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Time Series Analysis of Admission in the Accident and Emergency Unit of University College Hospital, Ibadan, Southwestern Nigeria

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Abstract Mortality resulting from accidents and late admission of patients into modern health facility constitute a high proportion of all deaths in the developing countries. Information on patterns of admission of Accident and Emergency (AE) patients is valuable to caregivers in AE department in meeting patients' seasonal needs. This retrospective study used gender-classified records of 79990 patients admitted into the AE unit between 1995 and 2006 in University College Hospital (UCH), Ibadan. We examined seasonal variation using trigonometric regression and moving average models. There exists significant difference in number of admission between males ($\bar{X} = 306.63, \sigma = 69.56$) and females ($\bar{X} = 248.85, \sigma = 65.27$).The analysis further showed that patient's admission peaked in May and minimal in November. Seasonal index showed that the peak of number of patients admitted was observed in the last quarter of every year. This is an indication that admission occurs mostly during the festive periods where people travel home to celebrate with their love ones. The projected quarterly admissions for 2011 are (Q1=1488, Q2=1497, Q3=1632, Q4=1634) and for 2012 are (Q1=1490, Q2=1499, Q3=1634, Q4=1635). The hospital management should engage more caregivers and make available more resuscitating medical equipments during last quarter of each year and peak periods.

Keywords Time-series, Seasonal Variation, Admission, Projection, Trigonometrical Model

1. Introduction

The fundamental aim of most of the themes in Millennium Development Goals was to improve survival chances through improved health and quality of life for both children and adult. The Accident and Emergency Department (AED) in any modern health facility provides initial treatment to patients with a broad spectrum of illnesses and injuries which in most cases are severe and life-threatening. Emergency department was developed during the 20th century in response to an increased need for rapid assessment and management of such critical illness.

The AED provides an insight to the quality of care available in the institution. In AED in UCH, the expectation of patients and their relatives are the same as elsewhere, but differ in the manner and extent to which this is met in terms of availability of 'facilities and care givers' relative to the number of patients on admission at a particular time. In Nigeria, it has been observed that some patients admitted to AED after trying to have their problem solved Elsewhere - churches, prayer home, traditional healers, drug dealers and self acclaimed pseudo-orthodox medical practitioners. The reasons for this delay in bringing patients to modern health care in Nigeria are multi-dimensional. Some patients would rather go for local medicine instead of coming on time to hospitals because they can't afford the payments.

However like most public facilities in Nigeria, the AED of most hospitals have their own share in terms of patients neglect due to poor and inadequate health facilities. Patients at times die as a result of inadequate valuable equipments that could be used to resuscitate patients who are in terrible conditions. Also poor electricity supply is another serious problem. In the face of these challenges, the AED in most Nigerian hospitals is striving to meet the health needs of the populace in terms of treatment and care. However, the patients' family members who are desperate of immediate attention and care for their love ones shift blames on the care givers, believing that they have lackadaisical stance to their problem.

Across all countries, the common cases of emergency admissions include; traumas–bodily injuries from Road Traffic Accident (RTA), fall, assaults, fire arms, cases of domestic accidents, violence and occupational hazards. Others are burns, ingestion of chemicals, acute renal failure, and cardiovascular problems such as heart attack and asth-

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matic conditions. Obstetrics emergencies, Paediatric (surgical) and Psychiatry emergencies are also reported. All these were assessed together as a variable and as the cases of emergency in this study with the view of observing its seasonal patterns, trends and projection.

Seasonal Variation of emergency admissions in the AED of a hospital will provide information that would assist in decision making by hospital management, health boards and others regarding the future funding and development of AED services. It would provide doctors, nurses and other staff in AED with a valuable tool in structuring their service to meet the needs of patients. This will also help to prepare the medical team toward the peak period of influx of patients. Specific environmental factors underlying seasonal variability in the AED will be more understood for adequate planning strategies for improvement.

This study aims to explore the seasonal variation of total patients in the Accident and Emergency unit of the University College Hospital within 12-year period of study (1995-2006). It will also describe the seasonal variation separately for the segments 1995-1997, 1998-2000, 2001-2003 and 2004-2006 in attempt to examine whether there have been shifts in the time of maxima over the years.

Emergency medical admissions have risen by 50% since 1984 and now account for almost half of all NHS admissions in England[1]. Over recent years there has been increasing concern that the number of hospital emergency admission is rising, and that this is placing an increasing financial burden on the NHS[2]

Often, adult cases are commonly reported in the in Accident and Emergency unit. Age and deprivation take their toll. People aged over 65 accounts for only 15% of the Scottish population but 37% of emergency admissions[1]. This proportion may have grown because more elderly people live alone as family groups fragment, eroding informal support. Hospitals become "the career of last resort." Socioeconomic deprivation operates across the board, from illness behavior through to use of tertiary services. Deprivation increases emergency admissions, particularly for cardiovascular disease, self poisoning, and asthma. These, along with non-specific conditions, dominate the emergency admission workload[3].

Worldwide, road traffic injuries are on the increase with most of morbidity and mortality occurring in Africa, Asia, the Caribbean and Latin America and the majority of deaths occur among pedestrians, cyclists, users of motorized two-wheelers and occupants of buses and mini buses[4]. Also[5] reported that in Nigeria one out of every three accident victim dies and since civil war, no other pathology or phenomenon has claimed the lives of more Nigerians than RTA.

Injuries from RTA are most significant problem so much so that motor vehicle-related mortality has been described as disease of development[6]. Trading is a central part of Nigerian culture and traders travel large distances to markets, particularly to the inter-kingdom markets[7]. Bearing in mind the poor state of our highways, the deplorable condition of the automobiles on these highways and attitude of the drivers to highways-safety issues, the incidence of Road traffic accident in our environment will be expectably high.

Moreover, in Nigeria, the prevailing economic circumstances have led to an upsurge in the use of motorcycles for private and commercial purpose[8]. Studies have reported that motorcycles users involved in collisions tend to sustain multiple injuries to various parts of the body. However, lower limbs are often injured[9]. Similarly[10] in a community based of commercial motor cyclist in Igbo-Ora, Oyo State reported that about 70% of the crash-involved motor cyclists and 50% of their passengers sustained injuries from the accident injury mainly affected the lower limb, upper limb and the head or face.

Higher incidence of burns have been reported in urban areas than in rural areas, and most of the affected burn injury may occur in the scenario of Road Traffic Accidents, blasts and industrial mishaps at work place. Seasonal variation of burns in Ibadan, Nigeria[11] showed that most patients affected are above 15 years, with most burn occurring in December/January and least incidence is between April and July. The home was the site of injury in most cases (60%), accidents in the street e.g. pedestrian road traffic accidents (30%) and work related burn injury (4%). Similar study by [12] shows that in Malaga, Spain, most cases of burn injury occur in urban environment (89.5%). Most of these accidents occurred at home (65.8%) especially in the kitchen involving hot liquids.

Further studies conducted in Europe suggested that greater number of children is injured during the summer months. Injuries presenting to the Accident and Emergency have shown that paediatrics emergency injuries has its peak during August when Scottish schools were on summer holiday. This is consistent with the findings of other studies. In Toronto, the highest numbers of presentation were recorded in August and September. The phenomenon could be explained by longer playing periods spent in playing unsupervised during holidays, rather than structured supervised activities in school. This seasonal variation suggests that specific injury control initiation should be implemented during school holidays[13].

2. Materials and Methods

2.1. Accident and Emergency Unit, UCH Ibadan

Established in 1984, the AE unit of UCH was established to take care of emergency cases with a broad spectrum of illnesses and injuries. The initial care of the medical team in the unit is aimed at saving life while on-going care focuses on prevention of complication. It is made up of several sections such as Endoscopy, Burns, Traumatology, Orthopaedics, Haematology, Operating theatre, Radiology and Pharmacy. The medical team comprises of Surgeons, Consultants, Doctors, Nurses and Pharmacists that run different shifts.

Individuals with serious illnesses are then seen by a phy-

sician more rapidly than those with less severe symptoms or injuries. Patients are not delayed but are given immediate and adequate transfer to the respective places where they will be given further attention may be resuscitation room, wards for admission or to the theatre for operation.

2.2. Data collection and Analysis

The data were obtained from the central medical records in UCH. The data gave the monthly statistics of male and female patients attended to for the period of January 1995 to December 2006. The total number of patients recorded during the 12-years period of study was 79990. A time series data was plotted for the preliminary examination of the linear trend. Auto correlations were calculated and used to examine the existence of serial correlation in the series. The correlogram was also plotted as a preliminary means of investigating whether the series contained a seasonal variation of the sinusoidal type. An appropriate regression technique was then employed to fit a trigonometric curve to the data in order to measure the seasonal variation. We consider a model of the form

$$Y_t = \mu + a\cos(\omega_t + \theta) + \varepsilon_t \quad (1)$$

Where:

μ = mean number of casualties per month between January 1995 to December 2006

$\mathbf{Y_t}$ = Number of casualties occurring in the t-th ordinal month starting from January 1995

ω = frequency of the periodic variation = 2πf (since f = 1/T and T = 12 months)

t = Time period (in month), **a** = Amplitude of the data, **θ** = phase which locates the peak

$\boldsymbol{\varepsilon_t}$ = Error or residual term, **(ωt + θ)** is measured in radians.

Re-parameterization transforms this model into a linear multiple regression of the form

$$Y_t = \mu + b_1 q_{1t} + b_2 q_{2t} + \varepsilon_t \quad (2)$$

Where;

$b_1 = a\cos\theta;\ \ b_2 = -a\sin\theta;\ \ q_{1t} = \cos\omega t;\ \ q_{2t} = \sin\omega t;\ \ \mathrm{a} = \sqrt{{\mathrm{b_1}}^2 + {\mathrm{b_2}}^2}$

The time of the highest variation was obtained by solving the equation

$\cos(\omega t + \theta) = 0$ which means $\omega t + \theta = \cos^{-1}0 \Rightarrow t = \frac{(\pi/2)-\theta}{\omega}$

Also,

$$\frac{b_2}{b_1} = -\tan\theta \ \therefore\ \theta = \tan^{-1}\left(-\frac{b_2}{b_1}\right)$$

$$\mu \text{ is estimated by } X = \frac{1}{N}\sum_{t=1}^{N} X_t;$$

$$b_1 = \frac{2}{N}\sum_{t=1}^{N} X_t \cos\omega t;\ \ b_2 = \frac{2}{N}\sum_{t=1}^{N} X_t \sin\omega t$$

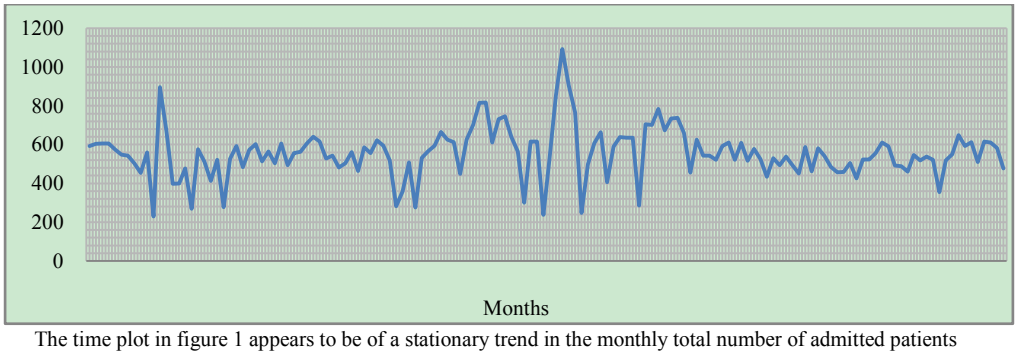
The extent of the seasonal variation above the mean level was measured by *a/u* while the highest variation was obtained by solving the equation cos(ωt+θ) = 0 for t. This was then converted to months and days. The above analysis was done for the series as a whole and separately for different time segments 1995-1997, 1998-2000, 2001-2003 and 2004-2006 in attempt to examine whether there have been shifts in the time of maxima over the years.

Seasonal variation of the data was also examined using moving average method based on additive model. The need for additive model was because of the stationary pattern of the data. The adjusted seasonal variations were obtained for each quarter and were later used for projection of the quarters of the year 2011 and 2012.

Table 1. Classification of the emergency cases that are handled at the AED of UCH

Surgical Emergency	Medical Emergency	Gynecology Emergency	Psychiatry Emergency	Pediatric Surgical Emergency
Trauma	Cardiovascular or Respiratory problems	Antepartum Hemorrhage	Violent Behavior	Foreign material in the body
Acute Blunt abdominal/ chest injuries	Diabetic or liver problem	Postpartum Hemorrhage	Suicidal attempt	Chemical ingestion
Severe Burn injuries	Chronic / Acute renal failure	Any reasons for virginal bleeding		
	Unconsciousness of any sort	Labour (Normal and abnormal)		

3. Results



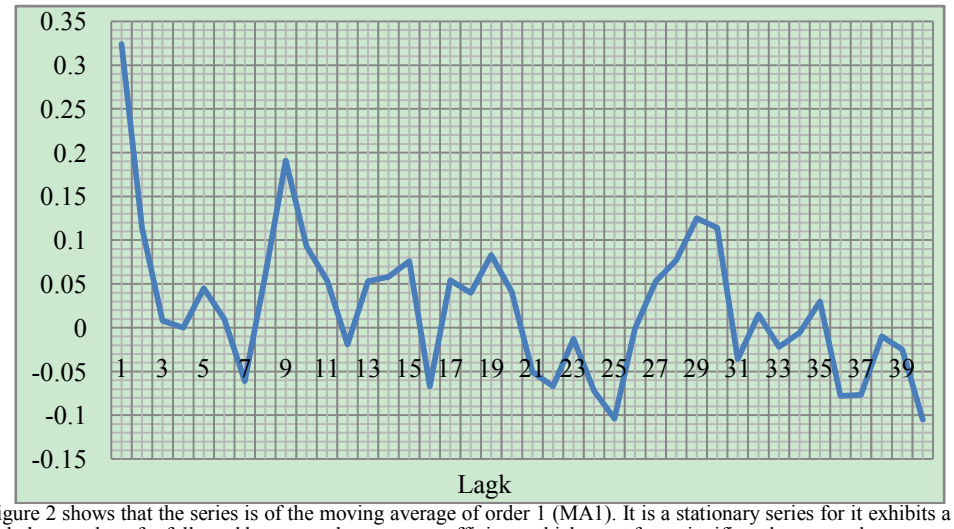
The time plot in figure 1 appears to be of a stationary trend in the monthly total number of admitted patients

Figure 1. Monthly Admission of patients in A&E Unit in UCH, Ibadan, 1995-2006

Table 2. Autocorrelation for the Total Patients

Lag K	Auto correlation	Lag K	Auto correlation	Lag K	Auto correlation	Lag K	Auto Correlation
1	0.324	**11**	0.054	**21**	-0.051	**31**	-0.036
2	0.114	**12**	-0.019	**22**	-0.067	**32**	0.015
3	0.008	**13**	0.053	**23**	-0.013	**33**	-0.022
4	0.000	**14**	0.058	**24**	-0.072	**34**	-0.006
5	0.045	**15**	0.076	**25**	-0.104	**35**	0.0300
6	0.010	**16**	-0.067	**26**	-0.001	**36**	-0.078
7	-0.061	**17**	0.054	**27**	0.053	**37**	-0.077
8	0.060	**18**	0.04	**28**	0.077	**38**	-0.010
9	0.191	**19**	0.083	**29**	0.125	**39**	-0.025
10	0.093	**20**	0.041	**30**	0.114	**40**	-0.105

Autocorrelation is important in identifying whether a time series (X_t) is stationary or not. This is done by using a correlogram which is the plot of r_k against k, i.e the plot of sample of autocorrelation coefficient against lag k.



The correlogram in figure 2 shows that the series is of the moving average of order 1 (MA1). It is a stationary series for it exhibits a short term correlation characterized by a fairly large value of r_k followed by two or three more coefficients which apart from significantly greater than zero, tend to get successively smaller.

Figure 2. Autocorrelation and Lagk of number of Admitted patients in A&E Unit in UCH, Ibadan, 1995-2006

Trigonometric Regression (T-R) Analysis

Table 3. Components Of The T-R Of The Total Patients For 1995-2000

T	X_t	X_tSin ωt	X_tCos ωt	T	X_t	X_tSin ωt	X_tCos ωt
1	592	296.11	512.62	37	615	307.61	532.54
2	604	523.21	301.78	38	529	458.24	264.31
3	606	606.00	-0.38	39	543	543.00	-0.34
4	605	523.69	-302.94	40	482	417.22	-241.35
5	574	286.48	-497.40	41	503	251.04	-435.88
6	548	-0.69	-548.00	42	561	-0.71	-561.00
7	543	-272.19	-469.85	43	464	-232.59	-401.49
8	503	-436.03	-250.77	44	586	-507.98	-292.14
9	454	-454.00	0.86	45	556	-556.00	1.05
10	559	-483.52	280.52	46	623	-538.88	312.64
11	230	-114.54	199.45	47	595	-296.30	515.97
12	896	2.27	896.00	48	519	1.31	519.00
13	673	338.10	581.91	49	282	141.67	243.83
14	398	345.26	197.98	50	359	311.43	178.58
15	399	399.00	-1.26	51	508	508.00	-1.61
16	478	413.15	-240.39	52	276	238.56	-138.81
17	270	134.16	-234.31	53	531	263.85	-460.81
18	576	-2.19	-576.00	54	566	-2.15	-566.00
79	512	-263.35	-439.08	55	595	-306.04	-510.26
20	413	-358.54	-204.99	56	665	-577.30	-330.07
21	522	-521.99	2.31	57	625	-624.99	2.77

22	278	-240.11	140.11	58	613	-529.45	308.96
23	527	-261.28	457.67	59	449	-222.61	389.93
24	592	2.99	591.99	60	626	3.17	625.99
25	483	243.70	417.01	61	699	352.68	603.50
26	572	496.93	283.28	62	815	708.03	403.63
27	602	601.99	-3.43	63	817	816.99	-4.65
28	513	442.75	-259.12	64	611	527.33	-308.62
29	564	279.01	-490.15	64	731	361.62	-635.29
30	503	-3.18	-502.99	66	746	-4.72	-745.99
31	605	-305.92	-521.96	67	638	-322.60	-550.43
32	494	-429.47	-244.11	68	564	-490.33	-278.70
33	557	-556.99	3.87	69	301	-300.99	2.09
34	563	-485.54	284.99	70	616	-531.25	311.81
35	605	-298.63	526.16	71	616	-304.06	535.73
36	640	4.86	639.98	72	238	1.81	237.99
TOTAL	19053	451.49	531.38	TOTAL	20063	-135.40	-473.09

Table 4. Components Of The T-R Of The Total Patients For 2001-2006

T	**X_t**	**X_tSin ωt**	**X_tCos ωt**	**T**	**X_t**	**X_tSin ωt**	**X_tCos ωt**
1	527	263.60	456.34	**37**	493	246.59	426.90
2	853	738.90	426.19	**38**	538	466.04	268.80
3	1092	1092.00	-0.69	**39**	494	494.00	-0.31
4	905	783.37	-453.16	**40**	451	390.39	-225.83
5	765	381.80	-662.91	**41**	587	292.96	-508.67
6	248	-0.31	-248.00	**42**	462	-0.58	-462.00
7	498	-249.64	-430.91	**43**	581	-291.24	-502.73
8	608	-527.06	-303.11	**44**	542	-469.84	-270.21
9	664	-664.00	1.26	**45**	485	-485.00	0.92
10	406	-351.18	203.74	**46**	458	-396.16	229.84
11	590	-293.81	511.64	**47**	459	-228.58	398.04
12	638	1.61	638.00	**48**	505	1.28	505.00
13	636	319.51	549.92	**49**	426	214.01	368.34
14	636	551.73	316.37	**50**	523	453.70	260.16
15	286	286.00	-0.90	**51**	523	523.00	-1.65
16	704	608.49	-354.05	**52**	557	481.43	-280.12
17	702	348.82	-609.20	**53**	610	303.11	-529.36
18	783	-2.97	-782.99	**54**	591	-2.24	-591.00
79	674	-346.67	-578.01	**55**	492	-253.06	-421.93
20	734	-637.20	-364.32	**56**	489	-424.51	-242.71
21	737	-736.99	3.26	**57**	461	-461.00	2.04
22	660	-570.04	332.65	**58**	546	-471.58	275.19
23	456	-226.08	396.01	**59**	518	-256.82	449.85
24	625	3.16	624.99	**60**	538	2.72	537.99
25	543	273.97	468.81	**61**	521	262.87	449.82
26	543	471.73	268.92	**62**	356	309.28	176.31
27	521	520.99	-2.96	**63**	518	517.99	-2.95
28	593	511.79	-299.53	**64**	549	473.82	-277.30
29	611	302.26	-531.00	**64**	648	320.56	-563.15
30	522	-3.30	-521.99	**66**	593	-3.75	-592.99
31	609	-307.94	-525.41	**67**	612	-309.46	-528.00
32	517	-449.47	-255.47	**68**	511	-444.25	-252.51
33	577	-576.99	4.01	**69**	615	-614.99	4.28
34	525	-452.77	265.75	**70**	610	-526.08	308.78
35	434	-214.22	377.45	**71**	583	-287.77	507.03
36	530	4.02	529.98	**72**	477	3.62	476.99
TOTAL	21952	853.12	-549.34	**TOTAL**	18922	-169.53	-607.16

Table 5. Analysis of variance for T-R model

Period	Date	Df	F ratio	P
All	1995-2006	2,141	2.277	0.106
1	1998-1997	2, 33	1.876	0.169
2	1998-2000	2, 33	0.143	0.867
3	2001-2003	2, 33	3.145	0.056
4	2004-2006	2, 33	3.365	0.047*

Ho: b_1, $b_2 = 0$ at $\alpha = 0.05$ * The regression coefficients are statistically significant.

Table 6. Trigonometric Regression Of The Total Patients In A&E Unit, UCH, (1995-2006)

Period	A	P	θ(degrees)	θ(radians)	M(μ)	t_i	a/μ	Estimated Time of Peak
1995-2006	20.62	0.106	42.31	0.7384	555.49	7.5888	0.0485	July
1995-1997	38.74	0.169	139.65	2.4374	529.25	4.3443	0.0732	April
1998-2000	27.33	0.867	164.03	2.8629	557.31	3.5318	0.0490	March
2001-2003	56.36	0.056	57.22	0.9987	609.78	7.0917	0.0924	July
2004-2006	35.02	0.047*	15.61	0.2724	525.61	8.4786	0.0666	August

Table 6 shows the results of the trigonometric regression analysis for the series as a whole and for each of the four time segments after adjustment. In all cases the simple trigonometric model was only significant in the last segment (2004-2006). For the 12-year period of study, the monthly number of patients in the Accident & Emergency varied by about 5% above and below the annual mean with the estimated peak occurring in the month of July. The extent of the seasonal variation above mean level was about 7%, 5%, 9% and 7% in 1995-1997, 1998-2000, 2001-2003 and 2004-2006 respectively. The estimated month of peak was in April for the first segment (1995-1997), March for the second segment (1998-2000), July for the third segment (2001-2003) and August in the last segment (2004-2006).

3.1. Estimating the Trend

In view of the results of Trigonometry Regression in which the most of the coefficients are not significant, the data was classified to 4quarters in a year (1st Jan.-Mar.; 2nd Apr-Jun; 3rd July-Sept; 4th Oct.-Dec.). We then estimated the trend of the quarterly data using least square method (Additive approach) and moving average method to estimate the quarter with the highest peak.

Table 7. Quarterly Data Of The Total Number Patients In UCH

YEAR	Q 1	Q 2	Q 3	Q 4	Total
1995	1802	1470	1657	1687	6616
1996	1149	2331	2472	1558	7510
1997	1607	1525	1472	1395	5999
1998	1727	1324	1580	1546	6177
1999	1373	2088	1918	2189	7568
2000	1726	1500	1758	1790	6774
2001	1500	1447	1656	1606	6209
2002	1885	1503	1770	2145	7303
2003	1703	1608	1442	1738	6491
2004	1685	1397	1808	1737	6627
2005	1688	1470	1634	1741	6533
2006	1489	1422	1602	1670	6183

3.2. Moving Average Method

The moving averages and centered moving averages are needed to eliminate seasonal variations and irregular fluctuations from the data. Here we used a 4-period moving average because the AE time series data are arranged in quarters for easy assessment. The time series is then modeled using additive decomposition model. The model is $X_t = TR_t + SN_t + CL_t + IR_t$. Where TR_t, SN_t, CL_t, and IR_t are trend, seasonal, cyclical and irregular variations respectively. Then seasonal factors were obtained by normalizing the $\overline{SN}_t$ values so that the normalized values sum to zero. The normalization is accomplished by subtracting the quantity $\sum_{t=1}^{L} \overline{SN_t}/L$ from each of $\overline{SN}_t$ values. That is the estimate of SN_t is $SN_t = \overline{SN}_t - (\sum_{t=1}^{L} \overline{SN_t}/L)$

Table 8. Estimation Of Trend Using Moving Average Method

T	X_t	4-Quarter Moving Total	4-Quarter Moving Average	Trend Line	Seasonal Variation
1	1802	-	-	-	-
2	1470	6616	-	-	-
3	1657	5963	12579	1572	85
4	1687	6824	12787	1598	89
5	1149	7639	14463	1808	-659
6	2331	7510	15149	1894	437
7	2472	7968	15478	1935	537
8	1558	7162	15130	1891	-333
9	1607	6162	13324	1666	-59
10	1525	5999	12161	1520	5
11	1472	6119	12118	1515	-43
12	1395	5918	12037	1505	-110
13	1727	6026	11944	1493	234
14	1324	6177	12203	1525	-201
15	1580	5823	12000	1500	80
16	1546	6587	12410	1551	-5
17	1373	6925	13512	1689	-316
18	2088	7568	14493	1812	276
19	1918	7921	15489	1936	-18
20	2189	7333	15254	1907	282
21	1726	7173	14506	1813	-87
22	1500	6774	13947	1743	-243
23	1758	6548	13322	1665	93
24	1790	6495	13043	1630	160
25	1500	6393	12888	1611	-111
26	1447	6209	12602	1575	-128
27	1656	6594	12803	1600	56
28	1606	6650	13244	1656	-50
29	1885	6764	13414	1677	208
30	1503	7303	14067	1758	-255
31	1770	7121	14424	1803	-33
32	2145	7226	14347	1793	352
33	1703	6898	14124	1766	-63
34	1608	6491	13389	1674	-66
35	1442	6473	12964	1621	-179
36	1738	6262	12735	1592	146
37	1685	6628	12890	1611	74
38	1397	6627	13255	1657	-260
39	1808	6630	13257	1657	151
40	1737	6703	13333	1667	70
41	1688	6529	13232	1654	34
42	1470	6533	13062	1633	-163
43	1634	6334	12867	1608	26
44	1741	6286	12620	1578	163
45	1489	6254	12540	1568	-79
46	1422	6183	12437	1555	-133
47	1602	-	-	-	-
48	1670	-	-	-	-

Table 9. Seasonal variation adjustment

YEAR	QUARTER 1	QUARTER 2	QUARTER 3	QUARTER 4
1995	-	-	85	89
1996	-659	437	537	-333
1997	-59	5	-43	-110
1998	234	-201	80	-5
1999	-316	276	-18	282
2000	-87	-243	93	160
2001	-111	-128	56	-50
2002	208	-255	-33	352
2003	-63	-66	-179	146
2004	74	-260	151	70
2005	34	-163	26	163
2006	-79	-133	-	-
TOTAL	-824	-731	755	764
AVERAGE	-74.91	-66.46	68.64	69.46
Adjustment factor	0.8175	0.8175	0.8175	0.8175
Seasonal Variation	-74.0925	-65.6425	69.4575	70.2775

$$\text{Increase in trend line per quarter} = \frac{1572 - 1555}{44 - 1} = 0.396$$

Table 10. Projected Number Of Patients In Accident And Emergency Wards In Uch For The Period, 2011- 2012

YEAR	QUARTER	TREND	SEASONAL VARIATION	PROJECTED FIGURES
2006	3	1555	69.4575	1625
	4	1555.396	70.2775	1626
2011	1	1562.128	-74.0925	1488
	2	1562.524	-65.6425	1497
	3	1562.920	69.4575	1632
	4	1563.316	70.2775	1634
2012	1	1563.712	-74.0925	1490
	2	1564.108	-65.6425	1499
	3	1564.504	69.4575	1634
	4	1564.900	70.2775	1635

$$\text{First quarter of Year}_{2011} = 1555.396 + (18 - 1) \times 0.396 = 1562.128$$

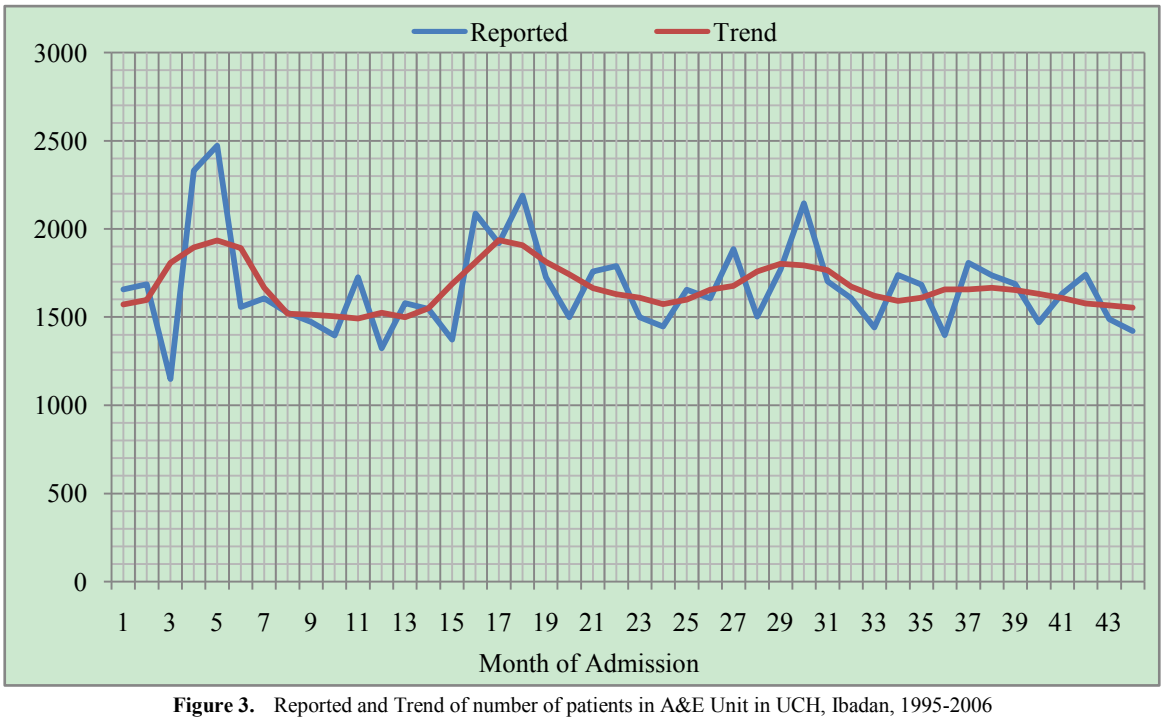


Figure 3. Reported and Trend of number of patients in A&E Unit in UCH, Ibadan, 1995-2006

Table 10. Descriptive Statistics of Males and Females in AE unit UCH, Ibadan 1995-2006,

	Mean	N	Std. Deviation	Std. Error Mean
Males	306.63	144	69.555	5.796
Females	248.85	144	65.274	5.439

Table 11. t-test for Males and Females in AE unit UCH, Ibadan, 1995-2006

Variable	Mean	Sd	S.E	95% C.I		df	Sig.(2-tailed)
Male Vs Female	57.78	40.923	3.41	51.037	64.519	143	0.000
Pre Vs Post Military Rule	3.79	114.56	16.54	-29.47	37.06	47	0.229

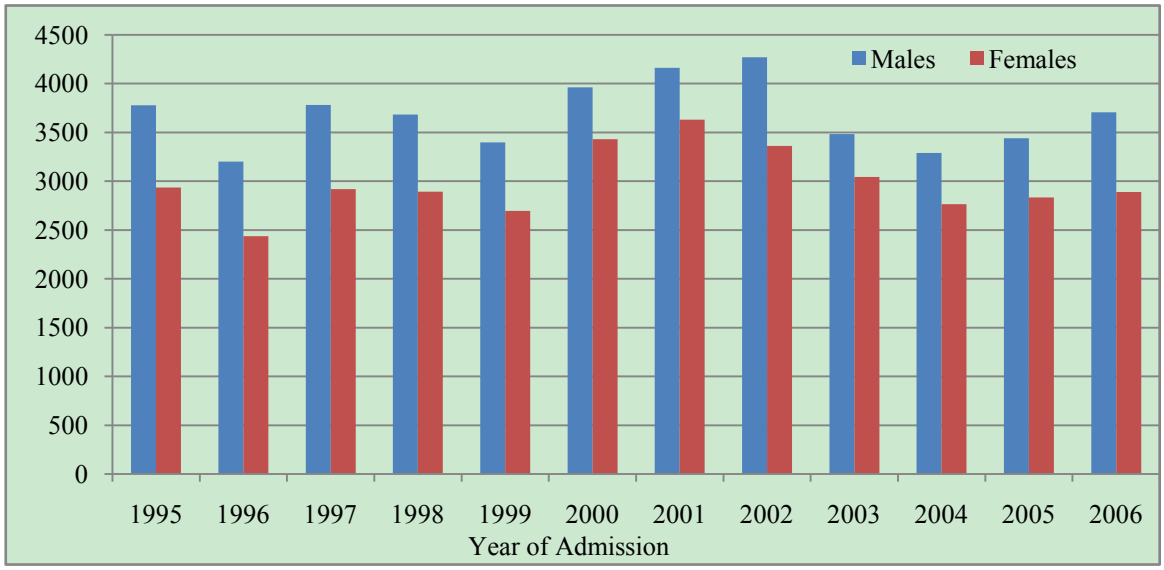


Figure 4. Number of Admission by sex versus year of admission in A&E Unit in UCH, Ibadan, 1995-2006

4. Discussion

Seasonal index showed that the peak of number of patients admitted was observed in the last quarter of every year. This is an indication that admission occurs mostly during the festive periods where most people travel to their native homes to celebrate with their love ones. Our finding corroborates the findings of[14] where it was reported that "the incidences of the RTA are on the increase and characterized by seasonal factors as can be seen from the high values of the seasonal indices for the months of January, February, May, June, October, November and December". However, our result is at variance with the findings in [15] and [16] where they claimed that highest number of RTA occurs during the rainy season, whereas our study suggested the peak is during the dry seasons. The estimated adjusted seasonal variations were used to make projections for years 2011 and 2012. The projected quarterly figures for 2011 (Q_1=1488, Q_2=1497, Q_3=1632, Q_4=1634) and 2012 (Q_1=1490, Q_2=1499, Q_3=1634, Q_4=1635).

The number of males patients admitted into AE wards was consistently higher than numbers of females for each of the year. This finding is in agreement with the report made by [15,9,17] where they stated that number of male victims in RTA is higher than that of females. The monthly mean number of admitted males and females were compared using t-test over the periods under study and the analysis revealed that there is significant difference between males ($\bar{X} = 306.63, \sigma = 69.56$) and females ($\bar{X} = 248.85, \sigma = 65.27$) number of admission ($p<0.05$). The differential can be accounted for going by more exposure of males to occupational and transport hazards than their female counterparts. For instance,[18] reported that accidents resulted from motorbike commercial riders in Nigeria constituted a high proportion of daily reported cases of accident. It is only men that engage in this business and as such, more vulnerable than women. Temporary internal migration was also more common among men than women in Nigeria, this make them more susceptible to accidents than women.

This study also carried out a comparison of the study period divided into period of military rule and democracy. No significant difference existed between number of A&E patients admitted during the two periods ($p>0.05$). This can be explained by total collapse of socio-economic and health infrastructures including abject poverty that persisted for a long period during military regime which transcends to democracy rule. The dilapidated facilities need many more years for revitalization.

5. Conclusions

Time series analysis is a very important tool in medical outfit like UCH, since the predictions of future number of patients and cases of specific diseases must be incorporated into the decision-making process and planning. This will assist management to make intelligent decision. The fore-

going results show that the number of patients seen at the accident and emergency unit of the UCH peaks in the last quarter of every year and are higher in males. The hospital management should engage more care givers and make available more resuscitating medical equipments during the last quarter of the year.

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