



# Effect of Bicycle Riding on the Blood Pressure and Body Mass Index of a Rural Community in North Central Nigeria

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## Abstract

Physical activity in form of exercise is of benefit to many organs and systems in the body. The aim of the study was to assess the effect of bicycle riding on the blood pressure and body mass index of a rural community in Andaha metropolis of Akwanga Local Government Area of Nasarawa State, Nigeria. A quasi-experimental study was carried out among 63 purposively selected males who met the inclusion criteria. A questionnaire, aneroid sphygmomanometer, weighing scale and measuring tape were used to collect the data. Bicycle riding significantly reduced the mean baseline BMI from 20.9378 Kg/m<sup>2</sup> to 20.1394 Kg/m<sup>2</sup> after day 6 of physical activity with a positive correlation. In the same vein, the bicycle riding significantly reduced the mean baseline SBP from 104.6828 mmHg to 103.6406 mmHg. Furthermore, the DBP was also significantly reduced from a baseline of 72.6406 mmHg to 71.6563 mmHg.

**Conclusion:** The study highlighted the positive effect of physical activity both on the body mass index and the blood pressure of the participants. Therefore physical activity in the form of bicycle riding should be encouraged among communities nationwide.

**Keywords:** Blood Pressure; Body Mass Index; Physical activity; Bicycle riding

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**Received Date:** 02 Aug 2019

**Accepted Date:** 21 Aug 2019

**Published Date:** 03 Sep 2019

### Citation:

Otovwe A, Rume Oghenenioborue O-B, Ume Ignatius S, Joseph Bijimi L. Effect of Bicycle Riding on the Blood Pressure and Body Mass Index of a Rural Community in North Central Nigeria. *Open J Public Health*. 2019; 1(1): 1005.

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## Introduction

Obesity and hypertension are both increasingly becoming major public health problems the world over [1]. Previous studies have shown both high blood pressure and overweight are independent risk factors for cardiovascular diseases [2]. In addition, obesity has been shown to be an independent risk factor for the development of hypertension [1]. Individual lifestyle behavior such as physical inactivity has been linked to the increasing prevalence of high blood pressure [3,4]. Physical activity refers to any movement or action by an individual that increases his or her heart rate and rate of breathing [5]. Physical activity which includes walking, dancing, swimming, cycling is of benefit to many parts of the body including the heart, lungs, muscles, bones, blood, immune system and nervous system [5,6]. According to the World Health Organization recommendation, an adult aged 18-64 years is expected to do at least 150 min of moderate-intensity aerobic physical activity throughout the week or do at least 75 min of vigorous-intensity aerobic physical activity throughout the week or an equivalent combination of moderate and vigorous-intensity activity. However, despite this recommendation physical activity among all age group have been shown to be poor and has been linked to the incidence of risk factors for chronic diseases. For example a study in Canada among adults aged 20 to 59 years showed that five health-related risk factors (Large waist circumference, High Blood Pressure, High Triglycerides, Cholesterol level, High blood sugar); was less common among participants of the study with good, very good or excellent aerobic fitness as compared with those participants with fair rating or those that needs improvement in physical activity [5]. Similar studies in Nigeria and South Africa found study participants who were inactive to have higher BMI and higher prevalence of overweight and obesity as compared to participants who were active [7,8]. Furthermore, since physical activity is essential in the control of body weight and blood pressure, urban dwellers often engage in physical activity such as simple walking, cycling and jogging. However, rural dwellers who are mostly farmers often depend on walking and bicycle riding which is their main source of transportation as their source of physical activity. Thus, this study was designed using the usual bicycle riding to assess the effect of bicycle riding on blood

pressure and body mass index among rural dwellers of in Andaha metropolis of Akwanga Local Government Area of Nasarawa State.

### Materials and Methods

A quasi-experimental design was adopted for the study. The study population was adult males who reside in the community. The inclusion criteria include adult males who were frequent bicycle riders for at least 30 min in a day, 3 days in a week. A sample size of 63 males who met the inclusion criteria were selected for the study. A purposive sampling technique was adopted in identifying male individuals that meet the inclusion criteria. The data collection instruments includes; a questionnaire used in collecting the socio-demographic characteristics of the participants, aneroid sphygmomanometer (Premium-quality, made in Germany) was used for measuring blood pressure, weighing scale (seca/Germany) was used in determining the weight of the participants and measurement tape (Butterfly/China) was used for the measurement of subject's height. After obtaining the necessary approval from the community leaders, the researcher went into the community and those that were randomly selected were given form to fill to determine their level of physical activity as well as to outline those that specifically ride bicycle, also to know frequency of their riding and the duration of time of riding by an individual. The response from the questionnaire helped in the recruitment of the 63 subjects. Before and after design was used in collecting the data. During the data collection, a subject was selected and after completing the set requirement of riding bicycle at least 30 min a day; measurements of blood pressure were taken after a 2 min to 3 min rest, with a minimum of 2 readings and the average of those readings was used to represent the patient's blood pressure. The recorded values were noted on a sheet containing columns of Age, BP, and Height in meters; Weight in Kilograms and Body Mass Index in Kg/m<sup>2</sup>. The collected data was entered into SPSS version 23.0 and descriptive statistics was used to evaluate frequency distribution, while paired t-test were performed to test for associations between variables of interest with level of significance set at p<0.05.

### Results

As shown in Table 1 below, more of the respondents 20 (31.30%) were between the ages of 31-40 years. Similarly, more than half of the respondents 36 (56.30%) were married, while almost one third 21 (32.80%) had no formal education and 17 (26.60%) were farmers.

According to Table 2 below, there was a general decrease in the mean BMI of the participants after engaging in the bicycle riding from day 1-6. In addition, there was a strong positive correlation with a positive t-value between the mean BMI before and after the bicycle riding in all the days. However, only day 1, 3, 4 and 5 showed a significant relationship between the mean BMI of the participants and bicycle riding before and after engaging in the physical activity (P<0.05).

Figure 1 below shows the effect of bicycle riding on the body mass index of the participants.

As shown in Table 3 below, the systolic blood pressure of the study participants showed an increased variation across the days. Generally, there was an increase in the systolic blood pressure from day 1 to 6, however all the blood pressures across the days were within the normal range for systolic blood pressure. In addition, there was also a strong correlation and significant relationship between the mean systolic blood pressure and the effect of bicycle riding on the study subjects (P<0.05).

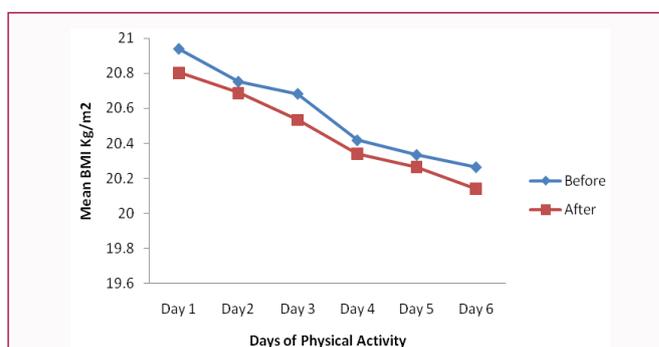


Figure 1: Graphical representation of the effect of bicycle riding on BMI.

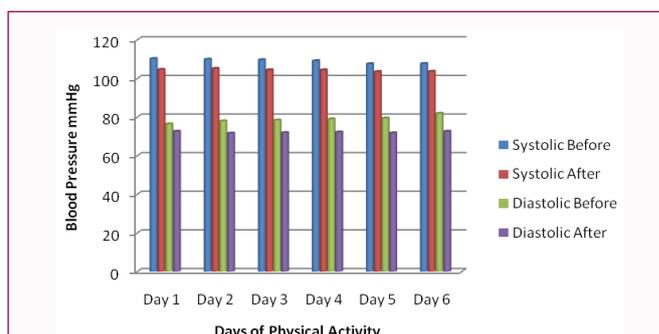


Figure 2: Effect of Bicycle riding on systolic and diastolic blood pressure.

Table 1: Socio-demographic characteristics of the respondents.

Variables	Frequency	Percentage
<b>Age</b>		
Below 25	8	12.5
25-30	21	32.8
31-40	20	31.3
41-50	15	23.4
<b>Marital Status</b>		
Single	14	21.9
Married	36	56.3
Divorced	14	21.9
Widower	0	0
<b>Religion</b>		
Christian	25	39.1
Muslim	37	57.8
Traditionalist	2	3.1
<b>Occupation status</b>		
Student	14	21.9
Farmer	33	52.3
Applicant	17	26.9

In the same vein, the mean diastolic blood pressure also showed similar variation across the days, however, while all the diastolic blood pressure were within the normal range the correlation was moderate and there was a significant association between the mean diastolic blood pressure and the effect of bicycle riding on the study subjects across the days (P<0.05).

Figure 2 shows the effect of bicycle riding on the systolic and

**Table 2:** Effect of Bicycle riding on the Body Mass Index (Kg/m<sup>2</sup>) of the participants.

		Before	After			
		Mean BMI	Mean BMI	Correlation	t	Sig.
Week 1	Day 1	20.9378	20.8036	0.989	2.895	0.004
	Day 2	20.7511	20.6878	0.962	0.707	0.481
	Day 3	20.6823	20.5331	0.991	3.528	0.001
Week 2	Day 4	20.418	20.3399	0.996	2.993	0.003
	Day 5	20.3352	20.2653	0.994	2.065	0.041
	Day 6	20.2653	20.1394	0.995	1.293	0.198

**Table 3:** Effect of Bicycle riding on the Blood Pressure (mmHg) of the participants.

		Mean Systolic BP Before & After				Mean Diastolic BP Before & After			
		Mean Systolic	Correlation	t	Sig.	Mean Diastolic	Correlation	t	Sig.
Week 1	Day 1	110.289	0.809	-6.575	0	76.4453	0.527	-4.186	0
		104.6828				72.6406			
		109.9453	0.871	-7.403	0	77.9922	0.665	-9.013	0
Day 2		105.1953				71.6563			
	Day 3	109.6641	0.795	-6.604	0	78.4141	0.537	-7.801	0
		104.4531				71.9297			
Week 2		Day 4	109.1719	0.841	-7.674	0	79.0234	0.491	-8.079
	104.4531					72.2578			
	Day 5		107.5938	0.661	-4.129	0	79.4531	0.412	-8.571
103.5625					71.7969				
Day 6		107.6953	0.828	-7.355	0	81.9219	0.554	-11.921	0
	103.6406				72.6328				

\*Mean BP before bicycle riding

diastolic blood pressure of the participants.

### Discussion

The findings of the study showed that more of the study subjects were between the ages of 25-30 years, were married and also were farmers. According to the study more of the study subjects being farmers are not surprising as most rural areas in Nigeria were made up of farmers because farming is their main occupation. This finding of the study is different from the study in Iran which assessed the effect of a 10-week water aerobic exercise on the blood pressure of hypertensive patients who had a higher age group among the intervention group [9].

Furthermore, previous studies have shown that both vigorous exercise and moderate or light intensity exercise is key to either lower body fat or weight [10-13] or maintain healthy body [11-14]. The findings of the study showed a gradual decrease in the mean BMI of the study subjects after physical activity from the baseline mean BMI to day 6 of the study. The most striking part of the findings is that despite the four days break before data collection for the study in week 2; the mean BMI of the study subjects still decreased on the baseline data for week 2. This shows the effect of moderate exercise of 30 min weekly in maintaining the weight of an individual. In addition, there was a positive correlation between bicycle riding and the mean BMI of the study subjects, as there was also a statistically significant relationship in all days of physical activity. Although, the

study did not control for other factors which have been shown to independently affect BMI such as occupational activity [15], stress [16], drinking [17], smoking and socio-economic status [10], diet [17-19], seasonal variations [20], physical fitness [21], personal health [22] and genetics[17]; the clear gradual reduction in the mean BMI of the study subjects and the subsequent positive correlation shows the effect of moderate exercise on the BMI of adults. This finding is in line with previous documented findings of researchers, health specialists and public health officials who have establish a relationship between physical activity and reduction in body fat or weight [23-25].

Previous clinical studies have documented the effects of dynamic aerobic exercises such as walking, jogging, cycling and running on the BP of study subjects; thus it has been recommended in the prevention and treatment of hypertension [26-28]. The study findings showed a systemic rise in both the systolic and diastolic BP of the study subjects in all the days that physical activity was carried out. This observed rise might not be unconnected to the physical activity of bicycle riding the subjects undertook. However, when the study subjects rested after engaging in the physical activity their BP is expected to return to its pre-physical activity level. This was precisely what happened as both the systolic and diastolic BP returned to their pre-physical activity level. This shows that the study subjects are most likely to be normotensive as both their systolic and diastolic BP returned to their pre-physical activity level and this was also corroborated in the level of both the systolic and diastolic BP of the study subjects. This

finding shows the importance of physical activity in maintaining an individual's BP by keeping the heart, lungs and blood vessels healthy. This finding of the study was different from a study in Tehran which examined the effect of a 10-week water aerobic exercise on essential hypertension that found both the systolic and diastolic BP to decrease when compared with the baseline 48 h after the last exercise session [9]. This difference in the finding of both studies might be attributed to the different study design and scope of each study and differences in when the BP measurements were taken. Furthermore, the findings of the study also showed variation with a previous study among youths in Accra Ghana which showed a decrease in both systolic and diastolic BP level among youths who engaged in moderate physical activity [4]. The observed differences between the two studies might also be attributed to differences in study design and scope. In addition, there was a significant strong correlation between the before and after systolic BP of the study subjects at ( $P=0.000$ ), however despite there was a significant relationship between the before and after diastolic BP at ( $P=0.000$ ) of the study subjects some of the correlation in the days of physical activity were moderate and weak. This shows that though physical activity is good for the body its effect on both the systolic and diastolic BP varies and this was also observed in previous studies [4-29].

### Limitation of the Study

The following were possible limitations of the study: Other variables that influence BP and BMI were not controlled in the study, methodological issues such as monitoring of exercise intensity; time between last exercise session and blood pressure measurement.

### Conclusion

The findings of the study highlighted the positive effect of bicycle riding as a form of physical activity on the body mass index and the systolic and diastolic blood pressure of the study subjects. Thus, the study has confirmed the positive effect of physical activity in keeping an individual and by extension an entire community healthy. Therefore, the study recommended that the benefits of physical activity should be incorporated into all health education programs both in health care facilities and in communities nationwide; so as to keep the population healthy thereby reducing the prevalence of non-communicable diseases.

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