Patterns of Sexual Assault victims presenting to the University Teaching Hospital in Lusaka, Zambia: a Cross-Sectional Study

Kaunda E., Ahmed Y. and Vwalika B.

Department of Obstetrics and Gynaecology; University of Zambia, School of Medicine, Lusaka, Zambia

Address of Correspondence:

Eugine Kaunda, University of Zambia, School of Medicine Department of Obstetrics and Gynaecology
P.O Box 50110, Lusaka. Phone: +260 977523551 Email: eugk2013@gmail.com

ABSTRACT

Background: Sexual assault, which encompasses defilement and rape, is a public health and public safety problem with the majority of victims being women and children. The consequences of sexual assault include physical injuries, psychological trauma, depression, suicide or suicidal attempt and post-traumatic stress disorder (PTSD) as a long-term consequence. Others are unwanted pregnancies and risk of acquiring sexually transmitted infections including the Human Immunodeficiency Virus (HIV). There is little information about the conditions under which sexual assault occurs. The aim of this study was to determine the patterns of sexual assault victims presenting to the University Teaching Hospital (UTH).

Materials and Methods: This was a cross sectional study that was carried out on sexual assault victims who presented to UTH over a period of four months from December 2013 to April 2014. A total of 160 participants were recruited, 59 from the Gynaecology admission ward (C03) and 101 from Paediatric Centre of Excellence Child Sexual Assault (PCOE-CSA). Participants were interviewed using an interviewer-administered questionnaire while some data was extracted from victims' files including documented HIV status. Frequency tables were constructed and characteristics of sexual assault compared between victims aged below 16 years and those aged 16 years and above. Data analysis was done using SPSS version 20.

Results: The age of 160 victims ranged from 2 to 34 years and the most affected age group was 11-15 years (n=91; 56.9%). Victims were mostly single (n=149; 93.1%), had attained primary education or none (n=102; 63.8%) were unemployed (n=149; 93.1%) and resided in high-density areas (n=144; 90%). Only 7.5% (n=12) of victims tested HIV positive. A positive HIV test occurred 14 times more frequently in victims aged 16 years and above (OR = 14.32, CI = 2.35 – 87.22, P-value < 0.01). Majority of the incidents took place in residential homes (n=110; 68.8%) and these were significantly less common among victims aged 16 years and above (OR = 0.33, CI = 0.11 – 0.98, P-value = 0.05). The majority of perpetrators were known to the victims (n= 119; 74.4%). Sexual assault perpetrated by strangers affected victims aged 16 years and above more than those aged below 16 years (50.0% versus 17.5%; P <0.01).About half of victims (n=84; 52.5%) reported to UTH within 72 hours of assault and these were 4.5 times more likely to be aged 16 years and above (OR = 4.53, CI = 1.23 - 16.73, P-value = 0.02). Genital injuries were present in 70% of victims. Absence of genital injuries was 8 times more in victims aged 16 years and above (OR = 8.46, CI = 2.78 – 25.77, P-value <0.01).

Conclusion: The majority of sexual assault victims were younger (<16 years). Younger victims were mostly assaulted by perpetrators known to them, mainly in residential homes while older victim were mostly assaulted by strangers in isolated places. Compared to older victims, younger victims presented more to UTH later than 72 hours following assault and sustained genital injuries more. Patters of sexual assault are therefore different in younger victims compared to adults.

Keywords: Sexual assault, Defilement, Rape, Zambia

INTRODUCTION

Gender Based Violence (GBV) including sexual violence is a problem throughout the world, Zambia inclusive. Sexual assault, which encompasses defilement and rape, is a public health and public safety problem with far reaching implications. Rape is the unlawful carnal knowledge of a woman without her consent or if consent is obtained by force or intimidation while defilement is the unlawful carnal knowledge of a girl under the age of sixteen years regardless of whether consent is obtained or not from the girl [8].

Sexual violence takes place within a variety of settings, including the home, the workplace, schools and the community. The causes of violence against women are not clearly understood, but associated factors include unequal status between men and women in communities, inadequate communication, violent upbringing among children, stress, poverty, and alcohol & drug abuse [3]. The consequences of violence against women and children can be immediate, short term or long term. They include physical injuries (genital and extra genital), psychological trauma such as anxiety, depression, sexual dysfunction, suicide or suicidal attempt and post-traumatic stress disorder (PTSD) as a long-term consequence. Others are unwanted pregnancies and risk of acquiring sexually transmitted infections including HIV and Hepatitis [4].

Given the substantial impact sexual assault has on individual victims and society, knowledge of the patterns of sexual assault victims in our communities can help in formulating strategies and policy decisions on how to minimize sexual assault cases. This study aims to narrow this information gap and contribute to community and family awareness as well as influence policy decisions on how to minimize sexual assault based on sound scientific evidence.

MATERIALS AND METHODS

This cross-sectional study included women and children who presented to the University Teaching Hospital (UTH) emergency gynaecological ward and Paediatric Centre of Excellence Child sexual Assault (PCOE-CSA) following sexual assault. The study took four months from December 2013 to May 2014 for participant recruitment and data entry.

Convenience sampling was used on all sexual assault victims presenting to UTH to identify those who met the inclusion criteria. Using the prevalence formula, with expected prevalence of 10% from Police Victim Support Unit (VSU) figures and adjusting for non-response rate at 15%, sample size was calculated to be 160.

Data was collected using an interviewer-administered questionnaire and by checking in the medical records to extract data related to HIV test results and presence or absence of genital injuries.

A univariate analysis of independent variables was done. Descriptive results are presented as percentages and means (with 95% confidence intervals). The Chi-squared test was used for comparison of proportions between groups accordingly. The relationship between study variables and age group category was examined using logistic regression.

All statistical procedures were done using SPSS for Windows Version 20. Significance level of $P<0.05$ was set as statistically significant

The University of Zambia Biomedical Research Ethics Committee (UNZABREC) approved this study.

RESULTS

A total of 160 victims of sexual assault were recruited to participate in the study between 16th December 2013 and 15th April 2014. Out of the 160 victims, 36.9% (n = 59) were recruited from the gynecology admission ward (C03) while 63.1% (n = 101) were recruited from the Paediatric Center of Excellence Child Sexual Assault (PCOE-CSA). Figure 1 shows the age distibution of victims. The age of victims ranged from 2 to 34 years of age while the mean age was 14 years.

The most affected age group was between 11 and 15 years of age 56.9% (n = 91). Victims aged less than 16 years constituted 75% (n=120) while those aged 16 years and above constituted 25% (n=40).

Table 1 shows the Socio-demographic characteristics of victims.The victims were mostly female 97.5% (n = 156) while male victims constituted only 2.5% (n = 4). All the 156 female victims were sexually assaulted by male perpetrators. On the other hand, two of the male victims were sodomised by male perpetrators while the other two were indecently assaulted by female perpetrators. The majority of victims (n=144; 90%) resided in high density residential areas such as shanty compounds and peri-urban areas. The majority of the Victims were found to be single (n=149; 93.1%). Those who were married constituted 4.4% (n=7) while those who were divorced or separated constituted 2.5%

(n=4).Almost half of the victims were either in primary school or had attained only primary school education (n=77; 48.1%). Those who were either in secondary school or had reached secondary school constituted 36.3% of victims (n=58). None of the victims had reached tertiary level of education while 15.6% (n=25) had not been to school at all. The majority of victims were unemployed (n=149; 93.1%), 5.6% (n=9) were in informal employment and only 1.3% (n=2) were in formal employment. All the victims or parents/ guardians in case of children were Christians (100%; n=160).

Table 2 shows comparison of study variables between age groups <16 and ≥ 16 years.Sexual assault incidents mostly took place in residential homes (n=110; 68.8%) and mostly occurred in the night (n=95; 59.4%).Sexual assault occuring in residential homes was one and half times more common among victims aged less than 16 years.In victims aged 16 years and above, the frequency of a positive HIV test was nine times higher.Sexual assault in victims who had taken alcohol and other drugs prior to sexual assault occurred three times more common in victims aged 16 years and above.

There were group differences in perpetrator characteristics, stranger perpetrators were twice more frequently associated with crimes against victims aged 16 years and above while intimate partners werefour and half more frequently associated with crimes against victims aged less than 16 years. In terms of self-protective actions by victims, fighting back by victims occurred seven times more frequently in victims aged 16 years and above. In terms of presentation to UTH following sexual assault, victims aged less than 16 years twice less frequently presented within 72 hours of sexual assault. Genital injuries were found twice more frequently in victms aged less than 16 years.

DISCUSSION

In this cross-sectional study at a tertiary referral hospital in Lusaka, Zambia, we found that the majority of sexual assault victims were single (93.1%). This is largely due to the fact that majority of the victims were below the age of 18 years (83.12%; n=133), which is the legal age of marriage in Zambia. This finding was similar to the findings in other parts of Africa [1]

A positive HIV test occurred nine times more frequently in victims aged 16 years and above. This finding may reflect the higher prevalence of HIV of 13% in adults aged 15-49 years compared to children aged below 15 years in the Zambian population[2]. Only 10% of victims reported condom use by the perpetrators. This finding is similar to what was found in Brazil, where 83% sexual violence occurred without condom use [7]. The low levels of condom use by the perpetrators put the majority of victims at risk of being infected with HIV and other STIs. Victims in the reproductive age group were also at risk of unwanted pregnancies as a result of this low condom use by the perpetrators.

The majority of victims reported penile-vaginal penetration (n=152; 95%). Other forms of penetration such as oral and anal were very rare. This is similar to what was found in Brazil where crimes involving vaginal penetration occurred in 91.9% of the cases [7]

Most of the sexual assaults occurred in residential homes (68.8%) while 23.1% occurred in the bush or other isolated areas. In Alaska, an even higher figure (86%) was found for sexual assaults that occurred in private residences [3].Sexual assault occuring in residential homes was one and half times more common among victims aged less than 16 years while incidents that took place in isolated places like the bush were more common in victims aged 16 years and above (52.50% versus 25.80%; P <0.01). This may be explained by the fact that younger victims are dependent on older people for their care and they usually stay at home where perpetrators mostly known to them pounce on them while older victims become vulnerable when they find themselves in isolated places like the bush where strangers attack them. Sexual assault perpetrated by strangers affected victims aged 16 years and above more than those aged below 16 years (50.00% versus 17.50%; P <0.01). This finding is similar to what was found in USA were 68% of the victims knew their assailant [3] and in Nigeria where 79.6% of the victims knew their assailants[1]However, another study in Nigeria found that the identity of the assailant was only known in 31.8% of the cases [6]

Genital injuries were present in 70.0% of victims. The injuries were mostly bruises, swellings, abrasions and lacerations. Genital injuries were found twice more frequently in victms aged less than 16 years. These findings may be due to the fact that the majority of victims aged 16 years and above were likely to be sexually active thereby reducing the chances of genital injury following sexual assault. On the other hand, victims aged below 16 years who mostly had not attained puberty were less likely to be sexually active, making their genital tract very susceptible

to injury following sexual assault. Similar results were found in USA where genital injuries were found in 66% of sexual assault victims who had an acute examination [3]

CONCLUSION

The majority of sexual assault victims were young, single and largely unemployed, residing in high-density areas. A significant portion of the cases was associated with acts of unprotected vaginal penetration, implying risk of unwanted pregnancy and STIs including HIV. Younger victims were mostly assaulted by perpetrators known to them, mainly in residential houses while older victim were mostly assaulted by strangers in isolated places. Compared to older victims, younger victims sustained genital injuries more. Patters of sexual assault are therefore different in younger victims compared to adults.

ACKNOWLEDGEMENTS

This paper is based on data for my dissertation, which was submitted in partial fulfillment for the award of the Master of Medicine degree in Obstetrics and Gynaecology. I am therefore grateful to my supervisors Dr. BellingtonVwalika and Dr. Yusuf Ahmed, my research assistants at C03 ward and PCOE-CSA and all the sexual assault survivors who participated in this study.

REFERENCES

1. Andeleke NA, Olowookere AS, Hassan MB et al.2012. Sexual assault against women at Osogbo South Western Nigeria. Nigerian Journal of Clinical Practice,15(2), pp. 190-193.
2. Central Statistical Office (CSO) [Zambia] and Macro International Inc. 2009. Zambia Demographic and Health Survey2014: Key Findings. Calverton, Maryland, USA: CSO and Macro International Inc.
3. Christopher PK, Christine HL, Tara D et al. 2007. The Campus Sexual Assault (CSA) Study Report. Washington DC: National Institute of Justice.
4. Drezett J, Pedroso D, Vertamatti MA et al. 2012. Pregnancy resulting from sexual abuse: reasons alleged by Brazilian women for carrying out the abortion – pregnancy and violence. HealthMED, 6:819–825
5. Dunkle KL, Jewkes RK, Brown HC et al.2002. Prevalence and patterns of gender-based violence and re-victimization among women attending antenatal clinics in Soweto, South Africa. American Journal of epidemiology, 160(3), pp. 230-239.
6. Ekabua JE, Agan TU, Iklaki CU et al.2006. Risk factors associated with sexual assault in Calabar South Eastern Nigeria.Nigerian Journal of Medicine, 15(4), pp. 406-408.
7. Marcia B, Jefferson D, Maria A et al. 2014. Characteristics of sexual violence against adolescent girls and adult women.BMC Women's Health, 14(14), pp. 1472-1476.
8. The Republic of Zambia. (No date). Zambian Penal Code, Chapter 87 (Amendment Act number 15 of 2005)(online). Lusaka: Ministry of Justice. Available at: http://www.parliament.gov.zm/downloads/VOLUME%207.pdf (Accessed: 23 June 2013).

Figure 1: Age distribution of victims

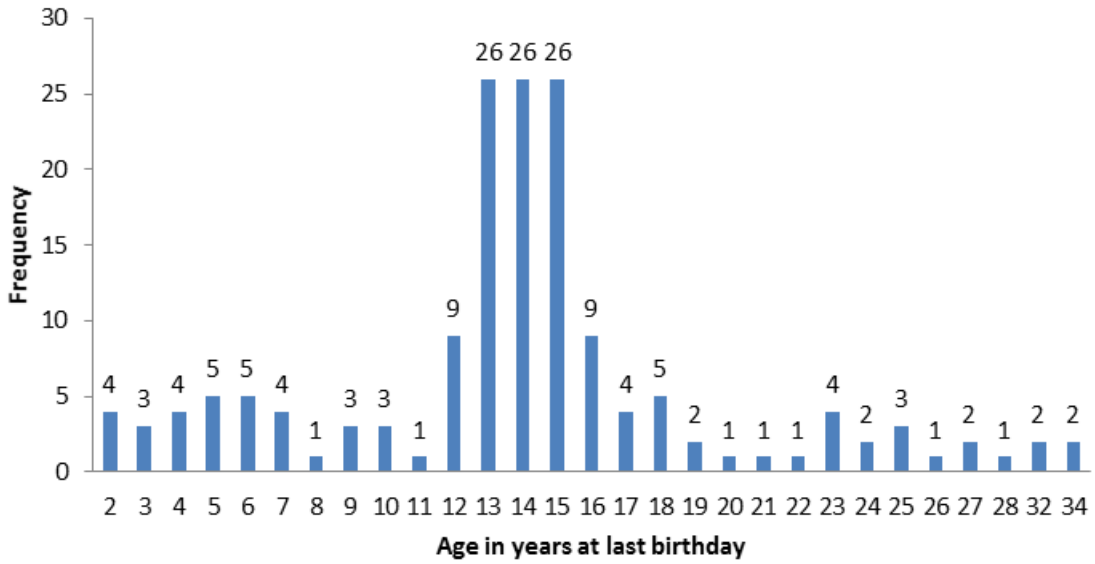

Table 1: Socio-demographic characteristics of victims

Characteristics		***Frequency (n)***	***Percentage (%)***
Age (years)	<2	0	0
	2-5	16	10
	6-10	13	8.1
	11-15	91	56.9
	16-20	21	13.1
	>20	19	11.9
Sex	Female	156	97.5
	Male	4	2.5
Marital status	Single	149	93.1
	Married	7	4.4
	Widowed	0	0
	Divorced	4	2.5
Current/ highest education level	None	25	15.5
	Primary	77	48.1
	Secondary	58	36.4
	Tertiary	0	0
Occupation	Unemployed	149	93.1
	Informal	9	5.6
	Formal	2	1.3
Religion	Christian	160	100
	Other	0	0
Residence	High density	144	90
	Low density	16	10
HIV test result	Positive (+)	12	7.5
	Negative (-)	147	91.9
	Declined	1	0.6
Total		**160**	**100**

Table 2: Comparison of study variables with age groups <16 and ≥ 16 years

Variable	AGE < 16 years (n = 120)		AGE ≥ 16 years (n = 40)		P-value
	n	%	n	%	
HIV Test Result					
Positive	3	2.50%	9	22.50%	< 0.01
Negative	116	97.50%	31	77.50%	
Place of assault					
Residential home	89	74.20%	19	47.50%	< 0.01
Other	31	25.80%	21	52.50%	
Time of assault					
Morning	10	8.50%	6	15.00%	0.23
Afternoon	38	32.50%	8	20.00%	
Night	69	59.00%	26	65.00%	
Drugs					
None	110	91.70%	29	72.50%	< 0.01
Alcohol / drugs	10	8.30%	11	27.50%	
Lossof conscious					
No	118	98.30%	36	90.00%	0.04
Yes	2	1.70%	4	10.00%	
Relationship					
Intimate partner	41	34.20%	3	7.50%	< 0.01
Acquaintance	46	38.30%	14	35.00%	
Relative	12	10.00%	3	7.50%	
Stranger	21	17.50%	20	50.00%	
# of Perpetrators					
One	116	96.70%	35	87.50%	0.04
More than one	4	3.30%	5	12.50%	
Weapon use					
None	114	95.00%	36	90.00%	0.27
Yes	6	5.00%	4	10.00%	
Condom use					
Yes	13	10.80%	3	7.50%	0.73
No/ Don’t know	107	89.20%	37	92.50%	
Self-protection					
None	86	71.70%	15	37.50%	< 0.01
Screamed for help	28	23.30%	11	27.50%	
Fought back	6	5.00%	14	35.00%	
Type of Exam					
Acute	52	43.30%	31	77.50%	< 0.01
Non-acute	68	56.70%	9	22.50%	
Genital Injures					
Absent	24	20.00%	24	60.00%	< 0.01
Present	96	80.00%	16	40.00%	

Changes in selected electrolytes in adult intensive care patients at the University Teaching Hospital, Lusaka, Zambia

Sheyo N[1], Vwalika B[2], and Kinnear J[3]

1. University of Zambia, School of Medicine, Department of Anaesthesia, P.O. Box 50110, Lusaka, Zambia and University Teaching Hospital, Department of Anaesthesia, P/B RW1X, Lusaka, Zambia
2. University of Zambia, School of Medicine, Department of Obstetrics and Gynaecology, P.O. Box 50110, Lusaka, Zambia
3. Anglia Ruskin University, Head of Anglia Ruskin School of Medicine, Michael Salmon Building, Bishop Hall Lane, Chelmsford | CM1 1SQ

Address of Correspondence:
Dr Ninza Sheyo; University Teaching Hospital, Department of Anaesthesia, P/B RW1X, Lusaka, Zambia.
Phone: +260 96 744 0748; E-mail: ninza.sheyo@gmail.com

ABSTRACT

Background: The importance of regulating electrolyte levels is well recognized in most Intensive Care Units (ICU). Various institutions across the globe have found varying figures on the extent and causes of electrolytes derangements in ICUs. The extent of electrolyte and fluid imbalance in patients being admitted and already admitted to the Main ICU (MICU) at the University Teaching Hospital (UTH) Lusaka Zambia is unknown.

This study aimed to explore the 24hour changes in sodium and potassium in adult MICU patients at the UTH, Lusaka, Zambia.

Methods: This was a prospective cohort study of the patients admitted to the MICU at UTH, Lusaka, Zambia. Data was collected over a four-month period (August to November) in 2017. Only consenting patients 18 years and above admitted for at least 24 hours in the unit were enrolled. On admission routine baseline investigations were obtained from every patient which included a full blood count and renal function tests. The second set of investigations was collected 24 hours post MICU admission. The blood samples were obtained from a peripheral vein in heparinized bottles for renal function tests. Serum electrolyte analysis was done was at UTH. Normal serum concentrations of sodium and potassium were considered as 135-145mmol/l and 3.5 - 4.5mmol/L, respectively. Comparisons between means were done with the Wilcoxon signed rank test. Logistic regression analysis was used to investigate the relationship between dependent and independent variables. A p – value < 0.05 was considered statistically significant. Statistical analysis was performed with STATA 13 SE.

Results: A total number of 100 patients were included in this study with a mean age of 36.8 years (SD = 12.1). The mean value of sodium level was 136.7 (SD = 8.9) mmol/L and 139.0 (SD = 11.6) mmol/L, on admission and 24 hours post admission respectively. This difference in serum sodium level was shown to be statistically significant with a P-value = 0.0051. Hypernatremia was shown to be associated with an increased risk of death (p = 0.021) in the Unit with an odds ratio of 4.0 at 95% confidence interval of 1.3 to 13.8. Hyponatremia was the most prevalent electrolyte imbalance but was neither shown to be associated with mortality (P-value = 0.18) nor prolonged ICU stay (0.56) at 24 hours post admission. The mean value of potassium level was 4.2 (SD = 1.1) mmol/L and 4.3 (SD = 1.1), on admission and 24 hours post admission respectively. This difference was not statistically significant (P-value = 0.57).

Conclusion: There was astatistically significant change in serum sodium levels after 24 hours post admission but there was no statistically significant change in potassium. Hyponatremia was the most prevalent abnormality whilst hypernatremia had astatistically significant association with mortality. Therefore, electrolyte imbalances can occur as early as the first day of admission in ICU with fatal complications. Correcting electrolyte imbalances in MICU patients is an urgent necessity and should not be delayed.

Keywords: Hypernatremia, Hyponatremia, Hypokalaemia, Hyperkalaemia, Electrolytes

INTRODUCTION

Fluid and electrolyte balance are among the key physiologic processes in maintenance of body homeostasis, and plays very important roles in cellular function, myocardial function, neurological function, enzymatic function, tissue perfusion, oxygen delivery and acid base balance1. The Main Intensive Care Unit (MICU) at the University Teaching Hospital (UTH) is the largest ICU in the Republic of Zambia with a bed capacity of ten. Because of the limited bed capacity coupled with a high demand for critical care services, there is long waiting list for admission to the unit. Due to the high demand of critical cares services, patients need to be optimally treated for their life-threatening conditions and transferred out of the MICU as soon as possible. This involves timely diagnosis and treatment of electrolyte disturbances that the patientsare admitted with or acquires during the stay in MICU.

Various institutions and hospitals across the globe have found varying figures on the extent and cause of electrolytes derangements in Intensive Care Units1,11,12,13.However, at UTH, there is no data on electrolyte changes in patients admitted to MICU with deranged electrolytes or those who acquire iatrogenic electrolyte disturbances during their Intensive Care Unit stay.This is because studies of this nature have not yet been done in ICUs across Zambia. The situation has remained so despite several studies regionally and internationally that have shown that electrolyte and acid base disturbances are common in ICU.

This study was aimed to ascertain changes in selected electrolytes in patients admitted to the MICU at UTH Lusaka, Zambia.

METHODS AND MATERIALS

This was a prospective cohort study in MICU at UTH, Lusaka, Zambia. Data was collected between August and November 2017 from patients 18 years and above and admitted for at least 24 hours in MICU for any medical or surgical condition. Patients admitted for less than 24 hours and re-admissions were excluded. Informed consent was obtained from the patient, next of kin or the Senior Medical Superintendent in case the patient is unknown or incapacitated. This clinical study was a consecutive case series with a random starting patient was picked who met the inclusion criteria then all eligible patients thereafter. A sample size of 100 was calculated based on the prevalence formulae N=Z2 x P (1-P)/ (E) 2 assuming a regional prevalence rate (P) of 7%, Z statistic=1.96(95% CI) and confidence interval (E) of 0.05.The patients were recruited in the order in which they were identified by meeting the inclusion criteria. The patients were enrolled upon admission to MICU and followed up until either their transfer to the ward or death within the Unit. The first panel of investigations was collected upon admission to MICU. This data was obtained from the routine baseline investigations obtained from every patient admitted to the Unit which included a full blood count, renal function tests and liver function tests. The second set of investigations was collected 24 hours post admission to MICU. This set of investigations are part of the daily routine investigations of patients in a well-equipped institution. The blood samples were obtained from a peripheral vein in EDTA bottles for full blood count and heparinized bottles for renal function tests. The samples were analysed from the UTH main laboratory. Serum electrolytes were analysed using the Beckman CoulterAU480 analyser serial: 2013102691machine manufactured in 2013, Mishima, Japan. Ethical approval was sought from the University of Zambia Research Ethics Committee and granted on 28th November 2016. Ethical clearance number: UNZABREC (REF. NO.006-10-16). In addition, the patient's co-morbidities, fluid balance sheet, and medications were obtained and entered together with the panel of investigations. Together this data was entered into a data collection sheet. The data collected was then computed into an excel spread sheet. Data from excel spread sheet was imported into STATA special edition 13.0 for statistical analysis. The data was summarized and expressed as mean, median and standard deviation.

Comparisons between means were done with paired t-test and non-parametric data with the Wilcoxon signed rank test. Logistic regression analysis was used to investigate the relationship between dependent(Mortality and Prolonged ICU stay)and independent(Electrolyte abnormalities) variables. A p – value < 0.05 was considered statistically significant.

RESULTS

A total number of one hundred (100) patients were included in this study with a mean age of 36.8 (SD = 12.1). The majority of patients were males 55 (55%) and in the age group of 18 to 73 years. The females were 45 (45%) and in the age group of 20 to 70 years. The average length of stay was 5.5±4.7 days in MICU until death/transfer to other wards. Of the total admission, 52% were transferred to other wards whilst 48% died in the unit. The mean value of sodium level was 136.7 (SD = 8.9) mmol/L and 139.0 (SD = 11.6) mmol/L, on admission and 24 hours post admission respectively. This difference in serum sodium level was statistically significant with a P-value = 0.005. The mean value of potassium level was 4.2 (SD = 1.1) mmol/L and 4.3 (SD = 1.1), on admission and 24 hours post admission respectively. This difference was not statistically significant (P-value = 0.57). However, there were significant changes in hypernatremia, hypokalaemia, and hyperkalaemia in the first 24 hours with p -values less than 0.001 for all three abnormalities.

Logistic regression was done separately for mortality as an outcome and prolong ICU stay as an outcome. Hypernatremia was shown to be associated with an increased risk of death (p = 0.015) in the Unit with OR: 4.30 (95% CI, 1.3 - 13.9). However, hypernatremia was not shown to be associated with prolonged stay (P = 0.44) in MICU. Hyponatremia was neither shown to be statistically associated with mortality (P = 0.21) nor prolonged Intensive Care Unit stay (P = 0.56) at 24 hours post admission. Neither hypokalaemia (p = 0.29) nor hyperkalaemia (p = 0.07) were associated with mortality at 24 hours post admission and there was no association with duration of stay in the unit, hypokalaemia (P = 0.09) and hyperkalaemia (P = 0.49).

DISCUSSION

In this study, the most prevalent electrolyte abnormality at the point of admission was hyponatremia (36%) followed by hyperkalaemia (28 %), hypokalaemia (24%) and the least was hypernatremia (13%). 24 hours post admission in the intensive care unit, there was no significant changes in potassium levels. However, there were significant changes in sodium levels with the notable change in patients with hypernatremia. There was a significant increase in the number of patients with hypernatremia by almost twice the number at 24 hours from the number recorded at admission. This reflects the study by Polderman2 that "hypernatremia is an indicator of quality of care in Intensive Care Unit". One explanation for this blood picture is possible dehydration resulting from the high incidence of patients not fed orally (65%) in the first 24 hours of admission2. This was mostly in surgical patients whose treatment plan required them to be zero per oral. Other losses may be related to active nasogastric or oral gastric tubes3. Hypernatremia may also be due to increased losses from the kidneys due to renal impairment in critically ill patients coupled with reduced water intake4,5. In medical patients, the commonest reason for not feeding or giving fluids orally was an active nasogastric or orogastric tubes6. The unit doesn't have a clear policy or guideline at which volume of aspirate should lead to restrictions of oral feeds and fluids. This might result in patients being starved and fluid restricted unnecessarily. Fluid replacement is key in maintaining fluid balance5. In MICU, there are only two working infusion pumps against ten patients in the unit. This poses a challenge in replacing fluids and titrating fluids as prescribed in MICU resulting in the developing of hypernatremia. Rosner5 stated that hypernatremia in the Intensive Care Unit is often iatrogenic and due to inadequate free water replacement of ongoing water losses.

Normal saline was a commonly used crystalloid in MICU despite having a high concentration of sodium and a tendency of causing hyperchloremic acidosis6. This could be the cause of hypernatremia in certain patients with impaired homeostasis7. In this study hypernatremia was also shown to be associated with poor outcome (mortality) but not with prolonged ICU stay. The unadjusted OR: 3.99 (95% CI, 1.2 – 6.3) of mortality within 24 hours of admission with sodium level >145 mmol/L. Rosner5 demonstrated that "hypernatremia present on admission or developing in ICU is an independent risk factor for poor prognosis". This was earlier documented by Bagshaw8 that "hypernatremia in hospitalized patients is iatrogenic and may contribute to serious morbidity and increased risk of death". Another study showed that "the development of hypernatremia is associated

with adverse outcomes for patients developing hypernatremia in the ICU and hypernatremia could potentially be used as an indicator of quality of care in the medical ICU"9.

There was a slight decrease in the patients with hyponatremia, but it remained the second most common electrolyte abnormality at 24 hours post admission. Dammon10 reported findings that "there is a high prevalence of dsynatraemias at ICU admission and that even mild to moderate abnormal concentrations are risk factors for ICU mortality". Despite being the most prevalent electrolyte abnormality, hyponatremia was not associated with mortality and prolonged ICU stay. This result is unlike the studies by Rosner5 and Bagshaw8 which showed an increased risk of mortality in patient with hyponatremia. This disparity can be due to the reduction in the number of patients with hyponatremia 24 hours post admission. The high frequency of hyponatremia can be attributed to administration of hypotonic fluids (5% dextrose and 10% dextrose) and impaired water secretion and retention6.

The increase in incidence of hyperkalaemia after admission can be explained by the pre – existing renal failure or indeed the developing renal failure with delay in dialysis5,7. Prevalence of hypokalaemia remained the same. Patients with hypokalaemia were postoperative patients for abdominal pathologies such as peritonitis and bowel obstruction9. Other patients with hyponatremia were on medical treatment with beta – blockers, insulin and adrenaline1. In this study hyponatremia, hypokalaemia and hyperkalaemia were all not shown to be associated with either poor outcome or prolonged duration of stay. This lack of statistical significance is probably a consequence of the weakness in the sample size of this study, or the degree of change in electrolyte in a 24-hour period may not have produced significant disturbances to support the already existing literature. Further research may need to be done with a larger sample size and to compare the changes at subsequent times e.g. 48 hours, 72 hours, or 5 days post admission.

As stated by Balci1 fluid and electrolyte balance are one of the key issues in maintaining homeostasis in the body, and it also plays important roles in protecting cellular function". Therefore, a change in serum electrolytes in the various fluid compartments can result in impairment of cellular function and homeostasis. In the Intensive Care Unit, the patients are in a dynamic physiologic state which may rapidly deteriorate11. Hence, slight changes in the electrolyte and fluid status can have significant impact on the outcome and duration of stay in Intensive Care Unit if these patients are not appropriately and promptly managed9.

CONCLUSIONS

The results from this study shows that electrolyte and fluid disturbances can occur as early as 24 hours post admission into ICU. Therefore, electrolyte imbalances can occur as early as the first day of admission in ICU with fatal complications. Hyponatremia was the most prevalent abnormality in the patients admitted to the unit but there was a tendency of the blood picture to change towards hypernatremia as the patient stayed longer in the unit. There was a statistically significant change in serum sodium levels after 24 hours post admission but there was no statistically significant change in potassium level. Hypernatremia had a statistically significant association with mortality and therefore, correcting electrolyte imbalances in ICU patients is an urgent necessity and should not be delayed. We should therefore manage electrolytes better in ICU. Hence early treatment and correction of electrolyte disturbances can reduce the high mortality rate which currently stands at 48%.

DECLARATION OF INTEREST

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this article.

ACKNOWLEDGEMENT

This study was made possible with the support of Professor Bellington Vwalika and Professor John Kinnear. Their unreserved availability, advice, insightful criticisms, guidance, understanding and patient encouragement aided the writing of this thesis in innumerable ways. I would also like to thank Dr Dylan Bould whose steadfast support of this thesis was greatly needed and deeply appreciated.

REFERENCES

1. Balci AK, Koksal O, Kose A, Armagan E, Ozdemir F, Inal T, et al. General characteristics of patients with electrolyte imbalance admitted to emergency department. World J Emerg Me.2013; 4(2): 113 -116.
2. Poldeman KH, Schreuder WO, Strack van schijndel RJ, Thijs LG. Hypernatremia in the intensive care unit; an indicator of quality of care. Rev Med Interne. 1999; 27(8): 1105-1108.
3. Hessels L, Hoekstra M, Mijzen LJ, Vogelzang M, Dieperink W, Lansink AO, Et al. The relationship between serum potassium, potassium variability and in-hospital mortality in critically ill patients and a before-after analysis on the impact of computer-assisted potassium control. Crit Care 2015; 19(1). 4.
4. Sedlacek M, Schoolwerth AC, Remillard BD. Electrolyte disturbance in the Intensive Care Unit. Semin Dial. 2006;19(6):496-501.
5. Rosner MH, Ronco C. Dysnatremias in Intensive Care Unit. ContribNephrol. 2010; 165: 292 - 298.
6. Perel P.Colloids versus crystalloids for fluid resuscitation in critically ill patients. Cochrane Database Syst Rev. 2013 Feb 28;(2):CD000567. doi: 10.1002/14651858. CD000567.pub6.
7. Sedlacek M, Schoolwerth AC, Remillard BD. Electrolyte disturbance in the Intensive Care Unit. Semin Dial. 2006;19(6):496-501.
8. Bagshaw SM, Townsend DR. Disorders of sodium and water balance in hospitalised patients. Can J Anaesth. 2009; 59(2): 151 - 159.
9. Lobo DN, Macafee DA, Allison SP. How perioperative fluid balance influences postoperative outcomes. Best Practice Res Clinical Anaesthesiology 2006; 20(3): 439 - 455.
10. Damon M, Diconne E, Souweine B, Ruckly S, Adrie C, Azoulay, et al. Prognostic consequences of borderline dsynatremia: pay attention to minimal serum sodium change. Crit Care. 2013; 17(1): R12
11. Kapoor d, Srivastava S, Singh P. Point of care blood gases with electrolyte and lactate in adult emergencies. Int J CritIllnInj Sci. 2014;4:216-222.
12. Stelfox HT, Ahmed SB, Khandwala F, Zygun D, Shahpori R. The epidemiology of intensive care unit-acquired hyponatraemia and hypernatremia in medical-surgical intensive care. Crit care 2008; 12: R16
13. Lee, J. W. Fluid and Electrolyte Disturbances in Critically Ill Patients. Electrolyte and Blood Pressure Press. 2010; 8(2): 72 - 81.

TABLES AND FIGURES

Chart 1: Flow chart of data management

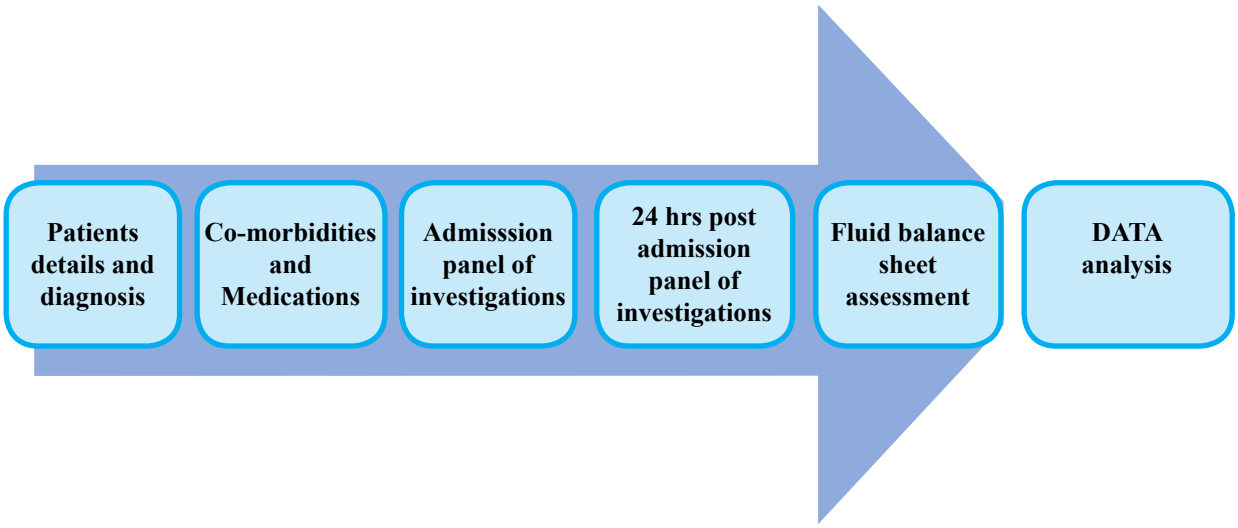

Table 1: **Demographics characteristics**

Age (Years)	Total	Gender	
		Male	Female
Percentage (%)	100	55(55%)	45(45%)
Mean	36.8	35.9	37.7
Median		34	35
Standard deviation	12.1	11.9	12.1

Table 2: Main Clinical variables

	0 hours	24 hours	P - value
Serum sodium level	136.7±8.9	139.0±11.6	0.005
Serum potassium level	4.2±1.1	4.3±1.1	0.568
Serum sodium status	0 hours	24 hours	
Hyponatremia	128.6±5.4	127.7±7.3	
Normal	138.5±2.8	139.1±2.6	
Hypernatremia	142.3±7.2	155.6±9.0	
Serum potassium status	0 hours	24 hours	
Hypokalemia	3.1±0.4	3.0±0.5	
Normal	3.9±0.3	4.0±0.3	
Hyperkalemia	5.6±0. .8	5.5±0.9	

Table 3: Logistic regression results for increased risk of Mortality in MICU

Independent variables	Odds Ratio	[95% Conf. Interval]	P>|z|
Sodium			
Hyponatremia	0.5	0.1 - 1.4	0.210
Hypernatremia	4.3	1.3 - 13.9	0.015
Potassium			
Hypokalaemia	1.8	0.6 - 5.5	0.294
Hyperkalemia	2.5	0.9 - 6.7	0.074
Constant	0.5	0.2 - 1.1	0.079

Table 4: Logistic regression results for prolonged duration of Stay in MICU

Independent variables	Odds Ratio	[95% Conf. Interval]	P>|z|
Sodium			
Hyponatremia	0.8	0.3 – 2.0	0.559
Hypernatremia	1.6	0.5 - 4.8	0.446
Potassium			
Hypokalaemia	2.7	0.9 - 8.3	0.091
Hyperkalemia	1.4	0.6 - 3.5	0.485
Constant	1.1	0.5 - 2.3	0.799