

Relationship between physical activity and socio-demographic characteristics of adults with asthma

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Abstract

Introduction: Physical activity is a simple and cost-effective means of prevention and cure for a gamut of chronic disorders and the adoption of a lifelong physical activity can be impacted by the demographic composition of populations in health and disease.

Objective: This cross-sectional survey was undertaken to assess the physical activity levels of individuals with asthma and their relationship with socio-demographic characteristics.

Methods: A total of 71 individuals with asthma aged ≥ 18 years (mean age = 40.28 ± 11.40 years) attending the Pulmonology clinic of Murtala Muhammad Specialist Hospital in Kano, North-Western Nigeria were selected using purposive sampling. Physical activity levels in Metabolic Equivalents (METs) were estimated using the Global Physical Activity Questionnaire while socio-demographic characteristics were obtained from case notes and confirmed by the study participants. Descriptive statistics of mean, standard deviation, percentage and frequency were used to summarize relevant data whereas the relationship between physical activity and socio-demographic characteristics was determined using Pearson product-moment correlation at a significance level of $p < 0.05$.

Results: With a mean Body Mass Index (BMI) of 25.50 ± 5.50 kg/m², study participants had an overall mean physical activity score of $3,519.64 \pm 3,232.59$ METs. Almost 86% ($n = 61$) of them were active with METs of ≥ 600 while 14% had METs of < 600 . BMI correlated significantly with overall physical activity score ($r = 0.24$, $p = 0.045$) but there was no significant correlation between this and each of level of education ($r = 0.12$, $p = 0.33$), age ($r = -0.11$, $p = 0.37$) and gender ($r = -0.08$, $p = 0.52$).

Conclusion: It was concluded that in adults with asthma, BMI is a potential determinant, perhaps a stimulating factor, in the performance of physical activity.

Keywords: Asthma, relationship, physical activity, socio-demographic characteristics, North-Western Nigeria

Introduction

Asthma is a chronic inflammatory disease of the airways associated with acute and chronic recurrent episodes of wheezing, breathlessness, coughing and tightness of the chest due to narrowing of the airways, leading to obstruction of airflow which can be mild, moderate, or even life-threatening (Morton and Fitch 2011). According to the report of the global initiative for asthma (GINA), asthma affects more than 300 million individuals of all ages, ethnic groups and regions worldwide. The global prevalence of the condition ranges from 1% to 18% of the population in different countries and it is projected to continue to increase (To et al. 2012). It contributes to nearly 250,000 premature deaths (Bousquet et al. 2010) and it could be a major cause of disability, health resource utilization and poor quality of life for those who are severely affected (To et al. 2012). Asthma leads to poor tolerance to physical activity (PA) due to factors such as reduced ventilator capacity, dyspnea (on activity and at rest) and exercise-induced bronchospasm (Wertz et al. 2010; Priftis et al. 2007).

There is a wide consensus that PA helps to maintain good health (Nelson et al. 2007). Increased PA levels have been linked to improved health and health

outcomes across a variety of chronic diseases (Warburton et al. 2006; Anderson and Durstine 2019). It has also been shown to have cardiovascular benefits (Ram et al. 2000; Mendes et al. 2011). Studies have shown that an increase in leisure time PA level in older women with asthma was associated with decreased episodes of asthma exacerbation over a period of one year (Garcia-Aymerich et al. 2009). Also a 12-month leisure time PA intervention resulted in improvement in asthma control and quality of life (Mancuso et al. 2013). Conversely, insufficient PA is believed to increase the risk of asthma exacerbation (Rosencrantz et al. 2012). It has been hypothesized that PA decreases hyper-responsiveness in at-risk asthmatics by stretching and relaxing the airway and its smooth muscle (Rosencrantz et al. 2012; Bonsignore et al. 2008). Furthermore, it has been reported that physically inactive individuals with asthma were more likely to be hospitalized overnight and seek multiple physician visits compared to active individuals with asthma and those without asthma (Dogra et al. 2009). Insufficient physical activity can lead to overweight and obesity which in turn can elicit poor control and exacerbation of asthma symptoms. Individuals with obesity tend to have more severe asthma than their

lean counterparts, and have about four to six times higher risk of being admitted to hospital in comparison with non-obese asthmatics (Holguin et al. 2011). Obese patients also have worse asthma control and lower quality of life (Vortmann and Eisner 2008; Peters et al. 2018). Individuals with severe asthma have consistently been shown to present with significantly low PA levels. Cordova-Rivera et al. (2018) reported as low as 5,362 steps per day and 22 minutes of moderate to vigorous PA per day in persons with severe asthma. Other socio-demographic variables such as age, gender, marital status and level of education might impact level of PA in persons with asthma. It is, therefore, important to investigate the level of PA of patients with asthma and to observe how specific socio-demographic factors affect it with a view to obtaining empirical data to support patient education, and initiate or improve public awareness on asthma prevention and management. Therefore, we assessed the PA level of individuals with asthma and its relationship with their socio-demographic characteristics in Kano, North-Western Nigeria.

Materials and Methods

Study setting and sampling: The study was a cross-sectional survey conducted at Murtala Muhammad Specialist Hospital, which is a secondary health facility located in Kano Metropolis, North-Western Nigeria using purposive sampling. Inclusion criteria were the presence of asthma, age ≥ 18 years, and ability to speak Hausa or English language. Individuals with a history of other disabling condition or systemic disorder such as stroke and heart failure, and those with recent asthma exacerbation (< 3 months) were not included in the study.

Data collection procedures: Ethical approval for this study was obtained from Kano State Hospitals Management Board and patients' informed consent was sought and obtained prior to recruitment in the study. Study participants' socio-demographic characteristics including age, weight, height, educational level, employment status and marital status were obtained and recorded using researcher designed proforma.

Assessment of physical activity: Study participants' PA levels were assessed using the Global Physical Activity Questionnaire (GPAQ). The GPAQ consists of 16 questions and 4 domains (occupational, active commuting, recreational and sedentary behavior). Study participants were asked to report on their physical activity during a typical week. The minutes per week were computed based on the study participants' response (yes or no), whether they engaged in PA and the type, intensity, duration and frequency of the PA in which they participated. A total

amount of MET (Metabolic Equivalent) minutes was calculated for those who answered yes to engaging in PA based on the following equation (World Health Organization 2000):

$$\text{MET (minutes per week)} = \text{MET level} \times \text{minutes of activity} \times \text{events per week minutes engaged in PA}$$

The MET intensity values used with vigorous PA is 8 METs, moderate = 4 METs, walk = 4 METs and sedentary = 1 MET (WHO, 2000)

MET minutes per week were calculated for each domain of PA as follows:

PA at work

$$\text{Total MET (minutes per week) at work} = \text{Moderate (METs} \times \text{min} \times \text{days)} + \text{Vigorous (METs} \times \text{min} \times \text{days)} \text{ at work.}$$

PA for transportation

$$\text{Total MET (minutes per week) for transportation} = \text{Walk (METs} \times \text{min} \times \text{days)} + \text{Cycle (METs} \times \text{min} \times \text{days)} \text{ for transportation.}$$

Recreational activities

$$\text{Total MET (minutes per week) for recreational activities} = \text{Vigorous (METs} \times \text{min} \times \text{days)} \text{ sport activities} + \text{Moderate (METs} \times \text{min} \times \text{days)} \text{ sport or fitness activities.}$$

MET for sedentary behavior

$$\text{Total MET (minutes per week) for sedentary behavior}$$

Thus, total PA score was obtained using the following formula:

$$\text{Total physical activity} = \text{MET at work} + \text{MET for transport} + \text{MET for recreational activities} + \text{MET for sedentary behavior.}$$

The physical activity (or inactivity) of the study participants was described using the WHO recommendations on physical activity for health (WHO 2010). The total time spent in physical activity during a typical week and the intensity of the PA was taken into account. Throughout any given week, study participants should at least do PA for work, transport and leisure amounting to:

- 150 minutes of moderate-intensity PA or
- 75 minutes of vigorous-intensity PA or
- An equivalent combination of moderate- and vigorous-intensity PA achieving at least 600 MET-minutes/week. Any study participant who was not able to achieve 600 MET-minutes/week of PA was classified as inactive.

Data Analysis: The characteristics of the study participants were summarized using descriptive

statistics of mean, standard deviation, percentage and frequency. Relationship between PA and socio-demographic characteristics was analyzed with Pearson product-moment correlation. All data analyses were conducted using SPSS version 23 with level of significance set at $p < 0.05$.

Results

Socio-demographic characteristics of study participants: A total of 71 individuals with asthma (38 females and 33 males) served as study participants in the study. They had a mean age of 40.28 ± 11.40 years (95% CI: 37.58 - 42.98), and a mean BMI within optimal range for weight. Majority of them had National Certificate of Education (NCE)/Diploma and almost 60% were married. The detailed socio-demographic characteristics are shown in Table 1.

Table 1: Characteristics of the study participants

Variables	Mean $\pm$ SD	Frequency (%)
Age (years)	40.28 ± 11.40	
Gender		
Male		33 (46.5)
Female		38 (53.5)
Marital status		
Single		9 (12.7)
Married		59 (83.1)
Widow		3 (4.2)
Occupation		
Student		9 (12.7)
Civil servant		45 (63.2)
Private institutions		3 (4.2)
Trading		9 (12.7)
Artisan		5 (7.0)
Educational level		
Primary		4 (5.6)
Secondary		22 (31)
NCE/Diploma		23 (32.4)
Degree		22 (31.0)
Body Mass Index (kg/m^2)	25.50 ± 5.50	
Underweight		5 (7.0)
Normal weight		31 (43.7)
Overweight		24 (33.8)
Obese		11 (15.5)

NCE = National Certificate of Education

Table 2: Mean scores of PA and body mass index of study participants (N=71)

Variables	Mean $\pm$ SD	Range
BMI	25.5 ± 5.5	15.6 – 40
Vigorous work MET	1780.3 ± 2880.3	0 – 13440
Moderate work MET	1363.4 ± 1816.4	0 – 8400
Walking (transport) MET	249.3 ± 369.6	0 – 2400
Vigorous recreation MET	22.0 ± 120.5	0 – 960
Moderate recreation MET	104.7 ± 247.2	0 – 1440
Sedentary MET	193.5 ± 101.5	30 – 420
Overall MET	$3519.6 \pm 3232.$	40 – 14760

NCE = National Certificate of Education

Table 2 presents the METs for different intensities for the various activities. Furthermore, the majority of study participants (86%) had 600 METs and above and were classified as active, while the remaining had less than 600 METs and were classified as inactive

PA pattern of the respondents **Correlation among physical activity status and demographic characteristics of the study participants:** Study participants' BMI has little positive correlation with their overall PA score ($r = 0.24$, $p < 0.05$). No significant correlation was however observed between overall PA and age ($r = -0.11$, $p > 0.05$), gender ($r = -0.08$, $p > 0.05$) and level of education ($r = 0.12$, $p > 0.05$) (Table 3).

Table 3: Correlation between physical activity status and socio-demographic characteristics (N=71)

Physical Activity Status	Characteristics	r	p
Vigorous work MET	Body Mass Index	0.09	0.44
Moderate work MET		0.23	0.05*
Walking (transport) MET		0.31	0.008*
Vigorous recreation MET		0.17	0.16
Moderate recreation MET		-0.22	0.066
Sedentary MET		-0.04	0.72
Overall MET		0.24	0.045*
Vigorous work MET	Level of education	0.12	0.31
Moderate work MET		-0.03	0.78
Walking (transport) MET		0.12	0.31
Vigorous recreation MET		0.07	0.57
Moderate recreation MET		0.15	0.22
Sedentary MET		0.15	0.21
Overall MET		0.12	0.33
Vigorous work MET	Age	-0.07	0.54
Moderate work MET		-0.07	0.57
Walking (transport) MET		-0.12	0.34
Vigorous recreation MET		0.09	0.45
Moderate recreation MET		0.08	0.51
Sedentary MET		0.06	0.60
Overall MET		-0.11	0.37
Vigorous work MET	Gender	-0.03	0.78
Moderate work MET		-0.12	0.33
Walking (transport) MET		0.10	0.42
Vigorous recreation MET		-0.12	0.10
Moderate recreation MET		0.20	0.10
Sedentary MET		-0.06	0.62
Overall MET		-0.08	0.52

MET = Metabolic Equivalent; * denotes statistical significance

Discussion

The physical activity pattern of the study participants in the present study indicates that majority of them were active having scored 600 METs and above in line with the recommendation of the World Health Organization (WHO 2000). Thus, majority of the study participants had the minimum requirement of PA for health, in spite of a number of studies that showing reduced PA level of individuals with asthma (Ram et al. 2000; Craig and Dispenza 2013; Oni et al. 2010). However, other studies did not report any significant difference in PA level between persons with asthma and their healthy (non-asthmatic) counterparts (Verlaet et al. 2013; Ford et al. 2003; Nystad 1997). This signifies that persons with asthma can engage in the recommended (optimal) PA level, which is comparable to that of healthy individuals as revealed by Verlaet et al. (2013), similar to our findings.

Our finding that age did not significantly correlate with PA levels is in agreement with previous research. Takagi et al. (2015) reported that light-intensity PA

did not correlate with age. In general terms, PA levels have been shown to decrease with advancing age (Bauman et al. 2012) which is a negative relationship. Reduction in PA with age is associated with age-related decline in strength (Daley and Spinks 2000; Lexell et al. 1988) and is observed in individuals irrespective of health condition but it is more incapacitating in the presence of an infirmity (Palacios-Ceña et al. 2012; Church et al. 2007). The double impact of age and chronic nature of asthma will be responsibility for increase in the burden experienced by these patients. Speakman and Westerterp (2010) demonstrated that PA level was not associated with age in individuals aged less than 52 years. However, they found a negative relationship with age in those aged 52 years and above with moderate-vigorous-intensity PA decreasing and light-intensity PA increasing with age (Ayabe et al. 2009). The non-correlation between age and PA, in the current investigation, might be due to the relatively younger age of the study participants (a mean of about 40 years).

Body Mass Index (BMI), a measure of obesity, is known to have an inverse relationship with the level of an individual's PA (Bauman et al. 2012; Hansen et al. 2014). Individuals that have excess body fat tend to think that PA is difficult and may not engage in programmes of regular therapeutic exercise given their "heavy nature." Our finding of a positive and significant relationship between BMI and physical activity does not support the assertion above. Although we found moderate work, walking (transport) and overall MET to be statistically significantly and positively correlated with BMI, these correlations were generally weak. Higher BMIs have been shown to have negative impact on asthma control and it is associated with more frequent asthma exacerbations (Yawn et al. 2015; Ostrom et al. 2013). On the other hand, BMI within the optimal range is related to good asthma control and quality of life (Pakhale et al. 2015; Ma et al. 2015).

The results of the current study showed no relationship between any of the PA categories and any of gender or level of education. In harmony with this finding, Good et al. (2017) and Dogra et al. (2009) revealed that gender and education were not correlates of PA in persons with asthma. In the general population, however, higher levels of education are associated with higher physical activity (Bauman et al. 2012; Del Duca et al. 2016; Pedišić et al. 2014). Educated persons tend to "go the extra mile" to explore the influence that factors such as physical activity could have on their health and are more likely than their uneducated counterparts to seek information about factors that can positively impact their health from several sources. Hickey and Mason (2017) revealed significant gender differences vis-a-vis the number of hours of participation in exercise and number of activities. They reported that men participated in more hours of exercise and more types of activities than female which does not agree with the findings of the current study. The presence of a chronic disease is a factor that might obscure any differences in lifestyle modification as both male and female individuals are likely to take similar decisions to overcome their medical condition. Some limitations to the present study are involving relatively small sample size, and use of a questionnaire to assess physical activity instead of measuring PA using device like the pedometer, which provides more accurate assessment of physical activity level of study participants'.

We concluded that, in adults with asthma, BMI (a measure of obesity) is a correlate of physical activity and therefore a potential determinant, perhaps a factor that may stimulate the performance of physical activity for weight reduction and better asthma control. Future researchers should include qualitative

interviews with informants from different parts of the country to better establish the socio-demographic correlates of physical activity in adults with asthma.

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