

Evaluation of The Utilization of Parenteral Preparations for Fluid, Electrolyte and Nutrition Management in Two Tertiary Hospitals in Southeast Nigeria

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ABSTRACT

Background: In this era of ongoing identification and analysis of medical errors, fluid and electrolyte management has trailed behind the medical decisions that have immediate obvious adverse consequences. This predicament may reflect a lack of understanding of the importance of considering individual volume and electrolyte abnormalities as a separate variable that can significantly alter a patient course and outcome.

Objective: This study evaluated the utilization of parenteral preparations, fluids and electrolytes in two tertiary hospitals.

Method: The study was a cross sectional descriptive survey which utilized the folders/medical records of patients' that visited the hospitals within January 2017 and December 2018. Data was collected using structured observational check list for parenteral utilization, patient care and health facility indicators. Data regarding parenteral utilization was obtained from sampled medical records retrospectively and filled in structured check list accordingly with careful observation. The data was checked and analyzed using the SPSS software (ver. 20.0 for Windows, Inc., Chicago, IL, USA). Descriptive statistics of frequency, percentage, mean and standard deviation was used to summarize the data.

Result: The study revealed that 242 (100.0%) drugs were prescribed to various patients, including anti-microbial drugs 129(53.3%) and infusions 57 (23.6%) appearing as the most commonly prescribed medications which were found in the first two (2) drugs prescribed to patients in Chukwu Emeka Odimegwu Ojukwu University Teaching Hospital (COOUTH). Similarly, at Saint Charles Boromeo Hospital (SCBH), a total of 250 (100%) drugs were prescribed to various patients, including anti-microbial drugs 113(45.2%), infusions 68 (27.2%) and antimalarial 16 (6.4%) appearing as the most commonly prescribed medications which were found majorly in the first three (3) drugs prescribed to patients. At COOUTH, more generic drugs 214(88.1%) were prescribed than the branded drugs 29(11.9%). Similar trend occurred at SCBH, where higher number of drugs prescribed were generic 171(70) compared to branded prescriptions 74 (30.2). Chi-square test revealed significant association ($\chi^2 = 15.873$, $p = 0.001$) between total dosage frequency of drugs prescribed in both hospitals. The relationship between total number of brands and generic prescription in both hospitals was significant ($\chi^2 = 9.765$, $p = 0.002$).

Conclusion: The generic prescription practices of parenteral drugs was prevalent in the two hospitals. Parenteral preparations were frequently used in the two hospitals.

Introduction

Background

Parenteral nutrition is the intravenous administration of a nutritionally balanced and physicochemical stable sterile emulsion or solution. It is indicated when the GIT is inaccessible, inadequate or inappropriate to meet the patients on going nutritional needs or gut rest is indicated. Parenteral nutrition (PN) is a complex therapy containing more than 40 components, including dextrose, amino acids, fat emulsions, water, electrolytes, trace elements, and vitamins. To order PN appropriately, clinicians need to have a good understanding of body composition, fluid balance, electrolyte assessment, and acid-base balance. Human cells consist of 65% to 90% water, water and solutes pass through cell membranes both actively and passively, specific fluid and electrolyte concentrations are necessary in order for cell metabolism to occur, and these balances are affected by different stresses including trauma, surgery, and critical illness [1-4]. While fluid loss both measurable and insensible, occurs with these stressors, replacement and maintenance fluids are commonly administered without consideration of specific patient needs. Protocols and order sets allow for one size fits all fluid management that, though the time efficient, may not optimize patient recovery and may be detrimental. A patient fluid and electrolyte status affects all organ systems. Improper dosing can exacerbate already injured systems. The human body in a state of wellness has a remarkable capacity to make small and large adjustments in fluid and electrolyte intake and mobilization for specific needs. In a state of illness these compensatory mechanisms are disrupted, and recovery is dependent on restoration of an appropriate balance [4- 6].

Fluid, electrolyte, and nutrition management is important because most infants in a neonatal intensive care unit (NICU) require intravenous fluids (IVFs) and have shifts of fluids between intracellular, extracellular, and vascular compartments. Therefore, careful attention to fluid and electrolyte balance is essential. If inappropriate fluids are administered, serious morbidity may result from fluid and electrolyte imbalances. Inadequate attention to nutrition in the neonatal period leads to growth failure, osteopenia of prematurity and other complications. They are utilized to ensure an adequate delivery of calories and protein when patients are unable to take sufficient food by either the oral route or via feeding tube. PN is utilized in a variety of patient populations, including surgical patients, severely malnourished patients, and the critically ill ones at intensive care unit. Nutritional support is a recognized determinant of outcome in critically ill patients. Development of critical care services in Nigeria has not been accompanied by certain appropriate ancillary support services such as adequate nutritional support [7-9]. Parenteral preparations is mostly prescribed for surgery and patients in intensive care units. In this era of ongoing identification and analysis of medical errors, fluid and electrolyte management has trailed behind the medical decisions that have

immediate obvious adverse consequences, perhaps because the effects of fluid mismanagement appear as multiple organ system failings that are attributed instead to progression of the underlying disease in the patient. This predicament may also reflect a lack of understanding of the importance of considering individual volume and electrolyte abnormalities as a separate variable that can significantly alter a patient course and outcome [8-9].

The evaluation of utilization of parenteral preparations in the aforementioned health facilities have not been carried out as no previous published literature were found. The study therefore, seeks to document a comprehensive parenteral utilization report of the health facilities and generate evidence-based information for intervention studies, and add to knowledge in promoting value based services, resource allocation, planning and better health care service delivery in our health facilities. This study evaluated the utilization of parenteral preparation for fluid electrolyte and nutrition, and document information for interventions and policy.

Methods

Study Location and Study Site

The study was carried out in two hospitals in Anambra State namely; St Charles Borromeo Hospital Onitsha, and Chukwuemeka Odumegwu Ojukwu University Teaching Hospital (COOUTH), Awka. St Charles Borromeo hospital is a mission hospital situated in the densely populated town called Onitsha with approximately 120 beds capacity. Onitsha is the commercial nerve center of the state predominantly inhabited by businessmen, artisans, civil servants and traders. It is demarcated from on the western side by the River Niger. COOUTH is situated at Awka, the capital city of Anambra State with 15 Departments and a bed capacity of about 400. Both towns are located in the tropical rain forest belt of eastern Nigeria.

Study Population

The study was carried out using eligible folders that met the inclusion criteria for in-patients who were admitted in the hospitals as inpatient within January 2017 and December 2018.

Sampling Method

All the eligible folders that met the inclusion criteria in the medical wards, surgical wards, and accident and emergency units were utilized to increase reliability.

Data Collection and Assessment of Collected Data

Data was collected using structured observational check list for parenteral utilization, patient care and health facility indicators. Data covering parenteral utilization was obtained from medical records retrospectively and filled in structured check list accordingly with careful observation.

Study Period

The study lasted from March 2018 to October 2018.

Statistical Analysis

The data was checked, cleansed and analyzed using the SPSS software program version. Descriptive statistics frequency, percentage, means and standard deviation was used to summarize the data.

Inclusion Criteria

- a) All folders/patient records with parenteral preparation that felled between the stated periods but were ineligible
- b) All the inpatients folders of patients that contained parenteral preparations.

Exclusion Criteria

- a) All folders/patient records that contains parenteral within the period which
- b) All folders containing other health devices and aids apart from parenteral.
- c) All patients that are not inpatients.
- d) Illegible Folders

Ethical Consideration

Ethical approval was obtained from the Research and Ethics Committee of Chukwuemeka Odumegwu Ojukwu University Teaching Hospital Nnewi before commencement of the study. Every form of patient’s identification was concealed in line with global best practices.

Results

Demographic characteristics of patients in Chukwuemeka Odumegwu Ojukwu University (COOUTH) and Saint Borromeo hospitals (SCBH) showed that 79 patients from COOUTH and 76 patients from SCBH that received various parenteral preparations for various ailments were selected for the study. At COOUTH, majority of patients (36, 45.6%) were between 21 -40 years with average age of 29.0 ± 5.8 years while 15 (19.0%) with average age of 48.7 ± 5.1 years were between 41 – 60 years as shown in Table 1. Table 2 showed the classes of parenteral drugs prescribed for various ailments at COOUTH and SCBH. Antihistamines was the only un-prescribed class of medication at SCBH. There was no significant association in the distribution of various classes of medications in both hospitals, as revealed by Chi-square test ($\chi^2 = 11.063$, $p = 0.806$). Dosage frequency of drugs prescribed at COOUTH and SCBH. Chi-square test as shown in Table 3, revealed a statistically significant association ($\chi^2 = 15.873$, $p = 0.001$) between total dosage frequency of drugs prescribed in COOUTH and SCBH as shown in Table 3. Table 4 indicated dosage duration of medications prescribed at COOUTH and SCBH. Dosage durations of total medications prescribed in both hospitals differed significantly as revealed by Chi-square ($\chi^2 = 34.748$, $p = 0.005$) between total dosage frequency of drugs prescribed in COOUTH and SCBH as shown in Table 4. Table 5 showed the categories of drugs prescribed at COOUTH and SCBH. In COOUTH, more generic drugs (214, 88.1%) were prescribed than the branded drugs (29, 11.9%). Similar trend occurred at SCBH, where higher number of drugs prescribed were generic (171, 70.0%) compared to branded prescriptions (74, 30.2%).

Table 1: Demographic characteristics of patients in Chukwuemeka Odumegwu Ojukwu University (COOUTH) and Saint Borromeo hospitals (SCBH) that were selected for the study.

Hospital	Category		n (%)
COOUTH n = 79	Age	<1year	13 (16.5)
		1-10 years	-
		11-20 years	5 (6.3)
		21 -40 years	36 (45.6)
		41- 60 years	15 (19.0)
		Above 60 years	10 (12.7)
	Gender	Male	43 (54.4)
		Female	36 (45.6)
	Hospital unit	SCBU	13 (16.5)
		Male and female medical wards	10 (12.7)
Surgical ward		7 (8.9)	
Emergency Department		49 (62.0)	
St. Charles Borromeo Hospital (SCBH) n = 76	Age	< 1 year	3 (3.9)
		1 -10 years	9 (11.8)
		11-20 years	12 (15.8)
		21-40 years	33 (43.4)
		41-60 years	12 (15.8)
		>60 years	7 (9.2)

	Gender	Male	38 (50.0)
		Female	38 (50.0)
	Hospital unit	Accident and emergency	15 (19.7)
		Female medical ward	14 (18.4)
		Female surgical ward	4 (5.3)
		Male medical ward	19 (25.0)
		Children's ward	13 (17.1)
		Labor/post-natal ward	11 (14.5)

Table 2: Class of drugs prescribed for various ailments at COOUTH and SCBH.

Hospital	Category	Drugs, n (%)					Total
		Drug 1	Drug 2	Drug 3	Drug 4	Drug 5	
COOUTH	Anti-microbial	30 (38.0)	46 (58.2)	34 (43.0)	13 (16.5)	6 (7.6)	129.0 (53.3)
n =79	Infusion	36 (45.6)	9 (11.4)	9 (11.4)	2 (2.5)	1 (1.3)	57.0 (23.6)
	Steroids	6 (7.6)	3 (3.8)	-	-	-	9.0 (3.7)
	Barbiturates	2 (2.5)	-	1 (1.3)	1 (1.3)	-	4.0(1.7)
	Bronchodilators	-	1 (1.3)	2 (2.5)	-	-	3.0 (1.2)
	Anti-malaria	-	2 (2.5)	1 (1.3)	-	-	3.0 (1.2)
	Analgesics	-	2 (2.5)	1 (1.3)	2 (2.5)	3 (3.8)	8.0 (3.3)
	Diuretics	2 (2.5)	1 (1.3)	1 (1.3)	2 (2.5)	1 (1.3)	7.0 (2.9)
	TNP	-	1 (1.3)	-	-	-	1.0 (0.4)
	Anti-ulcer	1 (1.3)	1 (1.3)	-	3 (3.8)	-	5.0 (2.1)
	Anti-histamines	-	-	-	1 (1.3)	-	1.0 (0.4)
	Anti-emetics	-	1 (1.3)	2 (2.5)	4 (5.1)	-	7.0 (2.9)
	Anti-spasmodic	2 (2.5)	1 (1.3)	1 (1.3)	1 (1.3)	1 (1.3)	6.0 (2.5)
	Vitamins	-	2 (2.5)	-	-	-	2.0 (0.8)
	Oxytocic	-	-	-	-	-	0.0 (0.0)
	Sedatives	-	-	-	-	-	0.0 (0.0)
	Anti-diabetics/Insulin	-	-	-	-	-	0.0 (0.0)
	Total						242.0 (100.0)
SCBH	Anti-microbial	24 (31.6)	32 (42.1)	26 (34.2)	26 (34.2)	5 (6.5)	113.0 (45.2)
n = 76	Infusion	33 (43.4)	11 (14.5)	11 (14.5)	6 (7.9)	7 (9.2)	68.0 (27.2)
	Steroids	2 (2.6)	3 (3.9)	4 (5.3)	-	-	9.0 (3.6)
	Barbiturates	1 (1.3)	-	1 (1.3)	-	-	2.0 (0.8)
	Bronchodilators	1 (1.3)	2 (2.6)	-	-	-	3.0 (1.2)
	Anti-malaria	2 (2.6)	9 (11.8)	5 (6.6)	-	-	16.0 (6.4)
	Analgesics	2 (2.6)	-	-	-	-	2.0 (0.8)
	Diuretics	6 (7.9)	3 (3.9)	2 (2.6)	4 (5.3)	-	15.0 (6.0)
	TNP	-	-	-	-	-	0.0 (0.0)
	Anti-ulcer	1 (1.3)	2 (2.6)	2 (2.6)	1 (1.3)	-	6.0 (2.4)
	Anti-histamines	-	-	-	-	-	0.0 (0.0)
	Anti-emetics	1 (1.3)	1 (1.3)	-	-	-	2.0 (0.8)
	Anti-spasmodic	1 (1.3)	1 (1.3)	-	1 (1.3)	-	3.0 (1.2)
	Vitamins	-	4 (5.3)	-	-	-	4.0 (1.6)
	Oxytocic	-	1 (1.3)	-	-	-	1.0 (0.4)
	Sedatives	2 (2.6)	-	1 (1.3)	-	2 (2.6)	5.0 (2.0)
	Anti-diabetics/Insulin	-	1 (1.3)	-	-	-	1.0 (0.4)
	Total						250.0 (100.0)

Table 3: Dosage frequency of drugs prescribed at COOUTH and SCBH.

Hospital	Dosage frequency	n (%)					Total
		Drug 1	Drug 2	Drug 3	Drug 4	Drug 5	
COOUTH n =79	Once	44 (55.7)	30 (38.0)	25 (31.6)	15(91.0)	10 (12.7)	124 (51.7)
	Twice	24 (30.4)	26 (32.9)	9 (11.4)	6 (7.6)	2 (2.5)	67.0 (27.9)
	Thrice	2 (2.5)	7 (8.9)	9 (11.4)	3 (3.8)	-	21.0 (8.8)
	Quad	9 (10.4)	6 (7.6)	8 (10.1)	5 (6.3)	-	28.0 (11.7)
	Total						240.0 (100)
SCBH n = 76	Once	27 (35.5)	21 (27.6)	11 (14.5)	9 (11.8)	3 (3.9)	71.0 (28.4)
	Twice	22 (28.9)	24 (31.6)	17 (22.4)	12 (15.8)	4 (5.3)	79.0 (31.6)
	Thrice	16 (21.1)	15 (19.7)	18 (23.7)	11 (14.5)	5 (6.6)	65.0 (26.0)
	Quad	11 (14.5)	10 (13.2)	6 (7.9)	6 (7.9)	2 (2.6)	35.0 (14.0)
	Total						250.0 (100.0)

Table 4: Dosage duration of medications prescribed at COOUTH and SCBH.

Hospital		Drug 1	Drug 2	Drug 3	Drug 4	Drug 5	Total
COOUTH n =79	1 day	26 (32.9)	23 (29.1)	15 (19.0)	8 (10.1)	4 (5.1)	76.0 (51.7)
	2 days	4 (5.1)	4 (5.1)	4 (5.1)	3 (3.8)	1 (1.3)	16.0 (10.0)
	3 days	5 (6.3)	7 (8.9)	7 (8.9)	1 (1.3)	-	20.0 (13.6)
	5 days	8 (10.1)	11 (13.9)	4 (5.1)	3 (3.8)	1 (1.3)	26.0 (17.7)
	6 days	-	-	-	-	-	0.0 (0.0)
	7 days	7 (8.9)	1 (1.3)	1 (1.3)	-	-	9.0 (6.1)
	Total						147.0 (100.0)
SCBH. Borromeo n = 76	1 day	24 (31.6)	17 (22.4)	10 (13.2)	11 (14.5)	4 (5.3)	66.0 (32.4)
	2 days	18 (23.7)	30 (39.5)	23 (30.3)	16 (21.1)	5 (6.6)	92.0 (45.1)
	3 days	6 (7.9)	5 (6.6)	11 (14.5)	6 (7.9)	1 (1.3)	29.0 (14.2)
	5 days	4 (5.3)	2 (2.6)	2 (2.6)	2 (2.6)	-	10.0 (4.9)
	6 days	-	1 (1.3)	-	-	-	1.0 (0.5)
	7 days	3 (3.9)	2 (2.6)	1 (1.3)	-	-	6.0 (2.9)

Table 5: Category of drugs prescribed at COOUTH and SCBH.

Hospital	Category	Drug 1 n(%)	Drug 2 n(%)	Drug 3 n(%)	Drug 4 n(%)	Drug 5 n(%)	Total n(%)
COOUTH n =79	Generic	75 (94.9)	62 (78.5)	43 (54.4)	23 (29.1)	11 (13.9)	214 (88.1)
	Brand	4 (5.1)	8 (10.1)	9 (1.4)	6 (7.6)	2 (2.5)	29 (11.9)
	Total						243.0 (100.0)
SCBH. Borromeo n = 76	Generic	60 (78.9)	52 (68.4)	32 (42.1)	19 (25.0)	8 (10.5)	171 (70.0)
	Brand	16 (21.1)	18 (23.7)	18 (23.7)	17 (22.4)	5 (6.6)	74 (30.2)
	Total						245.0 (100.0)
WHO recommended value for generic prescribing							100%

Chi-square test shown in Table 5, revealed a statistically significant association ($\chi^2 = 9.765, p = 0.002$) between total number of brands and generic prescription in COOUTH and SCBH. Ailments diagnosed at COOUTH and SCBH. Table 6 depicts frequency of various ailments diagnosed in COOUTH and SCBH. Prevalence of diagnosed ailments in COOUTH include; GIT disorders (19.0, 24.1%), Test of association using Chi-square revealed that there was a statistically significant different ($\chi^2 = 44.384, P = 0.001$) between

the distribution of various diseases in both hospital, as they did not follow the same trend in prevalence. In Table 7, combination of medications prescribed with infusion in COOUTH and SCBH showed that normal saline, dextrose water and metronidazole were the most commonly combined infusions with other medications in both hospitals. The trend in both hospitals were almost similar as test of association using Chi-square did not reveal significant difference ($\chi^2 = 11.880, p = 0.157$).

Table 6: List of ailments diagnosed at COOUTH and SCBH. CVS: cardiovascular system, CNS: central nervous system, GIT: gastrointestinal tract, TRA: road traffic accident

Hospital	Category	Frequency	Percentage (%)
COOUTH n =79	Malaria	9.0	11.4
	Diabetes	3.0	3.8
	Head injury and secondary degree RTA	1.0	1.3
	Asthma	4.0	5.1
	CNS disorders	2.0	2.5
	GIT disorders	19.0	24.1
	Fracture/bone injury	2.0	2.5
	CVS disorder/hypertension	5.0	6.3
	Liver diseases	1.0	1.3
	Kidney diseases	1.0	1.3
	Bruise/injury/burn/bleeding/wounds/bit	11.0	13.9
	Hypoglycemia	1.0	1.3
	Septicemia	6.0	7.6
	Cesarean Section	0.0	0.0
	Sickle cell diseases	2.0	2.5
	Postpartum hemorrhage	0.0	0.0
	Infertility	0.0	0.0
	Asphyxia	3.0	3.8
Others	6.0	7.6	
	Total	79.0	100.0
SCBH n = 76	Malaria	16.0	21.1
	Diabetes	2.0	2.6
	Head injury and secondary degree RTA	4.0	5.3
	Asthma	4.0	5.3
	CNS disorders	3.0	3.9
	GIT disorders	8.0	10.5
	Fracture/bone injury	3.0	3.9
	CVS disorder/hypertension	2.0	2.6
	Liver diseases	4.0	5.3
	Kidney diseases	2.0	2.6
	Bruise/injury/burn/bleeding/wounds/bit	8.0	10.5
	Hypoglycemia	3.0	3.9
	Septicemia	2.0	2.6
	Cesarean Section	6.0	7.9
	Sickle cell diseases	0.0	0.0
	Postpartum hemorrhage	4.0	5.3
	Others	3.0	3.9
	Infertility	2.0	2.6
Asphyxia	0.0	0.0	
	Total	76.0	100.0

Table 7: Individual parenteral medications prescribed at COOUTH and SCBH.

Hospital		Frequency (n)	Percentage (%)
COOUTH n =79	Normal saline	26	32.9
	Dextrose water	16	20.3
	Metronidazole infusion	31	39.2
	Vitamin C	0.0	0.0
	Vitamin B- Complex	10.0	12.7
	Mannitol,	5.0	6.3
	Dextrose saline	6.0	7.6
	TPN	1.0	1.3
	Ringer lactate	4.0	5.1
SCBH. Borromeo n = 76	Normal saline	30.0	39.5
	Dextrose water	28.0	36.8
	Metronidazole	39.0	51.3
	Vitamin C	1.0	1.3
	B. Complex	8.0	10.5
	Mannitol	8.0	10.5
	Dextrose saline	8.0	10.5
	TPN	0.0	0.0
	Ringer lactate	0.0	0.0

Discussion

The Use of Parenteral Preparation in The Hospitals

In view of the clinical relevance of using parenteral forms, evidenced in different studies, it is essential that they be administered adequately. A tool that contributes to this goal is the adoption of good intravenous therapy practices in healthcare services [10,11]. Infusions form an essential part of inpatients prescription especially in tertiary hospitals with critically ill patients. Good understanding of their utilization pattern will aid procurement and eliminate the out of stock syndrome especially in emergency situations [12,13]. Delays in rational use of infusions and parenteral preparations is usually associated with life threatening emergencies and fatalities [14,15]. The study suggested that infusions were predominantly prescribed in the two hospitals and was present in the first two drugs prescribed to patients. This was an indication that most of the hospitalized patients have either undergone surgery or were affected by varying cases of electrolyte imbalance. Among the infusions, antibiotic preparations were very common. Hence, the rationale for the frequent antibiotics' infusion prescription. This calls for antibiotic resistance stewardship. Most severely ill patients are placed on non-per-oral (NPO). Some other patients are emergency situation that required instant response that can by-pass the first pass metabolism especially in critical care. Emerging clinical studies suggest that patients in critical conditions benefit more from longer exposure of higher antibiotics especially at levels above the minimum inhibitory concentration (MIC) than results from in vivo and in vitro studies [16,17]. TPN is recommended for extended period in complications like pulmonary embolism [18].

Similarly, at SCBH, anti-microbial drugs, infusions and anti-malarial appeared as the most commonly prescribed medications found in majority and occurring within the first three drugs prescribed to patients. This suggests that malnutrition is a common problem in most hospitalized patients. Surgical patients with malnutrition have around three times more post-operative complications and four times greater risk of death than well-nourished patients with similar operations [19]. The outcome of the class of drugs frequently prescribed in the two hospitals indicated that parenteral antibiotics were the leading infusions in the two hospitals. This supports a study in Nigeria by Enwere et al. which reported high prescription of parenteral antibiotics [20].

Infusion Use and Prescription Practices in The Hospitals

Most of the infusions were predominantly administered either once or twice daily in the two hospitals. This is associated with the level of patients need and clinician's judgement and practices. Most hospitalized patients are either critically ill or have undergone surgeries and needs calories, proteins and other total parenteral nutritional substituents and electrolyte replacement. The study observed that the first, second and third medicine prescribes had higher prescription rates than the fourth and fifth drugs in both hospitals. This suggests indications for the predominant cases in commonly prevalent at the locations and suitability of frequently occurring medications [21]. However, a study suggested that clinicians usually prefer newer effective preparations with better profile to other existing options [22,23]. Prior drug utilization studies suggested that the tolerability of a drug may have more impact on the long term retention when compared to efficacy while changes

in outcomes of therapy decides the retention of complement agents [24-26]. The outcome showed that the dosage frequency in the two hospitals varied significantly. Once a day dosing occurred more in the two hospitals assessed. It could be attributed to the nature and availability of preparations which usually applied most times in emergency situation before switching over to oral ones. Most of the infusions administered lasted for one to five days. Prolonged infusion of antibiotic in resistant infections has been demonstrated to have positive impacts on pharmacotherapy [27,28].

Categories and Types of Medications Available

More generic drugs prescriptions were common to both hospitals compared to branded prescriptions. However, the percentage generic prescription still felled below standards for the two hospitals. Previous study suggested that generic prescribing reduces patient's confusion and medication errors [29]. Another study saw it as, "an indication of good practice" and a way of viable low-cost medications [30-32]. Generic prescribing in the hospitals was in conformity with the WHO recommendations and international best practices [33]. The idea of prescribing generic drugs will leave the patients with some many options on the cost-effective drugs to purchase, hence encouraging compliance. The generic prescription pattern from this study was better than the outcome in another work done in a teaching hospital in western Nigeria where the percentage of generic prescription from the study were much lower than that obtained in this study [34].

Other studies in the western and northern parts of Nigeria indicated values below 50% generic prescribing [35-37]. A study on the knowledge perception and, attitude of physicians on generic medicine prescribing suggested that therapeutic failure was a major concern that discourages generic prescribing [38]. However, another study in western Nigeria indicated that decline in generic prescribing was associated with the activities of pharmaceutical marketers who press for the prescription of their brands [37]. The list of ailments and individual parenteral medications prescribed indicated critically ill and emergency conditions which validated the use of parenteral preparations and infusions [38-42].

Conclusion

The use of parenteral preparations in the hospitals was achieved and the trend of prescription and utilization was determined. The categories and types of parenteral nutrition available were assessed and the disease pattern associated with their utilization were ascertained which mostly indicated electrolyte imbalance. The generic prescription and substitution practices of parenteral drugs in the two hospitals were assessed and were concluded to be more of generic than branded drug prescription. Thus, it can be concluded from the research that parenteral preparation can be inferred to be frequently used in the two hospitals assessed in South-eastern part of Nigeria.

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