Pattern and Trends of Respiratory Disease: A Six Year Review of Ambulatory Services in a Tertiary Hospital in Port Harcourt, Nigeria

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Abstract Background: Respiratory diseases are significant contributors to global disease morbidity and mortality especially in low and middle-income countries like Nigeria. It is imperative to evaluate the changing and current trends of respiratory disease especially with prevalent air pollution and exposure to biomass fuel; as disease trend evaluation promotes the planning of adequate service delivery. The objective of this study was to evaluate the pattern of respiratory disease in the ambulatory service of a tertiary hospital in Port Harcourt south-south of Nigeria over 6 years. Methods: This was a retrospective descriptive study of medical outpatient attendees diagnosed with respiratory diseases at the specialty respiratory clinic over 6 years, 1st January 2013 to 31st December 2018. Results: The leading respiratory conditions were Asthma (32.2%), Tuberculosis (31.2%), COPD (16.8%), Pneumonia/Lung infection (8.7%) and Lung malignancies (2.9%), Interstitial Lung disease (2.7%), Pleural diseases & others (2.2%), Upper Respiratory Tract disease (1.7%), Sarcoidosis (1.0%) and OSA/Sleep disorders (0.3%). Non-communicable respiratory disease accounted for 58.4 % of the respiratory diseases seen in this study. Conclusion: The pattern of respiratory diseases reported in this study corresponds with the global pattern of leading respiratory diseases. The findings of this study call for more attention to be paid to the prevention and management of the prevalent respiratory disease conditions to achieve a reduction in the morbidity and mortality associated with these conditions.

Keywords: pattern and trends, respiratory disease, Nigeria

1. Introduction

The burden of respiratory disease is revealed to be on the rise globally with evidence of increasing prevalence and incidence for chronic respiratory disease from 1990 to 2017 [1]. In addition the burden of chronic non-communicable respiratory diseases significantly contributes to mortality especially in sub Saharan Africa as shown in the age-standardised death rates for chronic obstructive pulmonary disease (COPD) which are highest in low-income regions of the world, particularly South Asia and sub-Saharan Africa (SSA) [2]. It is also observed that the burden of chronic respiratory disease (CRD) is also influenced by factors such as Global and National indoor and outdoor air pollution from environmental and occupational sources [2] which are recognised as key challenges in developing countries [3]. Observations over the last two decades have shown changing trends in the pattern and burden of chronic diseases inclusive of respiratory diseases. A 2005 report on the impact of CRD [4] observed that the consequences of and risk factors for CRD are not fully recognised. This situation applies more to low and middle-income countries (LMICs) of the world were 80% of mortalities for chronic respiratory diseases occur, [4] with CRDs accounting for 7% of global mortality at the time. The significance of these findings prompted the establishment of the Global Alliance Against Respiratory Diseases (GARD) in 2006 [5] with proposals to avert 35 million deaths from chronic disease and improve the lives of at least 1 billion people impacted by chronic and acute respiratory diseases as part of the MDGs targets by 2015 [4]; and SDGs targets by 2030[5].

The pattern of foremost respiratory diseases in the world include both infectious diseases and non-communicable diseases (NCDs) with environmental factors such as exposure to air pollution as key promoters. This has resulted in major morbidity and mortality especially in countries with low socio economic indices and significant burden of biomass smoke exposure [5,6]. The most common respiratory diseases include COPD, Asthma, Acute respiratory infections (ARIs) and pneumonias especially in children under 5, tuberculosis (TB), lung cancers, sleep disorders (SD), pulmonary hypertension (PH) and occupational lung disease (OLD). [7].

Akanbi et al [8] in a review of the burden of respiratory diseases in Nigeria have also documented a similar trend of the above leading respiratory diseases with a combination of infective and non-communicable disease conditions. In acknowledgement of the burden of respiratory disease globally and in LMICs; it is therefore important to evaluate the changing and current trends of respiratory disease in our environment especially with established air pollution [9,10] and exposure to biomass fuel in vulnerable populations in Port Harcourt and its environs [11,12]. The evaluation of respiratory disease patterns in both hospitalised and ambulatory care settings promotes a better understanding of the respiratory disease trends and provides baseline data for planning the priorities of care inclusive of financing needs, healthcare cost, clinical service and human resource requirement's based on disease trends and demographics [13]. In addition the patterns of disease over time also provide opportunity to appraise the impact of socio-economic and environment changes on disease trends [14]. Disease trends assessments also strengthens planning and provision of local health services based on population needs while promoting efficient use of healthcare resources to improve health indices. In furtherance of the above rationale the objective of this study was to evaluate the pattern of respiratory disease in the medical ambulatory service of a tertiary hospital in Port Harcourt south-south of Nigeria over 6 years.

2. Methodology

2.1. Study Design

This was a retrospective descriptive study of medical outpatient attendees diagnosed with respiratory diseases at the specialty respiratory clinic over 6 years, 1st January 2013 to 31st December 2018.

2.2. Study Setting

The study was done at the Medical out Patient department (Ambulatory) services unit of the department of Internal Medicine, University of Port Harcourt Teaching Hospital (UPTH), Port Harcourt, Nigeria. The hospital is an 800 bed tertiary referral hospital with a medical outpatient clinic service that runs from Monday to Friday with eleven subspecialty clinics for cardiology, respiratory/infectious disease, dermatology/venerology & rheumatology, endocrinology & diabetology, nephrology, neurology, gastroenterology and hepatology and geriatrics. Clinic attendees are referred from primary and secondary levels of care from outside the hospital as well as intra hospital referrals from other specialties and the emergency units.

2.3. Study Tools and Methods

The records of patients diagnosed with respiratory diseases attending the respiratory clinic over the study period was documented from clinics registers and case records. Key data were age and gender of patients, month and year of attendance and respiratory diagnosis. Key data

inclusive of diagnosis entries were filtered to prevent double entries. The diagnosis of respiratory disease was based on case conclusive diagnosis arrived at following completion of clinical review, the use of ancillary investigations and review by unit consultants and specialist cadre physicians in the unit. Diagnosis were also validated with guideline related diagnostic criteria for relevant disease while diseases were classified based on the ICD 10 categories for respiratory diseases. Ethics: The study was a retrospective study of hospital data with minimal risk to patients. Patient confidentiality was maintained with use of case folders code without names in data set. Administrative approval was obtained from the departments of internal medicine while ethical approval was obtained from the UPTH, Port Harcourt ethics and research committee. Data Analysis: Data was analysed using the statistical package software SPSS 23 for windows. Discrete data and continuous variables were presented as percentages with mean ± standard deviation. Comparisons of means were done using the ANOVA and independent t test. Proportions were compared using Z test and Chi-square test as appropriate. P value≤0.05 was considered as significant.

3. Results

3.1. Demographics

The A total of 804 new patients attended the respiratory clinics over 6 year study period with 583 diagnosed with respiratory diseases in line with diagnostic criteria and evidence of complete documentation. The mean age of attendees with respiratory disease, was 44.91±17.03, with a range of 14-93 years and median of 42 years (Table 1). The mean age for each year (2013, 2014, 2015, 2016, 2017 and 2018) were 44.86±16.20, 44.05±17.49, 45.38±16.17, 44.92±19.93, 46.81±17.51 and 43.82±16.68, respectively. There was no statistical difference between the means (p = 0.891). Subjects in the 30-39 year and 40-49 year age group were in the majority with a percentage of 24.5% and 19.7%, respectively. The details of age distribution of the patients is as shown in (Table 1).

Table 1. Age distribution of patients with respiratory diseases

Age Group (Years)	N	% of Total N	Mean±SD (Years)	Median	Min	Max
<20	20	3.4%	17.30±1.49	17.00	14	19
20-29	96	16.5%	25.59±3.03	26.00	20	32
30-39	143	24.5%	34.21±3.02	34.00	30	39
40-49	115	19.7%	44.27±3.09	44.00	40	49
50-59	65	11.1%	53.68±2.66	53.00	50	59
60-69	78	13.4%	62.64±4.03	63.00	36	69
>70	66	11.3%	76.05±5.90	74.00	68	93
Overall	583	100.0%	44.91±17.03	42.00	14	93

3.2. Pattern of Respiratory Disease

The pattern of respiratory diseases seen over the 6 year period is shown in (Figure 1). The leading diseases were Asthma (32.2%), TB (31.2%), COPD (16.8%), Pneumonia/Lung infection (PLI) (8.7%) and Lung

malignancies (LM) (2.9%). The pattern and trend of the respiratory diseases diagnosed for each year is as shown in (Table 2 & Figure 2).

3.3. Pattern and Trends of Respiratory Disease by Gender, Age and Age Group

The pattern and trends of respiratory diseases by age group and gender is as shown in Table 3 and Table 4, respectively. Asthma, TB, pleural diseases & others (PDO), upper respiratory tract disease (URTD), obstructive Sleep apnoea(OSA)/(SD) were significantly more common in people below 40 years while COPD, Sarcoidosis, Interstitial lung disease (ILD), PLI and LM were more predominant in people above 40years (Table 3). The gender distribution shows significant differences in diseases that were more common in males and females. TB, COPD and LM were more common in males, while Asthma, PLI, ILD and sarcoidosis and URTD were more common in females (Table 4 and Figure 3).
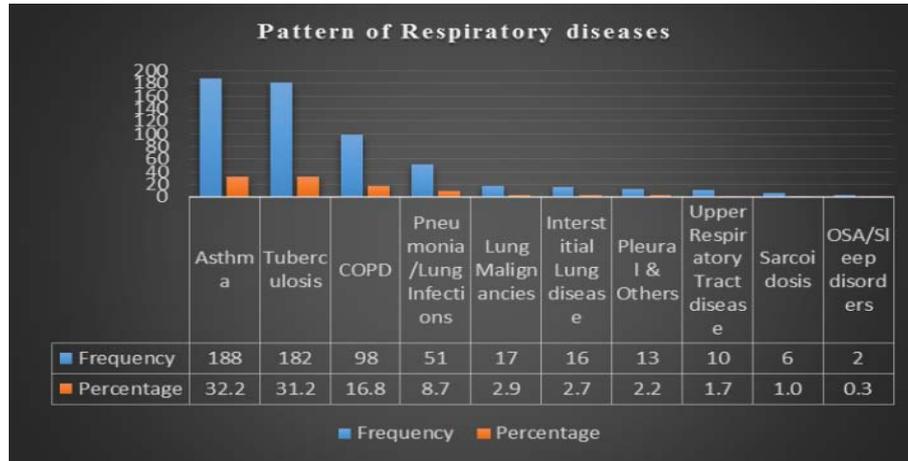

Figure 1. Overall pattern of respiratory disease

Table 2. Pattern and trend of the respiratory disease by year

Diagnosis	2013 (%)	2014 (%)	2015 (%)	2016 (%)	2017 (%)	2018 (%)
Asthma	26.8	39.0	22.8	29.5	41.2	39.5
TB	36.6	28.5	35.4	25.1	34.2	24.4
COPD	13.8	23.4	18.2	18.8	13.8	15.1
PLI	9.8	6.5	12.6	10.9	2.7	7.6
LM	3.3	2.6	4.7	4.7	0.0	1.7
ILD	3.3	0.0	4.7	3.1	0.0	3.4
PDO	0.8	0.0	0.8	6.3	2.7	4.2
URTD	4.1	0.0	0.8	0.0	0.0	3.3
Sarcoidosis	1.6	0.0	0.0	1.6	2.7	0.8
OSA/SD	0.0	0.0	0.0	0.0	2.7	0.0
Total	100.0	100.0	100.0	100.0	100.0	100.0

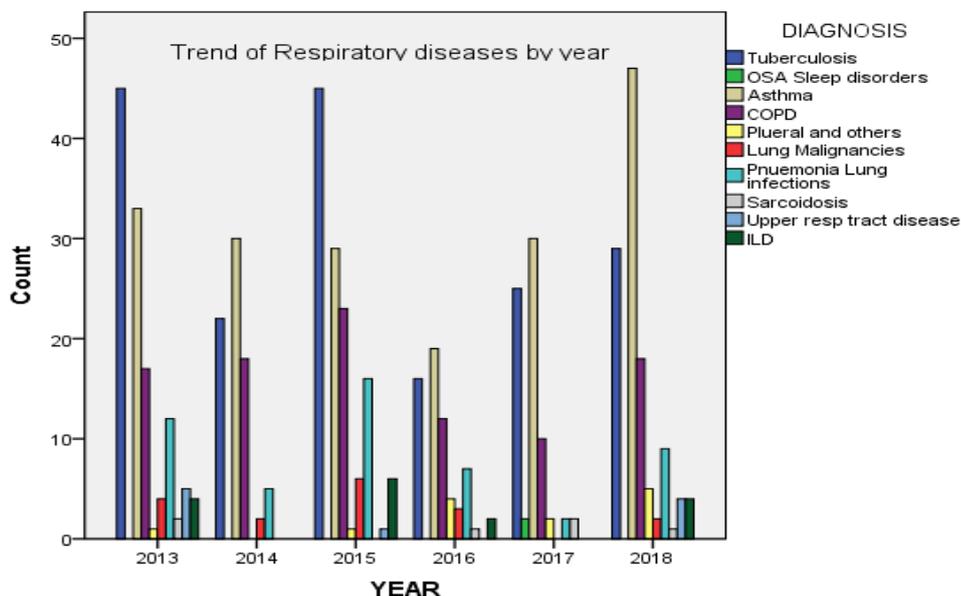Person χ^2, p=0.003, Likelihood ratio =0.001

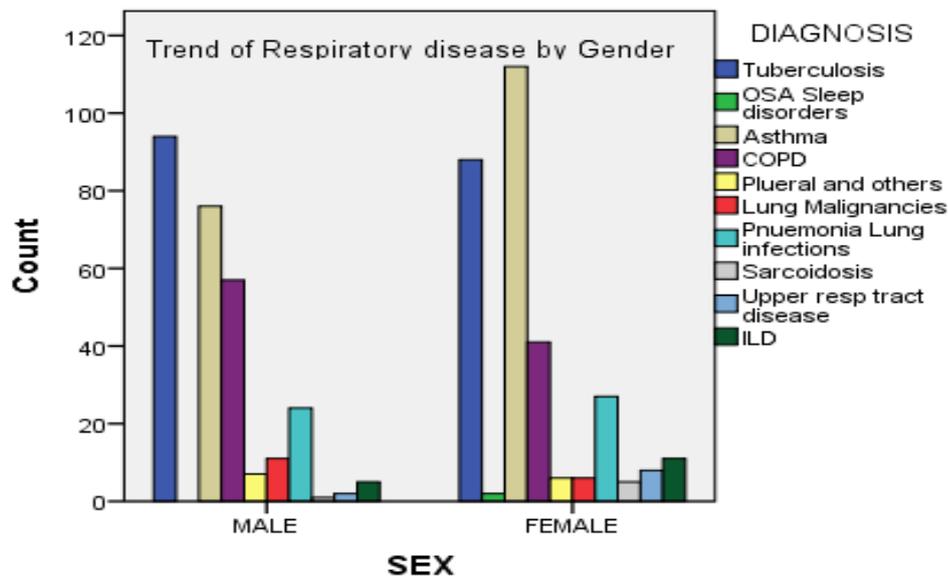**Figure 2**. Pattern and trend of respiratory diseases diagnosed by year

Figure 3. Trend of respiratory diseases by gender

Table 3. Trend of the respiratory disease by age group

Diagnosis	N	<20	20-29	30-39	40-49	50-59	60-69	>70
Asthma	188	9	46	54	31	17	15	16
TB	182	8	33	49	44	19	21	8
COPD	98	0	5	4	15	16	29	29
PLI	51	2	4	16	9	4	7	9
LM	17	0	2	4	6	1	1	3
ILD	16	0	2	3	5	5	0	1
PDO	13	1	2	5	2	1	2	0
URTD	10	6	2	6	2	0	0	0
Sarcoidosis	6	0	0	0	1	2	3	0
OSA/SD	2	0	0	2	0	0	0	0
Person χ^2, p=0.000, Likelihood ratio =0.000								

Table 4. Trend of the respiratory disease by gender

Diagnosis	N	Male	%	Female	%
Asthma	188	76	40.4	112	59.6
TB	182	94	51.6	88	48.4
COPD	98	57	58.2	41	41.8
PLI	51	24	47.1	27	52.9
LM	17	11	64.7	6	35.3
ILD	16	5	31.3	11	68.8
Pleural/others	13	7	53.8	8	61.5
URTD	10	1	10.0	2	20.0
Sarcoidosis	6	1	16.7	5	83.3
OSA/SD	2	0	0.0	2	100.0
Person χ^2, p=0.015, Likelihood ratio =0.009					

3.4. Pattern of Non-communicable and Infective Respiratory Diseases

Non-communicable (NCDs) (Asthma, COPD, LM, PDO, ILD, Sarcoidosis, (OSA/SD) made up 58.4 % of the respiratory diseases seen in this study while, 41.6% were infective conditions (TB, PLI and URTD).

4. Discussion

Respiratory diseases are among the leading contributors to global morbidity and mortality especially in SSA [2,5,6,7], with TB, COPD, Asthma, Acute respiratory infections (ARIs) and lung cancers as leading causes in the world [7] and Nigeria [8]. In this study the leading respiratory conditions were Asthma (32.2%), TB (31.2%), COPD (16.8%), PLI (8.7%) and Lung malignancies (2.9%). Other diseases were interstitial Lung disease (2.7%), Pleural diseases & others (2.2%), Upper Respiratory Tract disease (1.7%), Sarcoidosis (1.0%) and OSA/Sleep disorders (0.3%). The findings of the study especially in relation to the top 5 diseases i.e. Asthma, Tuberculosis, COPD, Pneumonia and Lung malignancies correspond with the global trends as documented in the 2017 Global Impact of Respiratory Disease publication [5].

The spectrum of the respiratory diagnosis and pattern of the top five disease conditions also correspond with the findings of other studies within and outside Nigeria which assessed patterns of respiratory disease in both in-patient and ambulatory settings. Umoh et al [15] in a 5 year (2008-2013) study of respiratory admissions pattern in the medical wards of a public teaching hospital in Uyo, South South, Nigeria, also reported Tuberculosis, (66.8%), Pneumonia (24.9%), Asthma (4.9%), COPD (2.2%), Lung cancers (0.6%) and ILD (0.6%) as the leading diagnosis. Three studies from South West Nigeria by Adeniyi et al [16], Adeoti et al [17] and Desalu et al [18] also show comparable findings with the outcome of this study.

The study by Adeniyi et al [16] which was a 5 year (2007-2012) review of in patients at a public tertiary hospital in Owo, south west Nigeria reported that the top five respiratory diseases were tuberculosis (53%), pneumonias (21.1%), COPD (13.7%), asthma (8,4%) and lung cancer (1.4%), in addition to Pleural Effusion (1.2%), URTI (1%) and Lung abscess (0.2%). Adeoti et al [17] in Ekiti South West Nigeria, did a 5 year (2011 to 2015) review of medical patients and reported pulmonary tuberculosis (44.1%), pneumonia (28.9%), COPD (11.1%), asthma (7.2%) and Pleural effusion (4.8) as the top five diseases. Other prevalent diseases were URTI (0.9%), pulmonary embolism (0.4%), acute respiratory distress syndrome (0.4%), Lung cancer (0.4%), Lung abscess (0.4%) and interstitial lung disease (0.2%). In like manner Desalu et al [18], in a 2 year (2006-2008) study of respiratory disease morbidity and mortality at public tertiary hospital in south west Nigeria reported pulmonary TB (42.1%), asthma (17.5%), pneumonia (15.3%), COPD (11.5%), Pleural diseases (7.7%), Lung cancer (0.6%) and ILD (0.6%) as the most prevalent respiratory conditions. A further comparison of two studies [19,20] from India with the index study also show similarities in the pattern of the leading respiratory conditions and spectrum of disease. Dubey and Sharma [19] in a 2 year (January 2013 to December 2014) study of respiratory disease profile from an OPD in central India found the top five disease conditions were URTI (37.9), Asthma (25.80), COPD (15.92), pneumonia (4.49) and ILD (3.20). Other diseases were tuberculosis (1.42), combined benign and malignant lung masses (1.65%), pleural disease 1.89% and Sarcoidosis 0.71%. The disease reported in this cited study [19] correspond with the prevalent diagnosis in this index study, though with variations in the frequency of occurrence of leading conditions. The large number of URTI (37.9%) found by Dubey et al [19] in comparison to 1.7% reported in this index study may be explained by presence of an ear, nose and throat department in our tertiary hospital which deals with most of the upper respiratory tract infections in addition to presentation to the family medicine clinics in our facility were these patients may receive primary care. In spite of the proffered observations the differing prevalence in URTIs may be reflective of the disease pattern the two countries. Dasgupta et al [20], reported the profile of respiratory problems in a referral pulmonary clinic in India over 9 months in 2006. The leading diseases were Asthma (26.54%), COPD (12.18%), TB (7.26%), pneumonia (7.16%) and ILD (4.32%). Other reported diseases were Lung cancers (3.88%), Pleural disease (2.74%), OSA

(1.94%) and Sarcoidosis (1.19%). This pattern mirrors the pattern in this index study, though infective diseases (TB and pneumonia) had a higher prevalence in our study. The observed differences in the frequency of the above stated infective disease conditions may be influenced by the setting of the Dasgupta et al [20] study which was a referral clinic. In addition patients with primary and secondary care diseases like susceptible tuberculosis also present in our facility.

Analysis of the spectrum of respiratory diseases in this study into non-communicable (NCDs) and communicable diseases CD) indicates that NCDs made up 58.4 % of the respiratory disease compared to 41.6% by infective conditions. This study mirrors the outcome of a previous study in the same institution by Unachukwu et al [21] in 2000-2004 that found NCDs comprising 56.2 % of the admissions into the medical ward of the University of Port Harcourt teaching hospital compared to 43.8% by communicable diseases. These findings indicate that while the prevalence of respiratory NCDs are on the rise infective diseases still remain a significant contributor to the respiratory disease burden in Nigeria.

The comparison of this trend with that of other studies in Nigeria by Umoh et al [15], Adeoti et al [16], Adeniyi et al [17] and Desalu et al [18] show contrasting findings with infective diseases comprising 91.7%, 74.7%, 75.3% and 57.4% of respiratory diseases, respectively.

This differences may be accounted for by the higher level of urbanisation and the more cosmopolitan nature of Port Harcourt the site for the index study. Dasgupta et al [20] from a referral clinic in India found that NCDs accounted for 84.5% of respiratory conditions, while Dubey et al [19] also found higher rates of NCDs 56.2% with infective conditions accounting for 43.81% with URTI making up 37.9% of this proportion. These findings further strengthen the importance of non-communicable chronic respiratory disease as major contributors to respiratory disease morbidity and mortality globally [2,3,5]. The yearly trend in the frequency of the various diseases show an increase in the proportion of pneumonia/lung infection from 2016, 2017 and 2018 while asthma and COPD showed a spike in 2017 and 2018 and 2018, respectively. The spike in these diseases is observed to overlap with the increasing incidence of outdoor air pollution and soot in Port Harcourt, Nigeria [9,10]. The increasing air pollution situation may be a contributor to increasing asthma prevalence. The mean age of attendees with respiratory disease, was 44.91±17.03, with a range of 14-93 years and median of 42 years; while subjects in the 30-39 year and 40-49 year age group were in the majority with percentage of 24.5% and 19.7%, respectively. In addition there was no significant difference in the mean age of the study participants for each year of the study as shown in Table 2. There were also more females 306 (52.5%) diagnosed with respiratory disease compared to males 227 (47.5%). The age of with respiratory diagnosis is similar to findings of other studies by Umoh et al [15] in Uyo who reported a mean age of 40.7 ± 14.7 years, with subjects below 50 years in the majority (64%). Other studies by Adeoti et al [17] found a mean age of 50.0±20.8, with patient's aged 16-44 years accounting for 42.2% of the study population. A similar trend of age group patterns presenting with respiratory

disease is also reported by Adenyi et al and [16], Desalu et al [18]. In contrast to the findings of this study with more females; other studies [15,16,17,20] reported a higher proportion of male patients. Desalu et al [18] found more female patients with respiratory disease in accordance with the index study. Analysis on the impact of age and gender on the respiratory disease patterns in this study shows significant differences. COPD, Sarcoidosis, Lung malignancies, ILD, pneumonia occurred more frequently in patients aged over 45years while Asthma, TB, URTI, OSA/Sleep disorders and pleural diseases were more prevalent in patient below 45years of age. Asthma, pneumonia, ILD, Sarcoidosis and OSA/Sleep disorders were more common in females while TB, COPD, lung malignancies, were more common in females. The pattern in this study is comparable with existing patterns for the above diseases and contrasts in some areas. Umoh et al [15] found asthma was more common in females while COPD, TB and Lung malignancies were more common in males in agreement with the findings of this study. In similar pattern Umoh et al [15] found that TB and Asthma were more common patients <45 years while COPD, Lung malignancies and pneumonia were more common in patients >45 years. Xie et al [22], in a study of respiratory disease trends from 1990 to 2017 report that CRD is on the rise among females, with COPD more prevalent in males and asthma more prevalent in females. Though Sarcoidosis and ILD were on the rise in females they were more prevalent in males. The higher frequency of ILD in females in this index study is explained by the higher prevalence of connective tissue diseases in females which is the major cause of ILDs in this environment. A previous study [23] in the same institution as this index study found that 93.3% of patients with rheumatologic disorders from 2012 to 2013 were females while Ohagwu et al [24] documented a 6:1 female to male ratio among patients with rheumatoid arthritis in Nigeria. In addition the disparities in respiratory disease patterns by gender and even age is influenced by various factors which are contextual, localised and determined by socio-economic and environmental influences [25]. Conclusion: In this study the leading respiratory conditions were Asthma (32.2%), Tuberculosis (31.2%), COPD (16.8%), Pneumonia/Lung infection (8.7%) and Lung malignancies (2.9%). The finding in this study calls for more attention to be paid to the prevention and management of the prevalent disease conditions in order to reduce the morbidity and mortality associated with the conditions. In addition planning for the management of these diseases in our facility should be prioritised through the provision of appropriate facilities for investigation and treatment. Protocols for the early screening of lung cancer and facilities for treatment should also be prioritized in healthcare service planning. The importance of COPD as a leading respiratory disease has also been highlighted in this study, with established risk factors like indoor and outdoor air pollution prevalent in this environment [9,11,12,13]. The trend of asthma shows how important this disease contributes to morbidity in our environment. In addition the link between rising asthma prevalence and the growing air pollution needs to be given adequate attention.

The presence of ILD most commonly due to connective tissue diseases and conditions like sarcoidosis may be due to increasing expertise stimulated by the presence of a specialty respiratory clinic. The presence of these diseases should stimulate the provision of essential services such as high resolution imaging, histopathology services and rheumatology studies. The presence of OSA/SD also indicates the need to create awareness about this common but under recognised condition. The use of simple screening tools for the diagnosis of OSA/SD is advocated especially in people at risk. A significant number of respiratory diseases belong to geriatric age group, in line with the global trend of aging as a key factor in the rising trend of chronic respiratory diseases. There is a need to prioritize the care of respiratory illness among geriatric population with adequate resource planning. The importance of improved quality of care for the management of respiratory conditions cannot be over emphasized. The use of guidelines and training of healthcare professionals through various continuing professional development platforms should consequently be encouraged. Finally the listed respiratory diseases should be incorporated into the scope of disease covered by the health insurance in Nigeria.

Acknowledgements

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