TO JUMC MEDICAL WARD MEDICAL AND EMERGENCY. The research is done for the purpose of partial fulfillment of the requirement for the certificate of specialty in internal medicine. This research helps to fill the gaps about hyponatremia and related issues which is potentially overlooked despite its significance on morbidity and mortality. Your participation makes a significant difference on the area and highly appreciated. If you agree to be involved in the study, I would like to ask you some questions and this will take about 30-45min and about 2-3 ml of blood sample will be taken by laboratory technician to determine your serum sodium level. This procedure is routinely done in hospital and rarely may cause infection, hematoma, bleeding and phlebitis over the puncture site. The information you give will be kept confidential. If there is any problem you can stop at any time. Do you agreed to participate?

1. Yes (continue asking the

2. questions)
3. No (stop asking the questions)

Interviewer Name and sign_____

Supervisor Name and sign _____

Date of data collection _____

Part I. Respondent's Socio demographic factors

No	Questions	Alternative /choice of responses	skip
101	Age in completed years		
102	Sex	1. Male 2. Female	
103	Educational status of the respondent	1. Illiterate 2. Only read & write 3. primary Education (1- 8) 4. Secondary high school (9-12) 5. 12+	

Part II- Medical background of the patient

No	Questions	Alternative /choice of responses	skip
201	Working diagnosis		
202	Length of hospital stay		
203	Have you ever been admitted to hospital	1. Yes 2. No	If answer is 2 skip to Q 205
204	If yes any documented serum sodium level? _____	1.At admission _____ 2.At discharge _____	
205	Current serum sodium level	1. >146 mEqv 2. 145-135 mEqv	If answer is 1 and 2

		3. 130-134 mEqv 4. 125-129 mEqv 5. <125 mEqv	skip The rest of the questions
206	If serum sodium level is < 135 mEq, is the patient is symptomatic ?	1.Yes 2. No_____	If answer is 2, skip To Q 208
207	If yes, What symptoms do the patient experienced? (can be more than one)	1. Headache 2. Seizure 4. Nausea 4. Vomiting 5. Abnormal behavior 6. Lethargy 7. drowsiness 8. loss of consciousness 1. Others (specify)_____	
208	Did the patient experienced Any of the predisposing condition for hyponatremia (can be more than one)?	1. Poor intake 2. vomiting 3. Diarrhea 4. sweating 5. malignancy 6. Trauma 7. salt salt restriction 7. Drugs (specify) _____ 88. others (specify) _____	
209	Have you ever told not to take or reduce salt?	1. Yes _____ 2. No_____	If answer is 2, skip To Q 2011
210	If yes , where you complaint ?	1. Yes _____ 2. No_____	
211	Does the patient has any known Pre-existing medical conditions (can be checked more than one)	1. DM 2. Hypertension 3. Liver disease 4. Renal disease 5. CHF 6. Infectious conditions 7. GI conditions 8. Stroke/ SAH 88. Others (specify) _____	
212	Is the patient taking medication that causes hyponatremia (use Annex C) ?	1. Yes _____ 2. No_____	If answer is 1 skip ToQ 2014
213	If Yes , specify	_____	

214	vital signs	<div>At admission Current</div> <div>BP (mmHg)_____</div> <div>PR (BPM) _____</div> <div>RR (BRM) _____</div> <div>T⁰ (C⁰) _____</div>	
215	GCS	1. 15 2. 13-14 3. 8-12 4. < 7	If answer is 1 skip To Q 214
216	volume status of the patient		
217	Is the patient edematous?	1. Yes _____ 2. No _____	If answer is 1 skip ToQ 2019
218	If yes, grade the edema	1. Grade I 2. Grade II 3. Grade III 4. Grade IV	
219	Short term Outcomes (at discharge or within 01 month of admission) of patients with serum sodium level <134	1. Same and discharged 2. Improved and discharged 3. Death 4. Same and not discharged 5. Improved and not discharged 6. Worsened and discharged 7. Worsened and not discharged	

Annex B- Amharic version of consent

የመረጃ ሰብሳቢው ስም _____ ፊርማ _____ ቀን _____

የሱፐርቫይዘር ስም _____ ፊርማ _____ ቀን _____

1. የመጠይቁ ቁጥር _____
2. የታካሚ ካርድ ቁጥር _____

ስሜ _____ ይባላል። ደ/ር አበባ የሺጥላ ለ ውስጥ ደዌ ህክምና እስፔሻሊቲ ትምህርት ማሟያ ለሚያደርጉት ጥናት የመረጃ ሰብሳቢ ሆኜ በመሰራት ላይ እገኛለሁ። ጥናቱ የሚካሄደው በጅማ ዩኒቨርሲቲ የውስጥ ደዌ ህክምና ክፍል እና በድንግትኛ ክፍል ተገኝተው በሚታከሙ ታካሚዎች ላይ ሲሆን፤ በ ደም ውስጥ የሚገኝ የሶዲየም መጠን እጥረት፣ ተያያዥ የጤና ሁኔታዎችና የችግሩ መጠን ላይ ያተኩራል። ይህ ጥናት ከደም ውስጥ የሶዲየም መጠን ማነስ ጋር ተያይዞ የሚፈጠር የጤና እክልን በተመለከተ የሚታዩ ክፍተቶችን ለመመላለስ ይረዳል ። በዚህ ጥናት ውስጥ ለመሳተፍ ፍቃደኛ ከሆኑ ከርሶ ጋር ማደርገው ቃለ ምልልስ ከ 30-45 ደቂቃ ይፈጃል። ከ ቃለ መጠይቁ ጎን ለጎን የደሞን የሶዲየም መጠን ለማወቅ ይረዳን ዘንድ ከ 2-3 ሚሊ-ሊትር ደም በ ላቦራቶሪ ባለሙያ ይወሰዳል። ምርመራው በ ሆስፒታሉ ውስጥ በተደጋጋሚ ከሚሰሩ የምርመራ አይነቶች አንዱ ሲሆን የደም መድማት አገልግሎት እና የሰውነት መቆጣት እጅግ አልፎ አልፎ ሊፈጠር ይችላል። በዚህ ጥናት ውስጥ የሚሰጡት ማንኛውም መረጃ ሚስጥራዊነቱ የተጠበቀ ሲሆን ቃለ ምልልሱን ከጀመሩ በኋላ በማንኛውም ሰዓት ማቋረጥ ይችላሉ። በጥናቱ ለመሳተፍ ፍቃደኛ ናት?

- 1.አዎ (ወደ ቀጣዩ ጥያቄ እለፍ)
2. አይደለሁም (ጥያቄህን አቁም)

Annex C- Afan Oromo version of consent

Maqaan ko _____ jedhama. Dr abbebaa Yeshixilaa banoota wal’aansa dhibee keessoo xumuruuf qorannoo godhaniif, odeeffanno/daataa walitti qabuuninchojjachaa jira. Qorannichii kan adeemsifamu jimmaa yuniversiitii kutaa wal’aansa dhibee keessoo fi kuraa dhibee tasaa wal’aanamtoota ciisanii yaalamanirratti yeroo ta’u, hanga hir’ina soodiyeemii dhiiga keessatii argamu haala fayyaa kanaan wal qabatu fi sadarkaa rakkinicha irratti xiyyeeffaata. Qorannoon kun hamma hir’ina soodiyeemii dhiiga keessaatiin wal qabatee rakkoo fayyaa muudatu ilaalchisee hanqina mul’atan guutuuuf gargaara. Qorannoo kanarratti hiemaachuun fedhii keessan yoo ta’e gaaffii fi deebiin ani isin waliin godhu daqiiqaa 30-45 fudhata. Gaaffii fi deebii cinaatti hamma soadiyeemi dhiiga keessanii beekuuf, ogeessi laaboraatoorii dhiiga 2-3 ml isinirraati fudhata. Qorannoon kun dosa qorannoo irra deddebiin hospitaalicha keessatti godhaman keesaaa tokko yeroo tahu, dhiigni dhiiguu, infekshinii/faalamnii fi qaamni hori’uun (adanyoo) darbee darbe uumamuu danda’a. Qorannoo kana keessatti odeffannoon kennitan hudiicciitiin kan qabu yeroo kamittiyyuu addaan kutuun ni danda’ama. Qorannicha irratti hirmaachuun fedha keessanii?

- 1.Eeyee (gara gaaffii itti aanuutti darbi)
2. Lakki (gaaffii ke dhaabi)

Annex D- List of medications that cause hyponatremia¹

- acetazolamide
- amiloride,
- amphotericin,
- aripiprazole,
- atovaquone,
- thiazide diuretics,
- amiodarone,
- basiliximab,
- angiotensin II receptor blockers,
- angiotensin-converting enzyme inhibitors,
- bromocriptine,
- carbamazepine,
- carboplatin,
- carvedilol,
- celecoxib
- cyclophosphamide,
- clofibrate,
- desmopressin,
- donepezil,
- duloxetine,
- eplerenone,
- gabapentin,
- haloperidol,
- heparin,
- hydroxyurea,
- indapamide,
- indomethacin,
- ketorolac,
- levetiracetam,
- loop diuretics,
- lorcainide,
- mirtazapine,
- mitoxantrone,
- nimodipine,
- oxcarbazepine,
- opiates,
- oxytocin,
- pimozide,
- propafenone,
- proton pump inhibitors,
- quetiapine,
- sirolimus,
- ticlopidine,
- tolterodine,
- vincristine,

- selective serotonin reuptake inhibitors,
- sulfonylureas,
- trazodone,
- tolbutamide,
- venlafaxine,
- zalcitabine,
- zonisamide.

1. Li RM, Wang C, Liu ZW, Zhao B. A case of severe hyponatremia induced by duloxetine and ziprasidone. *Chin Med J (Engl)*. 2012 Oct. 125(20):3750-1. [\[Medline\]](#).