

# Evaluation of Demographic Pattern of Asthma Patients in Nigeria: Insight from a Multilevel Analysis

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## ABSTRACT

This research was a retrospective review of asthma cases set out to evaluate demographic pattern of affected patients in order to provide better information on gender influence of asthma in our environment. The paper establishes a model for prediction of asthma, estimates the trend flow pattern of asthma disease in the stated age group, as well as determines the degree of relationship that exist between gender of affected asthma patients and age group. We used data from the publicly available existing data culled from the Health Record Department, University College Hospital, Ibadan. Statistical tools like Chi-square test, Student t-test, Karl Pearson product moment correlation, Spearman rank correlation, Analysis of Variance (ANOVA), and multiple regression analyses were used to analyze the data based on the stated hypothesis.

Chi-square test of independence indicates that there is a significant relationship between yearly admitted asthma affected patients and age-group at  $p < 0.05$  and  $p < 0.01$ , respectively, which implies that admission of asthma patients depends on age-groups. It also shows that asthma affected gender are independent of age-groups. The predictive models shows that females at adolescent age (12 to 17 years) and adulthood (age 18 years and above) are more affected with asthma disease while males are more affected with asthma at childhood (age of 0 to 5 years) and before puberty stage (age 5 to 16 years). The study of the demographic pattern of asthma patients provides better information on gender influence of asthma in our environment.

(Keywords: asthma disease, demographic pattern, gender influence, risk factors, age, predictive model)

## INTRODUCTION

Asthma is a chronic inflammatory disorder of the lungs characterized by episodic and reversible symptoms of acute airflow obstruction - narrowing of the airways that make it difficult to breathe. It is thought to be caused by a combination of genetic and environmental factors (Lemanske, et al., 2001). Symptoms can be prevented by avoiding triggers, such as allergens and irritants and by inhaling corticosteroids.

Corticosteroids are involved in a wide range of physiologic processes, including stress response, immune response, and regulation of inflammation. Asthma is clinically classified according to the frequency of symptoms, forced expiratory volume in one second (FEV1), and peak expiratory flow rate. Asthma may also be classified as atopic or non-atopic. Atopic asthma may have a hereditary component while non-atopic asthma may not have hereditary component. Patients with atopic asthma usually develop what is referred to as allergic asthma. Its diagnosis is usually made based on the pattern of symptoms and response to therapy over time. The prevalence of asthma has increased significantly since the 1970s.

As of 2010, 300 million people were affected worldwide (Matin, et al., 1997). In 2009 asthma caused 250,000 deaths globally. Despite this, with proper control of asthma with step down therapy, prognosis is generally good. People with asthma can suffer from symptoms ranging from wheezing, cough, and a sensation of tightness in the chest, to a severe inability to expel air from the lungs, suffocation, and death. (Küster, et al., 2004).

Although asthma can begin at any age, it most commonly occurs in childhood. In some cases, as children grow older, their asthma becomes less severe or resolves altogether. People who had asthma as children sometimes experience a recurrence of the disease later in life. Asthma is treated with bronchodilators to help in case of an acute attack (Falade, et al., 2004).

In Nigeria, for example, ISAAC (International Study of Asthma and Allergies in Childhood) found 16.7% in Ibadan Community. Children aged 0 to 4 years had the largest increase in prevalence and had greater health care use; that is, it is difficult to diagnose asthma in children younger than 5 years, but adolescents have the highest mortality rate. It was reported that about 200 hospitalized asthmatic children at the University College Hospital over a two and a half year period. Up to 80% of children with asthma develop symptoms before age five years. Asthma symptoms are often under-recognized and under-treated by both parents and healthcare providers. Common symptoms of childhood asthma may include cough, wheeze, breathlessness or chest tightness, frequently associated with colds, sleep or exercise. (Falade, et al., 2004).

Inhaled corticosteroids are the preferred treatment for young children. Inhaled corticosteroids can possibly slow the growth rate of children of all ages. Poorly controlled asthma also may reduce a child's growth rate. Older adults who take certain other medicines, such as aspirin and other pain relievers, and anti-inflammatory medicines, see other complications as these medicines can prevent asthma medicines from working properly and may worsen asthma symptoms. Older adults may develop weak bones from using inhaled corticosteroids, especially at high doses. Pregnant women who have asthma need to control the disease to ensure a good supply of oxygen to their babies. Poor asthma control increases the risk that a baby will be born early and have a low birth weight. Poor asthma control can even risk the baby's life (Lemanske, et. al., 2001).

The approach recommended for treating asthma is that medications and dosage are increased when needed and decreased when required. Based on severity of patients' asthma and their age, there are specific recommendations regarding whether to use long-term control medications. In choosing therapy, parental history of asthma should be considered or environmental factors should also be considered and known

allergens or foods. Patients should be re-evaluated within 2 to 6 weeks to assess response. Poor adherence to treatment and medical advice is well known to clinicians and has been widely reported. In a recent document the World Health Organization (WHO) recognized lack of adherence as a major problem in the treatment of chronic diseases and concluded that improving adherence would have more beneficial impact on health outcome than improving specific treatment. (Sebate, et al., 2003).

In asthma, as in other chronic conditions, only about 50% of patients comply with care recommendations over the long-term. (Sawyer, et al., 2003). It is recognized that treatment regimen are often complex and require active and tailored management, making optimal self-care arduous both to achieve and to maintain. In fact, in addition to the requirement for patients to take medications as prescribed, they are also asked to adopt a range of behavior patterns in order to manage and achieve good control- regular visits to healthcare providers, monitoring of symptoms, avoidance of aggravating factors, exercising, and lifestyle modifications. Effective self-management of asthma requires an "active, collaborative involvement of the patient in a mutually acceptable course of behavior to produce a desired preventive or therapeutic result" (Meichenbaum, et. al., 1997).

### **Asthma Disease in Pregnancy**

The ultimate goal of asthma therapy is to maintain adequate oxygen of the fetus. The National Asthma Education and Preventive Program (NAEPP, 2007); stated that an asthmatic pregnant women need to control the disease by ensuring a good supply of oxygen to their babies by using appropriate measures. Poor asthma control increases the chance (risk) of giving birth to the baby earlier with low birth weight (Schatz, et. al. 2009)

Asthma complicates an estimated percentage of 4% to 8% of pregnancies. Mild and well-controlled moderate asthma can be associated with excellent maternal and perinatal pregnancy outcomes. Severe and poorly controlled asthma may be associated with increased prematurity and other perinatal complications including maternal morbidity and mortality. Optimal treatment of asthma during pregnancy includes objective monitoring of lung function, avoiding or

controlling asthma triggers, patient education. Inhaled corticosteroids are the preferred medication for all levels of persistent asthma during pregnancy. For pregnant women with asthma, it is safer to be treated with asthma medications than to have asthma symptoms and exacerbations. The diagnosis of asthma is achieved when symptoms are more frequent during a particular season. It is also observed when exposed to the risk factors that triggers it symptoms. Asthma is difficult to diagnose in children between age group (0 - 4) years (Falade, et al., 2004). Estimated childhood asthma in the Ibadan community is 16.7% and about 80% of children develop asthma before age of 5 years.

### **Symptoms of Asthma Disease**

Asthma symptoms vary in severity from occasional mild attacks of breathlessness to daily wheezing that last even when a patient takes appropriate doses of medications (Sapeter, et al., 2006). After exposure to asthma triggers, symptoms rarely develop but progress over a long period of hours or days. Classic symptoms of an asthma attack include:

- Wheezing when breathing out is nearly always present during an attack. Usually the attack begins with wheezing and rapid breathing, and as it becomes more severe, all breathing muscles become visibly active.
- Shortness of breath is a major source of distress in patients with asthma. However, the severity of this symptom does not always reflect the degree to which lung function is impaired. Some patients are not even aware that they are experiencing shortness of breath. These patients are at particular risk for very serious and even life-threatening asthma attacks, since they are less conscious of symptoms.
- Coughing is the first symptom of asthma is a non-productive cough. Some patients find this cough even more distressing than wheezing or sleep disturbances. Chest tightness or pain, initial chest tightness without any other symptoms may be an early indicator of a serious attack.

## **MATERIALS AND METHODS**

A well-structured format containing variables like gender, age groups, number of admitted patients was used to obtain the data from the Health Record Department of the University College Hospital, Ibadan. Analysis was done using software package named Statistical Package for Social Sciences (SPSS) version 20 to obtain the parameters of the trends of multiple regression. Paired-Student t-test was applied to compare the means and standard deviation of all the age-groups at  $\alpha = 0.05$ . Univariate analysis using descriptive statistics was also used to examine the mean, standard deviation, range, skewness, kurtosis and graphs showing trends of demographic patterns along with the theoretical hypotheses testing using Chi-square test of independence to investigate whether the relationships that exist between admitted patients and age-groups is not statistically significant at  $p < 0.05$  level of significance and using Analysis of Variance (ANOVA) to investigate the equality in average admitted patients with special preference to the objectives of the study.

### **Regression Analysis**

Regression analysis is a statistical technique for estimating the relationships among variables. It includes many techniques for modeling and analyzing several variables, when the focus is on the relationship between a dependent variable and one or more independent variables. The simple linear regression model is given as:

$$Y_i = \beta_0 + \beta X_i + U_i,$$

where,

Y = response variable

X = explanatory variable

$\beta_0$  = constant (intercept)

$\beta$  = slope coefficient

### **Model for Prediction of Asthma Affected Male Age Groups**

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + U_i$$

where,

Y = Total admitted male asthma patients

$X_1$  = Male asthmatic patients of age < 1 year

$X_2$  = Male asthmatic patients of age (1 to 4) years

$X_3$  = Male asthmatic patients of age (5 to 14) years  
 $X_4$  = Male asthmatic patients of age 15 years and above  
 $\beta_0$  = constant (intercept)  
 $\beta_1, \beta_2, \beta_3$  and  $\beta_4$  = slope coefficients of the variables  
 $U_i$  = error term (stochastic)

**Model for Prediction of Asthma Affected Female Age Groups**

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + U_i$$

where,  
 $Y$  = Total admitted female asthma patients  
 $X_1$  = Female asthmatic patients of age < 1 year  
 $X_2$  = Female asthmatic patients of age (1 to 4 years)  
 $X_3$  = Female asthmatic patients of age (5 to 14 years)  
 $X_4$  = Female asthmatic patients of age 15 years and above  
 $\beta_0$  = constant (intercept)  
 $\beta_1, \beta_2, \beta_3$  and  $\beta_4$  = slope coefficients of the variables  
 $U_i$  = error term (stochastic)

**Model for Prediction of Asthma affected Children**

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + U_i$$

where,  
 $Y$  = Total admitted patients  
 $X_1$  = Female asthmatic patients of age < 1 year  
 $X_2$  = Male asthmatic patients of age < 1 year  
 $X_3$  = Female asthmatic patients of age (1-4 years)  
 $X_4$  = Male asthmatic patients of age (1-4 years)  
 $\beta_0$  = constant (intercept)  
 $\beta_1, \beta_2, \beta_3$  and  $\beta_4$  = slope coefficients of the variables  
 $U_i$  = error term (stochastic)

**Model for Prediction of Asthma affected Adolescents and Adults**

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + U_i$$

$Y$  = Total admitted patients  
 $X_1$  = Female asthmatic patients of age (5-14 years)  
 $X_2$  = Male asthmatic patients of age (5-14 years)  
 $X_3$  = Female asthmatic patients of age 15 years and above,  
 $X_4$  = Male asthmatic patients of age 15 years and above  
 $\beta_0$  = constant (intercept),  
 $\beta_1, \beta_2, \beta_3$  and  $\beta_4$  = slope coefficients of the variables  
 $U_i$  = error term (stochastic)

**Hypothesis A**

H0: Asthma affected Patients is independent of age-group

H1: Asthma affected Patients is not independent of age-group

Significance level = 0.05

$$\chi^2_{cal} = 386.5358$$

**Determination of Critical Region**

$$\chi^2_{\alpha/2, (c-1) (r-1)} = \chi^2_{0.05/2, (4-1) (10-1)} =$$

$$\chi^2_{0.025, (3) (9)} = \chi^2_{0.025, 27} = 43.194$$

**Interpretation:** Since the calculated value  $\chi^2_{cal} = 386.54$  exceeds the tabulated value  $\chi^2_{\alpha/2} = 43.194$ , we therefore reject the null hypothesis at 0.05 and conclude that admission of asthma affected patients is not independent of age-group.

**Table 1: Data [2001-2010].**

YEARS	< 1 YEARS	1 – 4 YEARS	5 -14 YEARS	15 YEARS ABOVE	TOTAL
2001	11 (3)	42 (15)	964 (942)	1179 (1235)	2196
2002	4 (4)	20 (15)	960 (953)	1237 (1249)	2221
2003	1 (4)	6 (15)	834 (895)	1244 (1173)	2085
2004	4 (4)	10 (17)	1278 (1017)	1078 (1333)	2370
2005	5 (3)	18 (11)	564 (682)	1003 (894)	1590
2006	1 (3)	17 (16)	1002 (934)	1156 (1224)	2176
2007	3 (4)	15 (18)	1169 (1108)	1396 (1453)	2583
2008	1 (4)	8 (19)	1193 (1192)	1577 (1563)	2779
2009	1 (4)	6 (19)	930 (1179)	1812 (1546)	2749
2010	4 (2)	13 (10)	644 (636)	822 (834)	1483
<b>Total</b>	<b>35</b>	<b>155</b>	<b>9538</b>	<b>12504</b>	<b>22232</b>

Source: University College Hospital, Ibadan

**Hypothesis B**

H<sub>0</sub>: Admission of Asthma affected Patients is independent of age-group VS

$$\chi^2_{0.005, (3) (9) \dots\dots}$$

$$\chi^2_{0.005, 27} = 49.645$$

H<sub>1</sub>: NOT H<sub>0</sub>

[Significance level = 0.01]

**Interpretation:** Since it obvious that the calculated value  $\chi^2_{cal} = 386.54$  exceeds the tabulated value  $\chi^2_{\alpha/2} = 49.645$ , we therefore reject the null hypothesis at 0.01 and conclude that there is relationship between yearly admission of asthma affected patients and age group.

**Determination of Critical Region**

$$\chi^2_{\alpha/2, (c-1) (r-1) \dots\dots}$$

$$\chi^2_{0.01/2, (4-1) (10-1) \dots\dots\dots}$$

**Table 2: Relationship that exists between Asthma Affected Gender and Age Group.**

GENDER	AGE- GROUP				TOTAL
	AGE < 1 YEAR	AGE 1-4 YEARS	5-14 YEARS	15 YEARS ABOVE	
Male	22 (17)	81 (75)	4639 (4622)	6031 (6059)	10773
Female	13 (18)	74 (80)	4899 (4916)	6473 (6445)	11459
Total	35	155	9538	12504	22232

**Hypothesis C**

H<sub>0</sub>: Asthma affected gender is independent of age-group

H<sub>1</sub>: Asthma affected gender is not independent of age-group

Significance level = 0.05

The test statistics is using chi-square test where the corresponding expected values were calculated.

where i= Observed/expected columns  
j= Observed/expected rows

$$\chi^2_{cal} = 4.15$$

and the tabulated value

$$\chi^2_{0.025, 3} = 9.348$$

shows that we are to

Reject H<sub>0</sub>, if  $\chi^2_{cal} > \chi^2_{\alpha/2}$

**Interpretation:** Since it obvious that the calculated value  $\chi^2_{cal} = 4.15$  does not exceeds the tabulated value  $\chi^2_{\alpha/2} = 9.348$ , we do not reject the null hypothesis at 0.05 and conclude that there is no relationship between asthma affected gender and age group. This implies that, asthma affected gender is independent of age-group.

**Table 3:** Degree of Relationship between Admitted Male and Female Asthma Affected Patients: Using Spearman Rank Correlation

Years	Male (X)	Female (Y)	R <sub>x</sub>	R <sub>y</sub>	d	d <sup>2</sup>
2001	1014	1182	8	4	4	16
2002	1068	1164	5	5	0	0
2003	1046	1039	6	8	-2	4
2004	1209	1161	4	6	-2	4
2005	722	868	10	9	1	1
2006	1031	1140	7	7	0	0
2007	1294	1289	3	3	0	0
2008	1324	1455	1	1	0	0
2009	1310	1440	2	2	0	0
2010	755	721	9	10	-1	1
Total	10773	11459			0	26

$$\rho = 1 - \frac{6 \sum d_i^2}{n(n^2 - 1)}$$

$d^2$  = square of difference in the ranks of the observations

where,

$\rho$  = correlation coefficient

$n$  = number of observations

$R_x$  = rank of X observations

$R_y$  = rank of Y observations

$d$  = difference in the ranks of the observations

### Regression

[DataSet1] C:\Documents and Settings\IMRATU  
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DATA ANALYSIS.sav

### Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.993 <sup>a</sup>	0.986	0.975	69.129

a. predictors: (Constant), Male Age 15 years above, Male Age < 1 year, Male Age 5 to 14 years, Male Age 1 to 4 years

b. Dependent Variable: Total Admission

The Model Summary of the Male Age groups implies that approximately 98.6% of the variation in the response variable (Total Asthma Patients) can be explained by the explanatory variable (Male Age groups) while the remaining 1.4% can be explained by the unknown variability.

**Table 4:** Equality of Average Affected Males in all Age Groups.

### ANOVA<sup>b</sup>

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	3.656E8	4	9.141E7	1.573E4	.000 <sup>a</sup>
Residual	34868.962	6	5811.494		
Total	3.657E8	10			

a. Predictors: (Constant), Male Age 15 years above, Male Age < 1 year, Male Age 5 to 14 years, Male Age 1 to 4 years

b. Dependent Variable: Total Admission

**H<sub>0</sub>:** The Average Affected Males in all Age Groups are equal

**H<sub>1</sub>:** The Average Affected Males in all Age Groups are not equal

Significance Level = 0.05 ( $\alpha = 0.05$ ,  $p = 0.000$ )

Significance Level = 0.01 ( $\alpha = 0.05$ ,  $p = 0.000$ )

**Interpretations:** The ANOVA shows that the average affected males in all age groups are not equal at  $p < 0.05$  and  $p < 0.01$  respectively. The result is therefore statistically significant at  $\alpha = 0.01$  and  $0.05$ , respectively.

**Table 5:** Determine Equality of Average Affected Females in all Age Groups.

**ANOVA<sup>b</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.656E8	4	9.141E7	1.981E4	.000 <sup>a</sup>
	Residual	27680.291	6	4613.382		
	Total	3.657E8	10			

a. Predictors: (Constant), Female Age 15 years above, Female Age 1 to 4 years, Female Age < 1 year, Female Age 5 to 14 years

b. Dependent Variable: Total Admission

**H0:** The Average Affected Females in all Age Groups are not significant

**H1:** The Average Affected Females in all Age Groups are significant

Significance Level = 0.05

Significance Level = 0.01

**Interpretations:** The ANOVA that the average affected females in all age groups are not equal at  $p < 0.05$  and  $p < 0.01$  respectively. The result is therefore significant.

**Table 6:** Application of Multiple Regression Analysis to Establish a Statistical Model for Prediction of Asthma Affected Female Age Groups.

**Coefficients<sup>a</sup>**

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	.909	25.014		.036	.972
Female Age < 1 year	50.529	26.965	.031	1.874	.110
Female Age 1 to 4 years	-7.028	4.230	-.025	-1.661	.148
Female Age 5 to 14 years	2.392	.617	.527	3.877	.008
Female Age 15 years above	1.602	.449	.466	3.568	.012

a. Dependent Variable: Total Admission

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + U_i$$

Y = Total admitted female asthma patients  
 $X_1$  = Female asthmatic patients of age < 1 year  
 $X_2$  = Female asthmatic patients of age (1 to 4 years)  
 $X_3$  = Female asthmatic patients of age (5 to 14 years)  
 $X_4$  = Female asthmatic patients of age 15 years and above  
 $\beta_0$  = constant (intercept)  
 $\beta_1, \beta_2, \beta_3$  and  $\beta_4$  = slope coefficients of the variables  
 $U_i$  = error term (stochastic)

$$Y_i = 0.909 + 50.529X_1 - 7.028X_2 + 2.392X_3 + 1.602X_4 + U_i$$

**Interpretations:** The affected females of ages < 1 year with positive coefficient ( $\beta_1=50.529$ ) is not significant at  $p > 0.05$ . The affected females of ages (1-4) years with negative coefficient ( $\beta_2= -7.028$ ) is not significant at  $p > 0.05$ . The affected females of ages (5-14) years with positive coefficient ( $\beta_3=2.392$ ) is significant at  $p < 0.05$ . The affected females of ages (15 years - above) with positive coefficient ( $\beta_4=1.602$ ) is not significant at  $p > 0.05$ .

**Table 7:** Model for Prediction of Asthma Affected Children.

**Coefficients<sup>a</sup>**

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	2398.463	322.901		7.428	.001
1 Female Age < 1 year	-61.410	190.134	-.163	-.323	.760
Male Age < 1 year	-120.353	123.263	-.709	-.976	.374
Female Age 1 to 4 years	46.689	45.120	.732	1.035	.348
Male Age 1 to 4 years	-21.747	47.237	-.254	-.460	.665

a. Dependent Variable: Total Admission

b. Predictor Variables: FemalAge0to1yr MaleAge0to1yr FemaleAge1to4yrs MaleAge1to4yrs

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + U_i$$

Y = Total admitted patients  
 $X_1$  = Female asthmatic patients of age < 1 year  
 $X_2$  = Male asthmatic patients of age < 1 year  
 $X_3$  = Female asthmatic patients of age (1-4 years)  
 $X_4$  = Male asthmatic patients of age (1-4 years)  
 $\beta_0$  = constant (intercept)  
 $\beta_1, \beta_2, \beta_3$  and  $\beta_4$  = slope coefficients of the variables  
 $U_i$  = error term (stochastic), Therefore, the model is given as:

$$Y_i = 2398.463 - 61.410X_1 - 120.353X_2 + 46.689X_3 - 21.747X_4 + U_i$$

**Table 8:** Estimated Statistic of Male and Female in all Age-Groups between 2001 and 2010.

**Descriptive Statistics**

	N	Range	Minimum	Maximum	Mean		Std. Deviation	Variance	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Male Age < 1 year	10	8	0	8	2.20	.814	2.573	6.622	1.485	.687	1.971	1.334
Male Age 1-4 years	10	14	3	17	8.10	1.616	5.109	26.100	.809	.687	-.396	1.334
Male Age 5-14 years	10	531	234	765	463.90	52.211	165.106	2.726E4	.351	.687	-.421	1.334
Male Age 15 & above	10	595	433	1028	603.10	57.609	182.177	3.319E4	1.499	.687	2.611	1.334
Female Age < 1 year	10	3	0	3	1.30	.367	1.160	1.344	.342	.687	-1.227	1.334
Female Age 1-4 years	10	23	2	25	7.40	2.166	6.851	46.933	2.216	.687	5.409	1.334
Female Age 5-14 years	10	331	320	651	489.90	33.973	107.433	1.154E4	-.334	.687	-.426	1.334
Female Age 15 & above	10	454	389	843	647.30	40.225	127.202	1.618E4	-.553	.687	1.050	1.334
Total Male Admission	10	602	722	1324	1077.30	68.040	215.160	4.629E4	-.539	.687	-.684	1.334
Total Female Admission	10	734	721	1455	1145.90	72.542	229.397	5.262E4	-.477	.687	.052	1.334
Total Admission	10	1303	1476	2779	2223.20	138.216	437.077	1.910E5	-.509	.687	-.377	1.334
Valid N (listwise)	10											

The standard errors for skewness and kurtosis in all age groups are equal since the number of years are the same throughout. The analysis reveals that approximately, average number (mean) of 1078 with standard deviation of 215 males were affected with asthma disease and approximately, average number (mean) of 1146 with standard deviation of 230 females were affected with asthma disease over the same period in the University College Hospital, Ibadan, Nigeria. Chi-square analysis indicate that there is relationship between yearly admissions of asthma affected patients and age-group which implies that asthma disease depends on age-group. The Spearman rank correlation  $r = 0.8424$  which indicates that there is 84.2% positive correlation between male and female affected asthma patients.

The Model Summary of the Male Age groups indicates the value of the coefficient of determination  $R^2 = 0.986$ , which implies that approximately 98.6% of the variation in the response variable can be explained by the explanatory. Adjusted  $R^2 = 0.975$  which is the modification of  $R^2$  that adjusts for the number of explanatory variables in the Model with Standard Error of 69.129. The result of the Pearson correlation between Male Age (1-4) years and Total Admission = -0.431 with covariance of -961.356, this indicates that there is a negative imperfect relationship between Male Age (1-4) year and Total Admission of asthma patients.

The result of the Pearson correlation between Male Age (5-14) years and Total Admission = 0.497 with covariance of 35894.578, this indicates that there is a positive imperfect relationship between Male Age (5-14) years and Total Admission of asthma patients. The result of the Pearson correlation between Male Age 15 years-above years and Total Admission = 0.715 with covariance of 56956.756, this indicates that there is a positive imperfect relationship between Male Age 15 years-above and Total Admission of asthma patients.

**CONCLUSION**

Asthma is a chronic condition in which airways undergo changes when stimulated by allergens or other environmental factors. The results of the analysis shows that averagely 1078 males with standard deviation = 215 were admitted with asthma disease and 1146 females with standard deviation = 230 females were also admitted with asthma disease in the University College Hospital, Ibadan, Nigeria between 2001 and 2010. The yearly average number of female affected asthma patients is higher than the average male patients. Children with asthma develop symptoms before age of 5 years. Children aged 0 to 4 years have the highest proportion of asthma disease because the diagnostic of asthma in that age range is difficult.

## RECOMMENDATION

On the basis of the analysis, interpretation and conclusion, the following recommendations are to be taken into consideration:

- Government should establish more health services in both rural and urban centres to the reach of the citizens as well as providing trained medical personnel.
- Funding to motivate and support the research on this disease should be provided, coupled with better public awareness and health education.
- Asthma affected patients should try to control attacks by avoiding risk factors such as smoking, dust, diet, fumes, exercise, and other environmental factors that can trigger its severe attack.
- Finally, it is our belief that the above recommendation will serve an immense benefit to the researchers in this area, government at the Federal, State and Local levels based on proper and practical implementation.

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