Original Article

Associated Factors and Disability Burden among Adolescent and Adult Nigerians with Bronchial Asthma

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Abstract

Background: Bronchial asthma is a global health issue affecting the socio-economic, financial, psycho-social, and emotional well-being of individual patients. It is a major non-communicable disease that affects children, adolescents, and adults. Bronchial asthma has been linked with a high burden of physical limitation and functional disability.

Aim/objective: This study was conducted to determine the prevalence of disability and its predictors in adolescents and adult patients treated for bronchial asthma.

Method: This is a facility-based cross-sectional study involving 106 randomly selected patients, and randomly selected asthmatic patients attending the General Out-Patient Department and Respiratory Clinics were recruited for this study. A structured questionnaire was used to collect the socio-demographic characteristics and the level of disability, which was assessed with WHODAS 2.0 short-form having a five-point ordinal scale, ranging from 1 to 5. Data was analyzed with SPSS version 16. Frequency, mean, and standard deviation were used to summarize the data. Associations between variables were assessed by using the chi-squared ($\chi 2$) test and Student's *t*-test. Associations between the independent effects of variables were assessed by using Poisson regression analysis. The level of statistical significance was set at a p-value of 0.05.

Results: This study included 32 (30.2%) males and 74 (69.8%) female participants with a mean age of 35.82±0.56 years. More than half of both male (n=19, 59.3%) and female (n=49, 66.2%) participants reported no disability, while only 1 male and 5 females reported severe disability. The differences were not statistically significant ($p>0.05$). The mean disability in this study was 2.1, suggesting low disability based on the International Classification of Functioning, Disability, and Health severity range. However, age (CI=0.998-1.003), BMI (CI=0,994-1.013), and duration of disability (CI=1.001-1.002) were the significant predictors of disability.

Conclusion: This study showed that individuals with asthma have a low burden of disability. Age, BMI, and duration of disability were the most important predictors of disability burden. The finding of a low asthma prevalence of disability in asthma emphasizes the need to incorporate disability assessment into asthma management. [*Ethiop. J. Health Dev.* 2024; 38(2): 00-00]

Keywords: Bronchial asthma, burden, disability, predictors, quality of life.

Introduction

Bronchial asthma has become a global health issue affecting the socio-economic, financial, psycho-social, and emotional well-being of individual patients(1). Asthma is a major non-communicable disease affecting both children and adults, and it is the commonest chronic disease among children (1). It is often underdiagnosed and under-treated, particularly in low- and middle-income countries (1). It is increasing in prevalence, affecting an estimated 300 million people worldwide in 2021 and leading to 455, 000 deaths (2). It affects 1-18% of the population in different countries of the world. In North America, asthma is present in 10% of the population (2). In a recent review, the prevalence of physician-diagnosed asthma, clinical asthma, and wheezing in Nigeria was 2.5%, 6.4%, and 9.0% respectively (3).

The number of individuals diagnosed clinically as asthma patients in Nigeria is approximately 13 million, and this likely ranks among the highest in sub-Saharan Africa (3). In addition to this, demographic, epidemiological, and environmental changes in Nigeria in the past 20-40 years have resulted in an increased burden of asthma, leading to rising morbidity and mortality of bronchial asthma in recent decades across all ages and races (4). This increased burden is noted in varying proportions and rates across diverse geographical areas in the world (5). Most asthma deaths are largely preventable and occur in individuals who are 45 years and older. These deaths are associated with delayed access to emergency care, especially during exacerbations ,insufficient long-term care, and scarcity of medications (6).

Asthma is defined as a heterogeneous disease characterized by chronic airway inflammation, and it presents with a history of respiratory symptoms such as chest tightness, shortness of breath, ,wheezing, and coughing, all of which vary over time and in intensity (7). Asthma is diagnosed based on characteristic

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symptom patterns and evidence of airflow limitation best demonstrated by bronchodilator reversibility testing (7,8). The mainstay of asthma treatment is the use of inhaled controller medications, which contain anti-inflammatory agents, usually inhaled corticosteroids, to reduce exercitations and reliever medications (short-acting bronchodilators) to relieve acute symptoms and effect bronchodilation during exacerbations (8).

Some studies have linked asthma to a high burden of physical limitations and functional disability, with people with frequent acute asthma attacks being at higher risk of disability (4,6). Others have linked the burden of the disease with low Disease Adjusted Life Year (DALY) and high economic burden on patients, particularly in developing countries where the healthcare system is poorly organized and funded. The direct health-care costs of managing bronchial asthma are substantial and vary from country to country depending on the burn of the disease, type of health system, demographic status and the level of organization of the health system of each country. Several studies have been published evaluating the economic burden of asthma on society and individuals, as well as evaluating the Disease Adjusted Life Year (DALY) and the Quality of Life (QoL) of adult patients with bronchial asthma (9). A 2018 study showed that among patients with treated asthma in the USA, the cost of medications was enormous and constitutes the largest portion of the total cost of treatment (10). For the year 2013, with an asthma prevalence of 4.9%, the estimated total medical cost of asthma in the United States was 57.9 USD billion. In Europe, the direct costs vary from less than 500 USD per individual per year in Russia to over 2,000 USD in the United Kingdom (10). A Nigeria study revealed that the burden of asthma among Nigerian adults is very high despite advanced knowledge of the pathophysiology of asthma and improved treatment modalities. The study showed significant impairment in daily activities which included sports (84%), Job/career (60%), Physical activity (55%), Social activity (54%), Household chores (61%), Disturbed sleep (53%), Daytime symptoms (51%), and Hospitalization (50%). (11) Another study done among children and adolescents in Nigeria revealed that childhood asthma was responsible for 23.6-34.24 YLLs per 1000 population, 0.01-1.28 YLDs per 1000 population, and 24.23-34.41 DALY per 1000 population. Minimal difference in DALYs was observed across clinical categories and was consistently higher among older children (adolescents) aged 12-17 years. (12).

Quality of Life (QoL) is a tool being employed to quantify the effect of the disease on the patients' daily life and well-being in a standardized manner. This concept, also referred to as health-related quality of life, is actually a representation of patients' judgment of the effect of their disease status and its treatment on their lifestyle. A nationwide study done in Portugal showed a marked effect of asthma on patients, with women reporting poorer QoL than men in all the questionnaire's subscales, and surprisingly, smokers presented better QoL than non-smokers. (13) Moreover, in 2019, the global age-standardized disability-adjusted life-years (DALY) rate was 273.6, with asthma patients being more likely to develop disability than those without asthma(4). Factors that are associated with an increasing burden of disability among people with asthma include increased Body Mass Index (BMI), Low socio-economic index, occupational ashmagens, and smoking (4,6). In Nigeria and Africa in general, there is a paucity of studies on the global disability burden in individuals on treatment for asthma (7). There is, therefore need for such a study that will help not only in estimating the burden of disability but will also highlight the magnitude and severity of the problem and help to develop consensual efforts to reduce the societal burden of disability and improve the health outcomes for individuals being managed for asthma. The study aimed to determine the prevalence of disability and its predictors among adolescents and adults being managed for asthma.

Methods

Study design and setting

This was a cross-sectional study of asthma patients attending the out-patient department c of a private university teaching hospital in southwest Nigeria. The teaching hospital is a 150-bed hospital that serve the people of Ogun State, with referrals from other southwestern states of Lagos, Oyo, Osun, and Ekiti. It provides health services to about 2-3 million Nigerians living in Ogun State and its environs (14). This study was conducted between February 1 and August 31, 2022.

Study population: One hundred and six randomly selected adolescents and adults diagnosed with asthma who were 15 years and older attending the General Out-patient Clinic (GOC) and Respiratory Clinics were included in this study.

Sampling technique/subject selection: From a sample frame of approximately 400 diagnosed asthmatic patients, a simple random technique was used to select study participants who fulfilled the inclusion criteria. Hence, a total of 106 patients attending the GOC and the Respiratory clinic were considered for this study.

Inclusion criteria

The patient must be above the age of 15 years and attending the General Out-patient Clinic (GOC) and Respiratory Clinic of the hospital.

The diagnosis of asthma must be confirmed by spirometry.

Exclusion criteria

Patients who were too ill and unable to respond to the questions.

Patients with significant comorbidity such as heart failure, myocardial infarction, chronic kidney diseases, malignancies, etc.

Data collection and disability assessment tool

A structured questionnaire was used to collect information on socio-demographic parameters with self-reported asthma duration (in years) obtained from

the participants. The dependent variable was the disability scores and classes, while the independent variables were the age and gender of the patient, the BMI, occupational status, and duration of disability. The World Health Organization Disability Assessment Schedule (WHODAS 2.0) short form with a five-point ordinal scale ranging from 1 (none) to 5 (extreme or cannot do it) was used to assess the level of disability in this study. This standard Disability Assessment tool Schedule 2.0 provides a common metric for the impact of any health condition in terms of functioning. It is useful in the assessment of both physical and mental disability burdens of all health conditions irrespective of etiology [9]. Due to the fact that it was an item-based analysis, each item was dichotomized as no disability (1 = none) and the presence of disability: 2–5 (mild to extreme). The items were re-coded from 0 (none) to 4 (extreme or cannot do it) for both simple sum and item-response theory (IRT) summary score analysis. A summary score (outcome) of 45 was the cut-off point for overall disability. Simple sum norm values of 0, 1–4, 5–9, and 10–48 were used to classify survivors into no disability, mild, moderate, and severe disabilities, respectively.

Statistical analysis

All data collected were analyzed using Statistical Package for Social Sciences (SPSS) version 16 [SPSS, Chicago, IL]. Continuous and categorical variables were presented as frequency, mean, and standard deviation. Significant statistical differences were assessed with the chi-squared ($\chi 2$) test for categorical variables and the Student's *t*-test or *F*-test for continuous variables. Associations between variables or predictive factors for disability were analyzed with Poisson regression analysis or predictive factors of disability. The level of statistical significance was set at a p-value of <0.05.

Ethical declaration

The study was approved by the Babcock University Health Research Ethics Committee and Health, Planning, Research and Statistics Review Board of the Ogun State Ministry of Health in Abeokuta, Ogun State, Nigeria (approval number HPRS/381/322). This study was conducted in accordance with the principles of the Declaration of Helsinki. Written informed consent was obtained from each participant.

Results

Socio-demographic characteristics of study participants: A total of 0ne hundred six participants attending the GOC and Respiratory Clinic of Babcock University Teaching Hospital (BUTH), Ilishan- Remo, Ogun State, Nigeria, were involved in this study, which included 32 (30.2%) males, and 74 (69.8%) females. The mean age of participants was 35.82±0.56 years. The majority of participants (n=69, 65.1%) had been diagnosed with asthma for less than 10 years. Only 19 participants (17.9%) were obese, majority of study participants were overweight (n=42, 39.6%). (Table 3)

The burden of disability among study participants: Table 1 shows the prevalence of disability by each item of the WHODAS scale. The prevalence of disability was high in 8 items among male participants and all 12 items among female participants but low or moderate in 4 items among male participants, ranging between 02 and 07. However, when the summary cut-off (45) was used, only 7 male (21.9%) and 21 female (28.4%) participants with asthma reported significant disability. There was no significant statistical difference in the prevalence of disability between male and female participants. (p=0.065). (Table 1)

Table 1 **shows the gender differences in the prevalence of disability by items.**

	Items	Male N (%)	Female N (%)	p-values
1	How much difficulty did you have in standing for long periods, such as 30 min?	3(9.3)	11(14.9)	0.047
2	How much difficulty did you have in taking care of your household responsibilities?	11(34.4)	38(51.4)	0.042
3	How much difficulty did you have in learning a new task, for example, learning how to get to a new place?	1(3.1)	3(4.1)	0.271
4	How much of a problem did you have joining in community activities?	9(2.8)	21(28.4)	0.112
5	How much have you been emotionally affected by your health problems?	06(18.8)	37(50.0)	0.034
6	How much difficulty did you have in concentrating on doing something for 10 min?	07(21.9)	23(31.8)	0.294
7	How much difficulty did you have in walking a long distance, such as a kilometer [or equivalent]?	13(40.1)	49(66.2)	0.534
8	How much difficulty did you have in washing your whole body?	02(6.3)	13(17.6)	0.057
9	How much difficulty did you have in getting dressed?	02(6.3)	16(21.6)	0.072
10	How much difficulty did you have in dealing with people you do not know?	03(9.4)	21(28.4)	0.077
11	How much difficulty did you have in maintaining a friendship?	7(21.9)	25(33.8)	0.055
12	How much difficulty did you have in your day-to-day work?	11(34.4)	31(41.9)	0.102
	The summary score for all items	07(21.9)	21(28.4)	0.065

Table 2 shows the severity of disability among patients with asthma attending the GOC and Respiratory Clinic at BUTH. More than half of both male [n=19, 59.3%] and female (n=49, 66.2%) participants reported no

disability, while only 1 male and 5 females reported severe disability. Adjusted for gender, the differences were not statistically significant [p>0.05].

Table 2 **shows the severity of disability by gender among study participants**

Severity of disability	Male N (%)	Female N (%)	p-values
No disability	19(59.3)	49(66.2)	0.125
Mild disability	7(21.9)	9(12.2)	0.067
Moderate disability	5(15.6)	11(14.9)	0.455
Severe Disability	1(3.2)	5(6.7)	0.321
Total	32(100)	74(100)	

Factors affecting the burden of disability among study participants

Table 3 shows the pattern of disability by socio-demographic and clinical characteristics. Majority of study participants were overweight (n=42, 39.6%), while only 19(17.9%) participants were obese, with no significant statistical difference (p=0.67). The disability in this study was 2.1, suggesting low disability based on the International Classification of Functioning, Disability, and Health severity range. This was noticed to have decreased with decreased duration of disability, though not statistically significant [p=0.68]. Furthermore, there was no gender difference in the pattern of disability among the study participants (Table 3). Table 4 shows the severity of disability in the patients with asthma. Poisson regression analysis showed socio-demographic variables of age (IRR=0.998-1.003), weight (IRR=0.994-1.013), and duration of disability (IRR=1.001-1.002) among asthmatic participants as significant predictors of disability. This study showed that one one-year increase in age and duration of disability and a unit increase in body weight were associated with 0.1%, 0.1%, and 0.3% increase in disability, respectively.

Table 3 **Pattern of disability by socio-demographic and clinical factors**

Variables	N (%)	WHODAS Summary score (IRT)			
		Both	***Male***	***Female***	
		Mean± SD	***Mean± SD***	***Mean± SD***	***p-value***
Age (years)					
15-24	37(34.9)	3.7±19.1	5.7±21.1	2.4±16.6	0.69
25-34	21(19.8)	3.3±19.1	1.4±19.0	5.6±19.3	0.77
35-44	19(17.9)	1.0±18.7	2.0±18.9	0.9±18.7	0.56
45-54	8(7.5)	2.1±18.6	1.7±19.1	3.3±16.8	0.35
55-64	10(9.4)	2.9±18.7	4.3±10.8	1.1±20.3	0.56
≥65	11(10.5)	1.8±20.1	0.8±19.6	2.4±18.4	0.66
	P=0.74*				
Gender					
Male	32(30.2)	2.6±16.7	1.9±17.9	3.0±20.2	0.54
Female	74(69.8)	2.7±19.3	1.4±18.5	3.3±20.5	0.98
	P=0.86*				
BMI (kg/m^2)					
Underweight	6(5.7)	3.5±23.6	5.8±23.1	2.9±20.0	0.62
Normal weight	39(36.8)	2.7±18.4	2.3±16.7	3.8±19.4	0.54
Overweight	42(39.6)	8.5±29.5	8.7±29.4	9.2±41.2	0.98
Obese	19(17.9)	8.0±18.4	7.2±07.2	8.6±29.1	0.49
	P=067*				
Religion					
Christianity	77(72.7)	3.8±18.3	3.6±23.1	4.2±19.4	0.89
Islam	25(23.5)	2.2±12.6	2.3±21.7	1.9±21.1	0.35
Others	4(3.8)	1.6 ±16.7	1.4±16.4	1.7±16.5	0.75
	P=0.84*				
Occupation					
Artisan	19(17.9)	5.9±18.7	5.0±19.3	7.8±23.1	0.54
Trading	27(25.5)	2.1±19.1	2.3±16.7	2.0±18.9	0.52
Professional	34(32.1)	2.7±29.4	3.0±18.7	2.2±41.2	0.22
Students	24(22.6)	2.4±19.0	2.0±18.4	2.3±21.2	0.96
Unemployed	2(1.9)	2.8±20.9	2.0±18.8	4.1±23.6	0.62
	P=0.57*				
Duration of disability					
≤ 10 years	69(65.1)	2.2±19.0	2.6±23.4	1.6±18.8	0.62
>10 years	37(34.9)	3.3±19.4	2.9±20.0	3.6±16.1	0.74
	P=0.68*				

Total	106	2.1±17.3	2.7±29.5	1.4±16.7	0.78

*p-values (f-test), p-values (t-test)

Table 4 **shows the Poisson Regression Analysis of Disability and Predicting Factors**

Variables	**B**	**SEB**	**IRR**	**95%CI(IRR)**	**p-value**
Intercept	2.565	0.311	15.040	7.093-21.889	0.0001
Gender					
Male (Reference)					
Female	-0.037	0.045	0.962	0.905-1.060	0.54
Age	0.001	0.001	1.001	0.998-1.003	0.0001
BMI	0.003	0.006	1.003	0.994-1.013	0.0001
Occupation	0.003	0.004	1.003	0.996-1.010	0.43
Duration of disability	0.001	0.001	1.001	1.001-1.002	0.0001

Discussion

The findings from this study showed that patients with asthma in Nigeria have a mild to moderate burden of global disability. This was shown to affect, to a great extent, the domains of mobility and life activity. This is similar to findings in previous studies with different measures of disability (15, 16). However, unlike this study, which shows a low prevalence of disability in young patients (15-24 years), some of these studies also reported a higher prevalence of disability among asthma patients, especially in the elderly and those aged 5-15 years (17,18). This shows that the younger the study subject, the lower the disability.

The low prevalence of disability in this study may be attributed to the fact that the majority of study subjects are young, are students and likely from economically well families. This study also showed that only 7 males and 21 females (1:3) had asthma disability, which was not statistically significant. The failure to establish differences in disability prevalence between males and females in this study may be attributed to the small sample size used for this study, and the result may not be fully comparable to findings in other large population studies.

The Global Initiative for Asthma (GINA) defines asthma as a heterogeneous disease, usually characterized by chronic airway inflammation. It is defined by the history of respiratory symptoms such as wheezing, shortness of breath, chest tightness, and cough that vary over time and intensity, together with expiratory airflow limitation (7). It is generally and scientifically accepted that asthma is a chronic inflammatory disease of the airways which, if left untreated, especially with the use of inhalational steroid-based controller medication, may lead to uncontrolled inflammation which causes irreversible damage to the airway (airway remodeling), resulting in persistent airflow limitation, decreased mobility, poor activity tolerance, and increased disability in asthma patients (19). Although GINA documented and established a relationship between asthma and obesity, it failed to evaluate, exploit, or discuss the likely effect of asthma and its risk factors on day to day activities of the patients and the effect of asthma on DALYs of asthma patients. This study also showed an association between obesity and disability in asthma patients. It is very important, therefore, to evaluate the quality of life of patients with asthma and put in place measures to reduce global disability in the management of asthma from the time of diagnosis and/ or at the onset of treatment (19, 20). This is imperative, especially in developing countries where disability from asthma is higher compared to the developed world or is on the increase partly due to poor economic status, non-availability, and/or scarcity of controller medications (19).

Our study showed low disability in people with asthma based on ICF severity. Other studies that used generic measures of disability, the WHODAS 2.0, particularly in black Africans, are not available for comparison. However, the low disability score of 2.1 in our study is much lower than the moderate to severe disability scores of 44 and 22 reported in stroke survivors (21) and type- 2 diabetes mellitus (T2DM0 (22) respectively in Nigeria, using the same assessment tool. This strongly suggests that asthma is associated with less disability burden compared to T2DM patients and stroke survivors. Similar to this study, disability in T2DM and stroke patients increases with an increase in aged (21,22), but unlike in this study, disability was significantly higher among females with T2DM compared to their males counterparts (22). This may suggest that asthma patients are more compliant with medications compared to stroke survivors or T2DM patients or that the anti-inflammatory agents used in the management of asthma promote treatment control and minimize adverse clinical outcomes (20).

Our findings also showed that there is no gender difference in disease burden among asthma patients, implying that disability attributed to asthma cannot be predicted by the gender of individual patients. This is similar to the findings of a study done in Jinan, China (23). The findings from our study showed that age, body weight, and duration of disability are significant predictors of disability among people with asthma. This supports the multifactorial nature of the disease as supported by multiple phenotypes explaining the pathophysiology of the disease (21). These factors significantly impacted functionig and may consequently affect the quality of life of this group of (4,6). This has been found to be in agreement with studies done in other parts of the world (24,25). This study suggests an association between the duration of disability and the burden of disability. A month increase in disability duration has estimated 1.001 times more disabilities reported in agreement with a

similar study which observed an association between the duration of disability and functional disability(22).

Study Limitation

The small sample size of this study makes it challenging to claim complete comparability of the findings with previous reports. Additionally, the sample size employed is a significant limitation of the study design, which may restrict the generalizability of the results to a larger population.

Conclusion

This study showed that individuals with asthma exhibit a mild degree and low burden of disability predicted by socio-demographic characteristics such as age, body weight, and duration of the disability. The burden of disability is, however, comparable to findings in other parts of the world. There are very few studies on the burden of asthma in Nigeria and Africa in general; therefore, more studies are needed in Sub-Saharan Africa to fill this vacuum.

Recommendation

The authors are advocates for a multi-center study with a larger sample size, which will evaluate other risk factors that were not part of this study, to be carried out in not too distant future in order to have a fuller picture of the effect of the disease on the physical, mental and social status of patients.

Declarations

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