



# Anger expression as a factor in elevated blood pressure among Nigerian patients

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## ABSTRACT

Nursing mothers may be at higher risk for depression and anxiety during postpartum due to the additional burden. Ostensibly, some women adjust less easily than others to this additional burden, and this could be attributed to some maladaptive traits and psychological factors. This study aimed to assess dependent personality as a correlate of postpartum anxiety and depression among Igbo nursing mothers, in their 6th to 14th weeks postpartum, in two tertiary hospitals in Enugu, south-east Nigeria. Self-report measures of the variables, namely, Dependent Personality Questionnaire (DPQ), Hospital Anxiety and Depression Scale (HADS), and Socio-demographic Questionnaire (SDQ), were used to collect data. Age range of participants was 20 - 46 years, and  $M = 29.65$ ,  $SD = 4.87$  years. Most of the respondents were graduates of tertiary educational institutions (74.1%). The prevalence of postpartum anxiety and depression were 30.1% and 33.3% respectively, with a co-morbidity of 22%. There was a weak negative correlation between dependent personality and postpartum anxiety,  $r(98) = -.215$ ,  $p < .01$ , whereas there was no significant correlation between dependent personality and postpartum depression. It was suggested that dependent personality may not be strongly associated with postpartum anxiety and depression among the nursing mothers which may be explained by other moderator variables that need further investigation.

## Introduction

Hypertension is a global public health challenge (Forouzanfar et al., 2017) and one of the major causes of coronary heart disease (Lou, Zong, & Wang, 2017; Mozaffarian et al., 2015) stroke, kidney disease and other complications (Lou et al., 2017). It is linked to increased mortality worldwide (Barry, 2015). World Health Organization (2011) reported that Africa has the highest prevalence of hypertension worldwide. Nigerian researchers have equally shown that the prevalence of hypertension in Nigeria is also very high (Akinlua, Meakin, Umar, & Freemantle, 2015; Ezekwesili, Ononamadu, Onyeukwu, & Mefoh, 2016). High blood pressure is another name for hypertension and refers to a chronic medical condition in which the pressure in the arteries is consistently elevated (American Heart Society, 2017). The range of normal blood pressure (BP) is between 100-140mmHg systolic (top reading) and 60-90mmHg diastolic (bottom reading). Hypertension is assumed to be present if the systolic blood pressure (SBP) is persistently at or above 140 mmHg and the diastolic blood pressure (DBP) is at or above 90mmHg (Sahraian, Mokhtari, Moaref, Rezaee, Moghimi, & Mani 2015). Two types of hypertension had been identified: primary or essential hypertension and secondary hypertension (Gupta-Malhortra et al., 2015). Primary or essential hypertension is most frequent type hypertension (95% prevalence) and has no clear underlying cause (Gupta-Malhortra et al., 2015) whereas secondary hypertension had detectable factors such as kidney disease, renal artery stenosis, heart or endocrine system and has the prevalence of about 5-10% (Jacovic, Zivkovic-Radojevic, & Petrovic, 2016).

A number of psychological factors had been linked to elevated BP such as psychological distress (Footman et al., 2013;

Ojike et al., 2016; Ringoir, Pedersen, Widdershoven, & Pop, 2014) type A behaviour pattern (Al-Asadi, 2010), generalized anxiety disorders and depression (Carroll, Philips, Gale & Batty, 2010; Pattern et al., 2009), self-efficacy (Ifeagwazi & Oguizu, 2006), hostility (Kretchy, Owusu-Daaku, & Danquah, 2014), emotional reactivity (Ifeagwazi, Egberi, & Chukwuorji, 2017), and anger (Hosseini, Mokhberi, Mohammadpour, Mehrabianfard, & Lashak, 2011; Sahraian, et al., 2015). However, most of these studies relating psychological factor with elevated BP were conducted particularly in Western countries with only a few studies in developing countries like Nigeria. Most of the studies in Nigeria concerning elevated BP are mainly focussed on the prevalence of hypertension (Akinlua et al., 2015; Ezekwesili et al., 2016; Gezawa et al., 2014), or behaviours of hypertensive patients (Chukwuorji, Amazue, Ifeagwazi, & Chibueze, 2017). This study aims to investigate as anger expression (anger-in and anger-out) as a factor in elevated BP among Nigerian patient population.

Anger is one of the basic emotions identified to play a role in predisposition and maintenance of several medical and psychological conditions (Sahraian et al., 2015). Smith, (1992) defined anger as an unpleasant emotion that ranges in intensity from irritation to rage, usually in response to perceived mistreatment or provocation. Emotions including anger are universally experienced in all cultures, but their expressions may differ (Ekman, 1999; Matsumoto, Yoo, & San, 2010). In other words, anger is one of the emotions that every individual experience at one time or the other, but individuals differ in how they expressed angry feelings, a concept referred to anger expression (Spielberger, Johnson & Jacobs, 1985). Spielberger et al., (1985) have identified two

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major ways people can express their anger namely anger in and anger out. Anger-in refers to the tendency to experience anger but only express it inwardly, whereas anger-out is described as the frequency with which an individual's anger is expressed outwardly towards either other persons or objects (Spielberger et al., 1985).

One of the notable early theories relating anger expression to elevated BP is Alexander (1939)'s Specificity Hypothesis. Alexander (1939) assumes that there are specific emotions which could result in elevated BP. The theory posits that chronic, inhibited, aggressive hostile impulses have a specific influence upon the fluctuations and increase of blood pressure. In other words, elevation of blood pressure results from an individual's reaction to acute rage, or chronic suppression of anger. This suggests that persons who are inclined to anger in may be more susceptible to elevated BP compared to persons who express their anger out. There are several empirical findings that have supported the anger in–elevated BP relationship. Most of these studies show that systolic blood pressure and diastolic blood pressure increased frequently with individuals who harbour grudges and held in their angry feelings. For instance, Johnson, Schork and Spielbergers (1987) investigated the associations between blood pressure and various dimensions of the anger expression (anger-in and anger-out) among 171 black and 279 white female adolescents, aged 15 and 17 years. They found that all subjects who frequently suppress their anger have higher systolic blood pressure. The association between anger in and elevated BP was stronger for black females compared to the white females. An equivalent study was carried a sample of black and white adolescent males who were enrolled in a health science course in Tampa, Florida (Johnson, Spielbergers, Worden & Jacobss, 1986). The study found that among black and white males, those who generally harboured grudges and suppressed their anger (anger-in) had higher systolic blood pressure and diastolic blood pressure. These findings indicate that persons who are at increased risk for elevated systolic and diastolic blood pressure can be identified by how often angry feelings are held-in and suppressed. In another study aimed at assessing anger expression and suppression among patients with essential hypertension, Hosseini et al. (2011) found that trait anger and anger suppression in patients with hypertension were significantly higher than the control group; however, anger out showed no significant difference in the two groups. In a meta-analytical study on the association of trait anger with resting blood pressure, Suls, Wan, & Costa (1995) showed that the anger-in and anger-out were significantly associated with resting blood pressure. In another meta-analysis of 15 studies that investigated the relationship between trait anger, anger expression and ambulatory blood pressure, Schum, Jorgensen, Verhaeghen, Sauro and Thibodeau (2003) found that anger expression had inverse relationship with diastolic blood pressure (DBP) but not with systolic blood pressure (SBP).

On the contrary, Porter, Stone and Schwartz (1999) found no association between anger expression (anger in and anger out) and elevated BP (SBP and DBP). This contradictory finding may suggest a need for more studies in this area particularly in a developing country like Nigeria. Besides, some of the existing studies (e.g., Suls et al. 1995) applied single blood pressure readings compared to studies measuring blood pressure over multiple time points as used in the present study. The major aim of this study is to ascertain whether anger expression (anger in and anger out) are factors in elevated BP among Nigerian Patient population. Another aim of this study is to compare anger expression between hypertensive and normotensive. Based on the study aims, the following hypotheses are tested:

1. Anger-out will significantly predict SBP among Nigerian patient population.

2. Anger-out will significantly predict DBP among Nigerian patient population.
3. Anger-in will significantly predict SBP among Nigerian patient population
4. Anger-in will significantly predict DBP among Nigerian patient population
5. Hypertensive and Normotensive will significantly differ in their anger expression (anger-in and anger-out).

## Participants

Participants comprised 310 volunteer patients (156 men and 154 women) drawn from the University of Nigeria Teaching Hospital. Their ages ranged from 20 to 80 years with a mean age of 50.45. Hypertensive patients were 189 (60.97%) whereas normotensive patients were 121 (39.07%). Participant's educational statuses are as follows: no formal education-42 (13.55%), had primary education (82, 26.50%), secondary education (76, 24.52%), and tertiary education (110, 35.48%). Their occupations were: trading (77, 24.84%), civil service (87, 28.06%), skilled work (66, 21.29%), and farming (40, 12.90%). Regarding the traditional risk factors for hypertension, 192 participants had family history of hypertension whereas 118 reported no family history of hypertension, 55 participants reported smoking cigarette whereas 255 reported were no smokers, 202 participants engage in physical exercise whereas 108 participants does not.

## Instruments

*Anger Expression Inventory (AEI)* (Spielberger, Johnson, & Jacobs, 1985)

The Anger Expression Inventory is a 16-item measure of anger, developed by Spielberger, Johnson and Jacobs (1985). It contains two subscales: anger-out and anger-in. Anger-out consists of 8 items that assess the tendency to express angry feelings verbally or via physically aggressive behaviour. It measures the frequency with which an individual's anger is expressed outwardly towards either other persons or objects. For example, 'I'll strike out at whatever infuriates me; 'I do things like slam doors', e.t.c. Anger-in (8 items) measures the tendency to experience anger but only express it inwardly, for example, 'I tend to harbour grudges that I don't tell anyone about'. Participants are required to respond in the following response set: Almost never (1), sometimes (2), often (3), almost always (4). The scores range from 8 to 32 for each of the subscale with higher scores indicating greater tendency to express or suppress anger. Internal consistency was found to be reasonably high for each of the two subscales .84 and .73 respectively. The internal consistency of the anger-in and anger-out scales, as reported by the developers were .73 and .84, respectively. In the present study, reliability coefficients of the scales were found to be .61 and .50 for anger-in and anger-out respectively.

## *Mercury Sphygmomanometer and Stethoscope*

Mercury Sphygmomanometer and Stethoscope (Accosson, made in England) were employed to measure the blood pressure of the participants. The instrument was used to obtain both their systolic and diastolic blood pressure readings.

## Procedure

Participants were recruited from three units in UNTH: the cardiology unit, surgical out-patient unit, and general outpatient department. In these units, participant's current SBP and DBP were taken by the help of doctors on duty using sphygmomanometer and stethoscope which was recorded on the questionnaire. Three BP readings were taken after interval

of five minutes and the mean of the three readings were used as the dependent variable for the study. The questionnaire for the present study had two parts: section A contains the bio-data and questions relating to traditional risk factors while section B contained the AEI. The researcher and four research assistants administered the questionnaire to the participants. The participants not literate enough were sufficiently guided by the researcher and the research assistance in completing the questionnaire. The total number of copies of the questionnaires distributed was 340, but 30 questionnaires were discarded for improper and incomplete filling. Questionnaires recovered and used for scoring and analysis were three hundred and ten (310), representing 91% of the number of the questionnaires distributed.

### Ethical Consideration

The study was approved by the Ethical Committee of the UNTH, South East Nigeria (Ethical Clearance Certificate NO: NHREC/05/01/2008B-FWA00002458; IRB00002323). Informed consent was obtained from all individual participants in the study.

### Design/ Statistics

The design of this study is cross-sectional design. Statistical analysis was performed with SPSS version 20. Pearson correlation analysis was first conducted to test the relationships among the control variables, risk factors (age, gender, education, occupation, smoking, exercise, and family history of hypertension), anger expression and elevated BP (SBP and DBP). Second, hierarchical multiple linear regression was conducted to test the predictive role of anger expression (anger-in and anger-out) on SBP and DBP. This method has also been adopted in many previous studies (e.g., Davids, Roman, & Kerchhoff, 2017; Meckelmann, Pfeifer, & Rauh, 2013). In step 1 of the regression analysis, the effects of the control variables and risk factors were controlled for in the analysis by regressing them on SBP and DBP. In step 2 and 3, the main variables of anger-out and anger-in were regressed on both SBP and DBP. To further test the difference in anger expression between hypertensive and normotensive patients, an independent sample t-test was conducted.

### Results

Result in Table 1 showed that all the demographic variables except occupation were significantly related to both SBP and DBP or either SBP and DBP. For instance, age had significant positive relationship with both SBP and DBP, indicating the higher the age, the higher the elevated BP. Gender had significant negative relationship with only SBP, showing that men displayed higher systolic BP compared to women. Education was significantly related to both the SBP, and DBP, indicating the lower the educational status, the higher the elevated BP. For the risk factors, smoking had significant positive relationship with both the SBP and DBP showing that individuals who smoke displayed greater SBP and DBP compared to non-smokers. Exercise had significant negative relationship with both SBP and DBP showing the lower the exercise the higher the elevated BP. Family history of hypertension had significant positive relationship with only

the SBP showing that individuals with family histories of hypertension displayed elevated SBP compared to individuals without family history of hypertension. Table 1 further showed that anger out had significant negative relationship with only the DBP, indicating the lower the anger out, the higher the DBP. The result also showed that anger-in had a significant positive relationship with both the SBP and DBP. This showed the higher an individual such his/her anger in, the higher the elevated BP.

Results in Table 2 showed that when the demographic variables and risk factors were added in step 1 of the regression model, they contributed 31% ( $\Delta R^2 = .31, p < .001$ ) to explaining the variance in BP, with age, education, smoking and family history of hypertension contributing significantly to SBP. Age significantly and positively predicted SBP ( $\beta = .42, p < .001$ ). This reveals the higher the age, the higher the systolic blood pressure. Education significantly and negatively predicted SBP ( $\beta = -.17, p < .01$ ) indicating that individual with lesser education displayed higher SBP than persons with higher education. Similarly, smoking had significant positive association with SBP ( $\beta = .17, p < .01$ ). This showed that persons who smoke were more predisposed to higher SBP than non-smokers. The result also showed that family history of hypertension was significantly associated with SBP ( $\beta = .14, p < .05$ ). This reveals that person with family history of hypertension were more likely to have elevated SBP compared to person without family history of hypertension. When anger-out was added in the second model, it contributed 0% ( $\Delta R^2 = .00, p > .05$ ) and was not significant predictor of SBP ( $\beta = -.02, p > .05$ ). However, the addition of anger-in in step 3 contributed a variance of 15% ( $\Delta R^2 = .15, p < .001$ ) and was a significant positive predictor of SBP ( $\beta = .42, p < .001$ ). This indicate the higher the anger-in, the higher the SBP.

For DBP, addition of demographic variables and risk factors contributed a total variance of 18% ( $\Delta R^2 = .18, p < .001$ ) with only age and smoking significantly predicting DBP. Age positively predicted DBP ( $\beta = .32, p < .001$ ) indicating the higher the age, the higher the DBP. Similarly, smoking positively predicted DBP ( $\beta = .17, p < .001$ ) showing that persons who smoke were more likely to have elevated DBP compared to non-smokers. When anger out was added in step 2 of the regression model, it contributed a variance of 1% and was a negative predictor of DBP ( $\beta = -.12, p < .05$ ). This showed the higher the anger-out, the lower the DBP. Similarly, addition of anger-in step 3 of the regression model contributed a significant variance of 24% ( $\Delta R^2 = .24, p < .001$ ) and significantly predicted DBP ( $\beta = .52, p < .001$ ). This reveals that the higher the anger-in, the higher the DBP.

An independent samples t-test was performed comparing the mean scores of hypertensive and normotensive on anger expression (anger-in and anger out). As predicted, the results of this test indicated that there was a significant difference between hypertensive and normotensive in anger-in,  $t(287.53) = -5.31, p < .001$ . These results suggest hypertensive participants ( $M = .20.55, SD = 5.73, n = 189$ ) displayed more anger in compared to the normotensives ( $M = 17.36, SD = 4.77, n = 121$ ). Similarly, there a significant difference in anger-out between the hypertensive participants and normotensive,  $t(230.65) = 1.55, p < .05$ , these results indicate that normotensives exhibited more in anger-out ( $M = 18.01, SD = 5.05, n = 121$ ) compared to the hypertensive participants ( $M = .17.14, SD = 4.41, n = 189$ ).



**Table 1. Correlations of the Study Variables**

S/N	Variables	1	2	3	4	5	6	7	8	9	10	11
1	SBP	-										
2	DBP	.78**	-									
3	Age	.47**	.35**	-								
4	Gender	-.17**	-.12*	-.19**	-							
5	Education	-.29**	-.20**	.30**	.02	-						
6	Occupation	-.06	-.09	-.06	.08	-.00	-					
7	Smoking	.21**	.19**	.01	-.24*	-.04	-.07	-				
8	Exercise	-.18**	-.13*	-.19**	.07	.23**	.09	-.08	-			
9	FH	-.15**	-.11	.05	.03	-.02	-.07	.12*	-.13*	-		
10	Anger-Out	-.06	-.12*	-.05	-.03	-.10	.07	.00	.03	-.03	-	
11	Anger-in	.51**	.59**	.20**	-.06	-.15*	-.09	.09	.01	-.05	.20**	-

Note: \* $p < .05$ , \*\* $p < .01$ . Coding: Gender: male=0, female 1. Family history of hypertension: 0 = No, 1 = Yes, Smoking: 0 = No, 1 = Yes, Exercise: 0 = No, 1 = Yes. SBP = Systolic blood pressure; DBP = Diastolic blood pressure; FH = Family history of hypertension.

**Table 2: Hierarchical Multiple Linear Regression on the relationship between Anger Expression and Systolic Blood Pressure (SBP) Diastolic Blood Pressure (DBP)**

Variables	SBP	Step 1	Step 2	Step 3	DBP	Step 1	Step 2	Step 3
<i>Controls</i>								
Age		.42***	.41***	.34***		.32***	.30***	.22***
Gender		-.04	-.04	-.03		-.01	-.01	-.04
Education		-.15*	-.15*	-.10*		-.09	-.11	-.04
Occupation		-.01	-.01	.02		-.05	-.04	-.01
Smoking		.17**	.17**	.14**		.17**	.17**	.13**
Exercise		-.03	-.04	-.06		-.01	-.02	-.05
FH		.14**	.14**	.13**		-.09	.09	.07
<i>Main Variables</i>								
Anger-out			-.06	.02			-.12*	-.02
Anger-in				.42***				.52***
<i>Model Summary</i>								
Adjusted R <sup>2</sup>		.29***	.29***	.45***		.16***	.17***	.41***
ΔR <sup>2</sup>		.31***	.00	.15***		.18*	.01*	.24*
ΔF		19.22***	1.36	85.63***		9.42***	4.87***	124.85***

Note: \*\*\* $p < .001$ , \*\* $p < .01$ . \* $p < .05$ . Coding: Gender: male = 0, female = 1. Family history of hypertension: 0 = No, 1 = Yes; Smoking: 0 = No, 1 = Yes; Exercise: 0 = No, 1 = Yes SBP = Systolic blood pressure, DBP= Diastolic blood pressure. Education: No formal education = 1, primary 2, secondary = 3, tertiary = 4. Yes = 1, No = 2. Occupation: trader=1, civil worker=2, skilled worker = 3, farmer = 4, others = 5.

**Table 3: Independent Sample t-Test on Anger Expression on hypertensive participants and normotensive**

Variables		N	Mean	SD	t
<b>Anger-in</b>	Normotensive	121	17.36	4.77	-5.10***
	Hypertensive	189	20.55	5.73	
<b>Anger-out</b>	Normotensive	121	18.01	5.05	1.55*
	Hypertensive	189	17.14	4.41	

Note: \*\*\* $p < .001$ , \* $p < .05$ , SD = Standard deviation

**Discussion**

The study was aimed at investigating the role of anger expression (anger-in and anger-out) in elevated BP. The study found that for both SBP and DBP, anger-in significantly predicted elevated BP. This indicates that individuals who suppress their angry feelings are more prone to the development of essential hypertension. The finding is in line with by previous studies (Hosseini et al., 2011; Johnson et al., 1986; Johnson et al., 1987) which found that anger-in is significantly related to elevated BP. Anger has also been shown to elevate blood pressure through the activation of the sympathetic nervous system (e.g., Schneider,

Egan, Johnson, Drobney, & Julius, 1986) and the elevations are believed to be very high when anger is experienced but cannot be openly expressed (Hokanson, & Burgess, 1962).

However, for DBP only, anger-out was shown to have a significant negative relationship with elevated BP. This showed that as anger-out increases, DPB reduces. It therefore suggests that individuals who express their anger out may be more likely to have reduced elevated BP compared to individuals who bottle up their anger. This is in line with previous studies (Johnson et al., 1986; Johnson et al., 1987) that found that black female and male college who express their anger out had lower SBP and

DBP. Anger out was significant for both SBP and DBP for the while adolescent male college student in the study of Johnson et al., (1986). In other words, suppressing angry feelings as found earlier increases the likelihood of elevated BP compared to expressing angry feelings out. This study also lends support to the Alexander (1939) hypothesis which posits that when there is persistent and chronic inhibition of hostile and aggressive feelings, it could lead to an increase in high blood pressure.

Further, the study found a significant difference between hypertensive patients and normotensive on both anger in and anger out. Specifically, the hypertensive patients were found to be significantly higher in anger in compared to the normotensive. This showed suggesting that individuals who were hypertensive were more likely to harbour their anger in than persons without hypertension. This further supports the hypothesis linking higher anger in and elevated BP. On the contrary, normotensive patients reported more in anger-out compared to the hypertensive indicating that people who are normotensive are more likely to express their anger out than the hypertensive. This suggests that expressing anger out seems to be more beneficial than bottling up anger.

In addition, among the demographic variables and risk factors, only age and smoking were significant predictors of elevated BP. They were associated with both SBD and DBP at different levels of the regression model. For age, the higher an individual age, the higher the blood pressure. This in line with other researchers (Cappuccio et al., 2004) who found that age is one of the risk factors in elevated BP. Smoking was found to be positive associated with elevated BP showing that persons who smoke are likely to experience elevated BP compared to persons not smoking. Other studies have equally linked smoking cigarettes with elevated BP (Bowman et al., 2007). The prevalence of substance abuse including smoking in the contemporary Nigerian society could result in the consistency found in this study.

### Implications of the Findings

This study had an important implication to medical as well as psychological management of essential hypertension in Nigerian health sector. There is therefore need for the emotional correlates of elevated BP to be taken into consideration while assessing and managing individuals with essential hypertension. In the country bedevilled with a variety of challenging problems ranging from extreme poverty, unemployment, hunger and extreme violence etc, individuals may harbour lots of angry feelings either towards themselves, the government or the source of the challenging situation. These angry feelings when not properly expressed may lead to elevated BP. The study therefore suggests that all these factors could be taken into consideration while managing individuals with essential hypertension. Other mental health professional including psychologists, social workers could be employed in our hospitals to collaborate with the medical practitioners in the management of people with essential hypertension.

### Limitations of the Study and suggestions for further study

This study adopted correlation approach which does not show causality, hence, the need to use longitudinal approach so that causal inferences may be made. In addition, this study was carried out in one teaching hospital located in South East Nigeria which may limit its generalizability to the entire Nigerian population. Future study could address this limitation by including other six geopolitical zones in Nigeria for adequate generalization.

### Summary and Conclusion

This study investigated the association between anger expression (anger-in and anger-out) and elevated BP. Anger in consistently predicted both SBP and DBP in the entire regression model. Anger-out was found to be significant negative predictor of only DBP suggesting an inverse relationship with DBP, hence confirming the theory that anger suppression could result in elevated BP. There was also a significant difference in anger expression between hypertensive patients and normotensives. Since research have shown that emotional factors such as anger expression are important factors in elevated BP, collaboration among the medical professionals and other mental health workers would go a long way to abate the danger posed by high rate of mortality attributed to hypertension in the contemporary Nigerian society.

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