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# Using Multi-Theory Model to Predict Low Salt Intake - Nigerian Adults with Hypertension

Christine Adekemi Dokun-Mowete  
*Walden University*

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# Walden University

College of Health Sciences

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Christine Adekemi Dokun-Mowete

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2017

Abstract

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Hypertension

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MSc, University of Ibadan, 1992  
BSc, Kwara State College of Technology, 1983

Dissertation Submitted in Partial Fulfilment  
of the Requirements for the Degree of  
Doctor of Philosophy  
Public and Community Health Education

Walden University

November 2017

## Abstract

Hypertension is a chronic non-communicable disease and a major risk factor for cardiovascular diseases, renal malfunction, disability, and premature death. One of the public health recommendations for the management of hypertension is the reduction of sodium/salt intake. There is need to develop and implement new evidence-based theoretical interventions to initiate and sustain behavior change in health education and promotion. Therefore, the quantitative cross-sectional method and design was used to investigate the adequacy of multi-theory model (MTM) constructs for the initiation and the sustenance of low sodium/salt intake behavior in hypertensive Nigerian adults. In addition, the impact of the MTM (initiation) constructs on actual salt/sodium intake was evaluated to validate self-reported behavior. A convenience sample of 149 consenting Nigerian adults with hypertension and of ages 20 to 60 years, self-administered the valid and reliable 39-item MTM instrument. The findings of confirmatory factor analysis showed construct validity of subscales for the initiation and sustenance model. All items loading for the two models were significant,  $p < 0.001$ . Multivariate regression analysis revealed 40.6% of the variance in initiating the consumption of low salt diets explained by advantages outweighing disadvantages, behavioral confidence, and changes in physical environment. About 41.8 % of the variance to sustain the intake of low salt diet was explained by emotional transformation, practice for change, and changes in social environment. The results justified the predictive role of MTM and adequacy of its utility to build evidence-based health education programs and interventions to address the health need of people with hypertension and contribute to social change in the country.

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## Dedication

I dedicate this dissertation to the loving memory of my late parents Mr. Michael Adeyemi and Mrs. Felicia Mopelola Ayanbanre Opadokun; you were both father and mother par excellence. You sacrificed so much to ensure the proper education and upbringing of your children, while also providing love, care, and support to several others that came your way. I also recall the support my late father-in-law, Chief Patrick Ikedieshi Mowete over my decision to commence the doctoral program first at a Nigerian University before transferring to Walden University. Eternal rest grant to them O Lord, and let your perpetual light shine upon them. May the good Lord continue to rest your souls in peace, also guard and guide us your children! Amen.

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## Chapter 1: Introduction to the Study

Hypertension is a chronic, non-communicable disease and a major risk factor to other health disorders like cardiovascular diseases, renal failure, disability, and premature death (Ayodele et al., 2005). Therefore, hypertension constitutes a very serious public health issue and has affected more than one billion people worldwide (World Health Organization, 2013a). Hypertension is defined as elevated or high blood pressure (HBP) that exposes the heart to more rigorous operation than expected, and causes the blood to push out against the blood vessel (artery) walls as blood circulates through the body (Foe & Sear, 2004; Poulter, Prabhakara, & Caulfield, 2015; Xie et al., 2016). The blood pressure (BP) readings are composed of two values: the normotensive levels of systolic and diastolic BP values are less than 120/ 80 mmHg respectively. The prehypertensive stage is indicated by the systolic BP values ranging from 120 to 139 mmHg over a diastolic BP value ranging from 80 to 89 mmHg. Hypertension is characterized by systolic BP level values equal to or higher than 140 mmHg over diastolic BP level values equal to or higher than 90 mmHg (Gu et al., 2008; Ogah et al., 2012a).

Several prevalence studies, including meta-analyses, have shown evidence of higher incidences of hypertension among Black Americans than White Americans. Other research also revealed that the disease was more common among men than women and the prevalence increased with old age in the different categories of black races and cultures (Gu et al., 2008; Ogah et al., 2012b; Society for Public Health Education, 2011). Because foreign trade and global travels deepened in the mid-1990s, African countries that were NCD-free before then, began showing signs of the hypertensive disease when

the people became associated with sedentary lifestyles and habits, such as reduced physical activity, cigarette smoking, alcohol drinking, and poor dietary practices. (van de Vijver et al. (2013). Hendriks et al. (2012) and van de Vijver et al. (2013) observed that the prevalence and burden of hypertension in Africa that increased significantly to about 80 million hypertensive people in 2000, and projected about 150 million people by 2025. over the years, most African countries have reported alarming risk factor figures of hypertension, particularly in Guinea (43.6%), Burkina Faso (40.2%), Nigeria (38.2%), and Togo (36.7%), (Bosu, 2015; 2016; Daniel et al.2013; Iwelumor et al., 2014; Ogah et al., 2012a; 2012b).

Several randomized clinical trials and meta-analyses of population studies in high and middle-income countries have provided scientific evidence of the effectiveness of lifestyle modifications, such as moderate alcohol consumption, optimal weight maintenance, and changes in dietary patterns in lowering blood pressure (Rankins et al., 2007; Mezue, 2013; Meuser et al., 2011). Consequently, I instituted this study in order to contribute to the extant literature and the body of knowledge. I investigated how the constructs of multi-theory model (MTM), which are psychosocial and environmental factors, influenced the initiation and maintenance of lifestyle modifications (intake of low sodium/salt diets) by Nigerian adults with hypertension. I also evaluated the impact of the initiation constructs on the actual consumption of dietary sodium/salt of adult Nigerian hypertensives in adherence to the recommended dietary guidelines and, consequently, may project factors that aid in reducing the prevalence of hypertension in Nigeria.

Chapter 1 includes the introduction, background, and problem statements of the study. The chapter also includes an explanation on the research questions, hypotheses, and the purpose of the study. In this chapter, I described the theoretical framework, the nature of the study, the limitations, delimitations, and assumptions, and the significance of the study.

Chapter 2 includes the literature review and an exploration of the uses, relevance, and impact of theoretical perspectives in the restructuring of behavioral changes as a public health challenge. It also includes a discussion of the theoretical framework of MTM constructs and its multicomponent employed to investigate other behavioral and lifestyle changes. In this chapter, I also discussed how individual variable of demographic and socioeconomic variables, as well as interpersonal and environmental factors contributed to the food choice patterns of Nigerians and have positively influenced or impeded the achievement of low salt/sodium intake among Nigerians.

Chapter 3 includes a discussion of the method of inquiry, the study design, the sampling strategy used, the instruments for data collection, and the rationale for the choice of the research designs and method. Chapter 4 includes the findings, results, applicable data analysis. Chapter 5 includes a discussion of the findings, limitations recommendations, and conclusions of the study.

### **Background of the Study**

Hypertension or elevated blood pressure has gradually changed from being a disease that affects rich and affluent people to being pervasive more in the developing countries. More than two-thirds (640 million) of the 1.15 billion people affected by

hypertension globally were reported to be situated in the developing and low-income countries of the world, while only 330 million people with hypertension were located in the developed countries (World Health Organization {WHO} 2012a ; 2013a). Olsen and Spencer (2015) highlighted the WHO (2013b) estimate that Africa has the highest prevalence of hypertension in the world. It was estimated that the hypertension disease affected about 46% of adults in Africa from ages twenty-five years-old and above, while the rate found in the Americans was 35% and the global rate stood at 40%.

In 2010, the (WHO 2013b) country profile on NCD reported that of the 13 million cases of such diseases found in Nigeria; about eight million cases were people with hypertension. The findings of Ogunmola et al. (2013) and Onwubere et al. (2011) showed that the hypertension prevalence rates in the southwest and southeast part of Nigeria were 66.4% and 46%, respectively. Although hypertension was reported as part of the aging process, empirical evidence showed a significant spread of the disease across different age groups within several populations (WHO, 2013b). Similarly, hypertension was detected in many developing and scarce-resource countries like Nigeria. The meta-analysis of prevalence studies on Nigerian hypertensive adults from January 1980 to December 2013 conducted by Adeloje et al. (2014) showed an estimated figure of about 20.8 million Nigerian hypertensive cases in the country. The researcher further projected an estimated figured of about 39.1 million Nigerians with hypertension by 2030 (within age bracket 20 years and above) at the prevalent rates of 30.5% for adolescents, 32.6% for men, and 29% for women.

Psychological trauma and economic effects of managing hypertension have considerable adverse effects on people with hypertension, their families, and their communities and countries (Cecchini et al, 2010; Olowookere et al, 2015; Osamor & Owumi, 2011). The reports of Chukwu (2011) showed that in 2005, about 400 million dollars was spent on hypertension in Nigeria, while an estimated cost of eight billion dollars was projected for 2015. The increasingly high cost of treating the disease revealed by Ilesanmi et al., (2012) and Ukwaja and Onyedum, (2013) in their investigative studies among the people with hypertension rural southwest people of Nigeria, necessitated the call to seek and adopt a much cheaper and local treatment options for the disease in order to meet the demand of the low resource countries like Nigeria and other poor countries of the sub-Saharan region.

The WHO (2002) initially responded to the growing global epidemic of chronic (NCD) by establishing the global conceptual model, the innovative care for chronic conditions (ICCC) which relied on the interaction of the varying components of healthcare system to address the optimal treatment and control of the NCD (Epping-Jordan et al., 2004). Meanwhile, some exploratory researchers (both locally and internationally) like Ekezie et al. (2011), Crowley et al. (2011), Iwelumor et al. (2014), Murthy et al. (2014), and Vincent et al. (2015) had positively associated the growing rates of hypertension in the developing and low income countries, with the impacts of urbanization, poor healthcare systems and infrastructures, and inadequate healthcare workforce in meeting the high demand for the control and management of hypertension.

The high intake of sodium, a primary nutrient in dietary salt, has been linked to the physiological complications of HBP as a leading risk factor for heart disease, kidney dysfunction, and stroke (Akpolat, Kadi, & Utas, 2009; He et al., 2012; Koliaki et al., 2013). Also, the evaluative studies on the preparation of commonly consumed pastry foods such as bread, cakes, and pastries, reported evidence that the overconsumption of baking soda (bicarbonate sodium) was associated with health complications and lead to high blood pressure (Akpolat et al., 2009; Gradual et al., 2011; Hashemi et al., 2016). Consequently, HBP has been a public health concern, that triggered global health campaign on the need to promote lifestyle modification such as the consumption of low salt/sodium diets referred to as the DASH diet (Koliaki & Katsilambros, 2013; James et al, 2014; WHO, 2013a). The DASH diet has been a known therapeutic nutritional regime containing calorie-controlled, reduced sodium/salt, low-fat, and low-meat diets. It includes foods that are high in calcium, magnesium, and potassium as well as other nutrients associated with the reduction of sodium (Sacks & Ard, 2001; Rankins, Sandpson, Brown, & Jenkins-Salley, 2005; WHO, 2003; 2012; 2013).

The investigations of Rankins et al. 2005 and Meuser et al. (2011) further advanced the advantages of using a theoretical model in establishing behavioral change and lifestyle modifications. The results of these studies showed that two of the three constructs of socio-cognitive theory (self-efficacy and self-regulation) mediated positive behavioral modification in the use of fruits and low-fat diets among adolescent hypertensive patients with DASH diets.

Although, several behavioral theories have been in use over the years, but Sharma (2015) argued that majority of such theories were fraught with poor predictive powers. Sharma (2015) reported that the existing theories were less parsimonious (some had too many constructs), other theory do not have easily modified constructs, and have limited coverage in application. To this end, I focused this study on the growing need to develop other new behavioral change theories by testing the adequacy of the MTM developed by Sharma (2015) to determine the extent of influence the MTM constructs have on the behavioral changes of hypertensive Nigerian adults who wanted to reduce salt consumption. Given the understanding that public health measures and interventions are crucial to decreasing the risk of developing hypertension complications, it also became expedient to use this study in evaluating how MTM initiative model and constructs influence the actual levels of salt/sodium consumption of hypertensive Nigerian adults.

### **Problem Statement**

Following several epidemiological findings that associated the reduction in dietary sodium intake as an important non-pharmacological intervention in preventing and controlling hypertension. The WHO (2002; 2003 ;2013) long-term campaign continued to reiterated the need to use public health initiatives in decreasing population exposure to HBP and heart diseases through the reduction of sodium/salt intake. Consequently, the WHO (2013a) offered a recommended dietary guideline (RDG) for population sodium/salt intake, stipulating a maximum of 2g per day by 2015 and a further reduction to a minimum of 1.5g per day by 2025.

Several empirical pharmaceutical studies, such as those of Boima et al. (2015), Busari et al. (2014), Dosse et al. (2009), Osamor and Owumi (2011), and Olowookere et al. (2015) stressed the need to adhere to drug therapy with the aim of reducing the high prevalence of hypertension worldwide. Regrettably not much success has been recorded in reducing HBP, especially in developing countries like Nigeria with scarce resources. However, aside from the non-pharmacological investigations conducted several years ago by Ijarotimi and Keshiro (2008) and Tayo et al. 2012 in the suburbs and rural areas of Nigeria that confirmed the positive influence of low salt intake on low blood pressure, the most recent study about Nigerians with HBP and actual salt consumption was a meta-analysis by Adeloje et al. (2014). Therefore, it became imperative to investigate the observed research gap among Nigerian adults with hypertension concerning their readiness to initiate and sustain the intake of low dietary sodium/salt for the control of HBP

MTM was designed and advanced as new behavioral theory and model with great predictive power, to support health education and promotional interventions directed at motivating population behavioral change for various public health challenges within different cultures either as an individual or group (Sharma, 2015; Nahar et al., 2015). Therefore, it became imperative to engage and test the adequacy of MTM as a theoretical and conceptual framework in other settings of developing countries like Nigeria. The positive social change impact of my study are a) It would help identify reasons for non-adherence to behavioral change in the use of reduced salt/sodium as a critical factor in addressing suboptimal BP control and the high costs of management of the disease

through drug treatment (Crowley et al, 2011; Ilesanmi et al, 2012).b) The data would promote the knowledge and understanding of the impediments or barriers to behavioral changes in the reduction of salt/sodium intake by Nigerian adults with hypertension.

c)The findings could also provide relevant information required by the decision makers and health educators to focus immediate efforts and facilitate The findings could also provide relevant information required by the decision makers and health educators to focus immediate efforts and facilitate strategies for increasing compliance rates.

### **Purpose of the study**

The purpose of this quantitative cross-sectional study was to examine how the MTM initiation constructs; participatory dialogue, behavioral confidence, changes in physical environment (independent variables) predict the behavioral change of hypertensive Nigerian adults in initiating the consumption of low salt/sodium (dependent variable) as a lifestyle modification. Similarly, I also evaluated how MTM sustenance components and constructs; emotional transformation, practice for change, and change in the social environment, (independent variables) predicts the behavioral changes of hypertensive Nigerian adults in sustaining low consumption of salt diet (dependent variable). In addition, I assessed the impact of the MTM constructs (independent variable) on the real behavior, actual sodium/salt consumption (dependent variable) of Nigerian adults with hypertension, while controlling for demographical factors like age, gender, educational background, and income level in the areas of investigations. Since this study employed a quantitative method, Cronbach's alpha was conducted to test and establish the reliability of scales, and while the confirmatory factor analysis (CFA) was

conducted to test for construct validity. The routine spot urine samples collected by the facilities were used to estimate sodium excreted by the participants and to determine the actual sodium intake per day. The data analysis involved the translation of the descriptive responses from the instrument into numerical estimates to obtain the descriptive analysis. The multivariate analysis was employed to determine the correlation between the MTM constructs (independent variable) and the' decisions of Nigerian adults with hypertension to initiate and sustain the consumption of low salt diets (dependent variables) as a behavioral change.

### **Research Questions and Hypothesis**

RQ1- Quantitative: How do MTM constructs (independent variables) influence decision of Nigerian adult with hypertension to initiate the consumption of low sodium diet (dependent variables)?

$H_0$ 1: MTM constructs; participatory dialogue, behavioral confidence, changes in physical environment (independent variables) are not associated with the decision to initiate low salt intake (dependent variables) by Nigerian adults with hypertension.

$H_a$ 1: MTM constructs; participatory dialogue, behavioral confidence, change in physical environments (independent variables) are associated with the decisions to initiate low salt diets intake (dependent variables) by Nigerian adults with hypertension.

RQ 2- Quantitative: How do MTM (independent variables) constructs influence decision of Nigerian adults with hypertension to sustain low sodium/salt consumption levels (dependent variables)?

*H<sub>02</sub>*: MTM constructs: emotional transformation, practice for change, change in social environment (independent variables) are not associated with decision Nigerian adults with hypertension' to sustain low salt intake (dependent variables).

*H<sub>a2</sub>*: MTM constructs; emotional transformation, practice for change, change in change in social environment (independent variables) are associated with decision Nigerian adults with hypertension to sustain low salt intake (dependent variables).

RQ 3- Quantitative: How do MTM initiation constructs influence actual salt/sodium intake of hypertensive Nigerian adults?

*H<sub>03</sub>*: MTM initiation constructs; participatory dialogue, behavioral confidence, changes in physical environment does not influence actual salt/sodium consumption levels of Nigerian adults with hypertension

*H<sub>a3</sub>*: The MTM initiation constructs; participatory dialogue, behavioral confidence, and change in physical environment influence the actual salt/sodium consumption levels of Nigerian adults with hypertension

### **Theoretical Framework**

Theoretical framework as the core of the research, health education, and health promotion lend credence to the fact that theory constitute varying interrelated ideas, concepts, and predispositions. Researchers use theory as their lenses to observe the various worldviews and to offer meanings to empirical facts and findings (Grant & Osanloo, 2014; Sharma, 2017). Furthermore, Grant et al. (2014) highlighted the need to understand the direction of research problems, research questions, and the relationship between the different variables as well as the likely empirical facts and findings of the

study. Such research constituents emerged as the logical conceptual perspectives to form the systematic presentation and explanation of events and situations (Sharma, 2017). Since research is structured around established theoretical frameworks and conceptual perspectives derived from other peer-reviewed studies, which are relevant to the fields of inquiry, Connelly, (2005) and Vaughan, (2008) identified and emphasized the need to develop new theories in order for such theories to support the specific needs of any phenomenon being studied.

Since this current study pertained to health behavioral change, I employed a related behavioral theory known as multi-theory model (MTM), as the theoretical framework to structure the study. Sharma (2015) developed MTM as a theoretical and conceptual framework by remodifying the constructs of some existing theories such as the health belief model, the transtheoretical model, the PRECEDE-PROCEED model, and the ecological models (Sharma, 2015; 2017). Sharma also posited that for a behavioral theory to be effective, it must be parsimonious and have adequate predictive power to predict health behavior change. Furthermore, the theory must be tested and supported with empirical evidence about health behavior changes, as well as having constructs that are malleable to induce immediate and long-term health behavior changes that cut across individuals, or groups of people in different culture (Sharma, 2015: 2017).

MTM is a made-up of two components, the initiation model with the short term behavioral change and the sustenance or maintenance model of the long-term behavioral change. The two components were the culmination of varying theoretical perspectives from other established theories, which Sharma (2015) restructured into three different and

respective constructs per component. The initiation component consisted of three constructs--namely participatory dialogue, behavioral confidence, and change in physical environment-- while the sustaining component featured constructs such as emotional transformation, practice for change and change in social environment.

Participatory dialogue, is the first construct of MTM. It is a two-way streams of communication used to establish positive support for the initiation decision or intention such that the advantages of participatory dialogue outweigh the disadvantages (Sharma, 2015; Knowlden et al., 2015). The participatory dialogue construct emanated from the constructs of other tested theories and is therefore similar to the perceived benefits and perceived barriers constructs of the health belief model (HBM), as well as the pros and cons of the transtheoretical model (TTM) (Nahar et al., 2015; Sharma, 2015).

Behavioral confidence is the second initiation construct. It emanated from Ajzen's perceived control and Bandura's self-efficacy (Sharma 2015; Nahar et al. 2016) MTM behavioral confidence differed from the other constructs because it was directed at ensuring the initiation of behavior change not only based on the individual's inner confidence, (which is limited to self-will), but also relied on support from other external sources such as counsel from the health educators or councilors and interventions in one's life (Nahar et al., 2015; Sharma, 2015; 2017).

The "change in the physical environment" is the third construct of MTM initiation component created by Sharma (2015) from the re-modification of the other three existing constructs namely Prochaska's environmental re-evaluation construct, Bandura's environment construct, and Fischbein's environmental factors. The construct

relied on factors within the natural and physical environments such as available resources necessary to assist the change of behavior.

Emotional transformation, the first construct of the MTM sustenance component, was based on the self-motivation construct of the emotional intelligence theory.

According to Sharma, the construct assists in restructuring the emotional balance of targeted audience to withstand and sustain the pressures that might arise in the course of behavioral change.

Practice for change is the second construct for MTM sustenance component. It was derived from the praxis construct of Freire's adult education model and have and have used to express the peoples' deeper reflection of the situation and reflective attitude required for the sustenance of behavioral change. Practice to change relied on the constant practice of desired behavior change by the gradual introduction of different steps of the new lifestyle modifications, such that the target audience not only become increasingly aware of the change, but are gradually exposed to removing barriers that could impede the desired change.

Change in social environment, the last construct of MTM for sustaining health behavior change, relied on the formation of social support systems coming from individuals' interpersonal relationships or social groups with friends or health educators within the environment that assist in facilitating the sustenance of behavioral changes.

Although the high prevalence of hypertension among Nigerian adults is well-documented and a major public health issue (Bosu, 2015; Landry, et al., 2010; Ogah et al, 2012), it remained unabated due to the country's poorly managed infrastructure and the

healthcare system that cannot solely be relied upon to control incident rates of many NCDs, especially hypertension. Consequently, it became imperative to test the adequacy of Sharma's new theory MTM, a combination of models (the multi-components) and integrative theoretical constructs in assessing the predictive potential of MTM in the initiation and sustainability of structural health behavioral change of hypertensive Nigerian adults. The findings of the study sufficed to build evidence-based health education and intervention programs that may contribute to improving the health needs of adult hypertensives in the Nigeria community.

### **Nature of the Study**

In this cross-sectional study, I employed the quantitative research method of inquiry in investigating hypertensive Nigerian adults registered and attending a healthcare provider, Lagos University Teaching Hospital (LUTH), located in Surulere local government area of Lagos state, Nigeria. The purposive (convenience) homogenous selection of sample participants from ages 20 to 60 years-old with hypertension. Other inclusion criteria include: a) must have been diagnosed at hypertensive at LUTH facility and b) the cut-off point with systolic and diastolic BP values equal to or higher than 140mmHg and 90mmHg, respectively. The ready-made instrument of the multi-theory model by Sharma (2015) was utilized to elicit information from participants. The questionnaire was used as either a self - administered questionnaire or a face-to-face interview on the participants. The strategy of inquiry and the study design were very appropriate and advantageous for this facility-based study because the method allowed for a snapshot in time. The strategy was easy to implement and relatively inexpensive

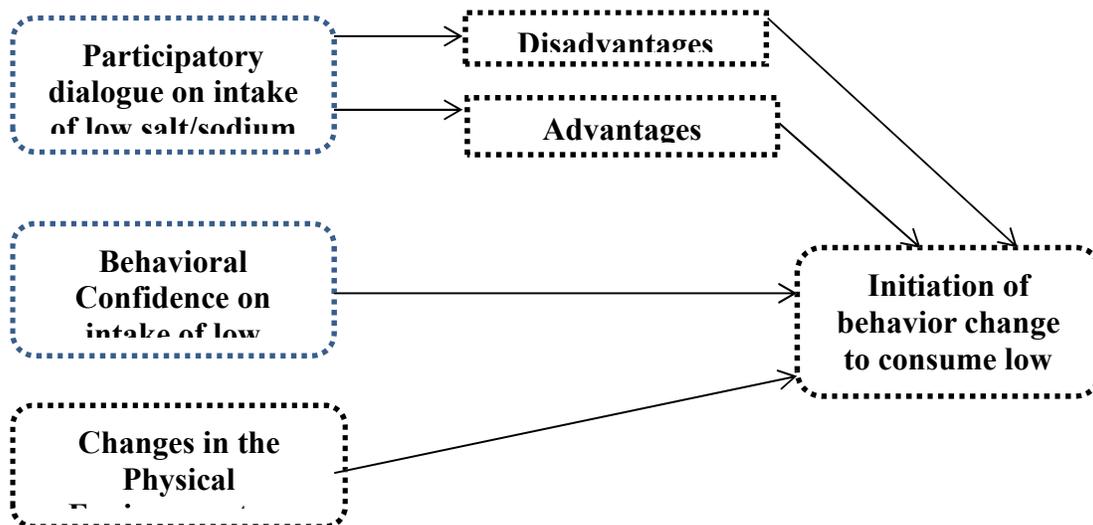


Figure 1.

*Constructs of multi-theory model in the initiation of behavior change to consume low salt /sodium diets*

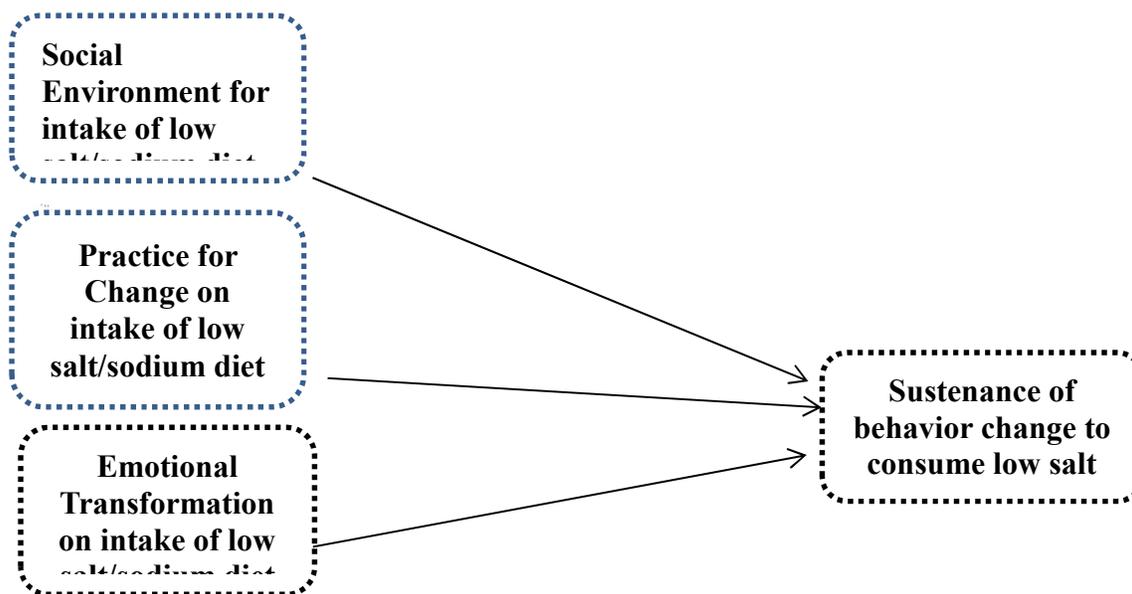


Figure 2.

*Constructs of multi-theory model in the initiation of behavior change to consume low salt /sodium diets*

(Creswell, 2009). Moreover, no data was collected without formal approval of the University Institutional Review Board (IRB), and informed consents of the participants.

### **Definitions.**

*Behavioral confidence:* The behavioral confidence construct used a five-scale item to determine the willingness of participants to start reducing their sodium (salt) intake to 1,500 milligrams per day (1) this week, (2) this week while eating out, (3) this week while enjoying meals, (4) this week without getting fed up by eating low salt food, or (5) this week without feeling depressed. The possible responses are: Not at all sure (0), Slightly sure (1), Moderately sure (2), Very sure (3), and Completely sure (4). The summative score of the above five- item scale ranged from 0-20, while high score was associated with likelihood of initiating a behavioral change to the self-imposition of a low salt diet.

*Changes in Physical Environment:* The three-item scale was used to measure the change in the physical environment construct. It assessed how available physical resources impact participant willingness to (1) have low salt foods available for all meals, (2) eat low salt food at restaurants, or (3) eat low salt for a meal. The likely responses to the above items were the following: Not at all sure (0), Slightly sure (1), Moderately sure (2), Very sure (3), and Completely sure (4). The summative score of the above three-item scale ranged from 0-12, while a high score was associated with the high likelihood of initiating a behavioral change—the implementation of a low salt diet.

**Changes in social environment:** The change in social environment variable used three-item scale to measure the certainty of participants to (1). keep a self-diary to

monitor eating low salt foods every day, (2), be able to eat low salt foods every day if barriers are encountered, and (3), be able to make low salt foods for meals. The responses are rated on the following scale: Not at all sure (0), Slightly sure (1), Moderately sure (2), Very sure (3), and Completely sure (4). The summative score of each respondent's answers are derived from the score that ranged between 0 and 12, and a high score was associated with a high likelihood that the respondent would sustain a low salt diet.

*Elevated Blood pressure:* The elevated blood pressure (BP) was measured based on the speed or persistence of movement of blood in the arteries rated by the systolic and diastolic (BP) values  $\geq 140/90$  mmHg obtained on different occasions after the initial screening. The cut-off point BP level  $\geq 140/90$  mmHg was premised on the seventh report of the Joint National Committee(JNC7) {on prevention, detection, evaluation and treatment of high blood pressure Chobanian et al, 2003}.

*Emotional transformation:* The construct was measured using a three-item scale to determine what and how participants. (1) direct emotions/feelings toward the goal of eating low salt foods every day, (2) are they motivated to eat low salt foods every day, and (3) overcome self-doubt in accomplishing the goal of eating low salt foods every day. The likely responses were rated on the following scale: Not at all sure (0), slightly sure (1), Moderately sure (2), Very sure (3), and Completely sure (4). The summative score of a participant's responses to these three items derives a score in the range of 0 to 12, and a high score was associated with the likelihood of sustaining a low salt diet.

*Initiation of low salt intake:* Initiation of low salt intake served as a dependent variable in this study. It was measured using a one-item scale to determine the likelihood

of participants consuming low salt (sodium) food daily in the coming week. The possible responses were rated on the following scale: Not at all likely (0), Somewhat likely (1), Moderately likely (2), Very likely (3), and Completely likely (4). The possible ranged from 0 to 4.

*Instrument:* Refers to the MTM structured questionnaire used as the tool to gather data (information) from the research participants.

*Non-communicable diseases (NCD):* - These are chronic, non-infectious diseases, which include hypertension, (high blood pressure), cardiovascular diseases (like heart attacks and stroke), cancers, chronic respiratory diseases (such as chronic obstructive pulmonary disease and asthma) and diabetes.

*Practice for change:* The practice for change variable measured how participants prevent activities that are barriers and inimical to the sustenance of a low salt diet using the construct's three-item scale: (1) keep a self-diary to monitor eating low salt foods every day; (2) be able to eat low salt foods every day if you encounter barriers; and (3) change your plan for eating low salt foods every day if you face difficulties. The possible responses were rated on the following scale: Not at all sure (0), Slightly sure (1), Moderately sure (2), Very sure (3), and Completely sure (4). The summative score of items ranged from 0 to 12, while high scores were associated with a high likelihood of sustaining a low salt diet.

*Participatory dialogue:* The participatory dialogue construct entailed subtracting the score of disadvantages (negative outcomes) from the score of advantages (positive implications). The disadvantage component was rated on five-item scale to determine if

the reduction of sodium (salt) intake in one's diet to 1,500 milligrams a day made participants (1) not enjoy food, (2) develop high serum cholesterol, (3) develop high levels of certain hormones, (4) have poor quality of life, or (5) unable to reduce salt because of lifestyle. Similarly, the five-item scale regarding the advantages of participatory dialogue assessed if the reduction of sodium (salt) intake in one's diet to 1,500 milligrams a day made participants (1) healthy, (2) have a reduced chance of stroke, (3) have a reduced likelihood of getting kidney disease, (4) have a reduced chance of getting heart disease, or (5) have prolonged lifespan. The five-item scales for disadvantages and advantages were rated on the following: scale; Never (0), Hardly ever (1), Sometimes (2), Almost always (3), and Always (4). The summation of the possible scores ranged from 0 to 20 for each component. Therefore, the participatory dialog score ranged from -20 to +20 (Sharma, 2015).

*Sustenance of low salt intake:* Sustenance of low salt intake, a dependent variable in this study was measured on a one-item scale to determine likelihood that participants would sustain the consumption of low salt (sodium) foods. The possible responses were rated on the following scale: Not at all likely (0), Somewhat likely (1), Moderately likely (2), Very likely (3), and Completely likely (4). The possible ranged from 0 to 4.

*Salt/sodium intake:* A dependent variable in this study that was measured as the actual rate of salt/sodium consumed by participants as daily dietary nutrients. It was determined through the laboratory analysis of spot urine samples (early morning urine sample) as an estimate of the sodium excreted per day provided (as a secondary data) by the facilities

### **Assumptions**

Participants have responded honestly and truthfully to the questions of their own volition. There was no form of coercion or manipulation of the participants during data gathering. The information obtained from participants and results of urine sodium were solely used for the purpose of this study. The data were not disclosed or transferred indiscriminately to any other person. The self-reporting of participants may not necessarily be an accurate measure of their attitudes and intentions regarding behavioral change.

### **Delimitations**

The delimitations of this study was the inclusion criteria of previously diagnosed Nigerian hypertensive adults attending Lagos University Teaching Hospital, Nigeria. The hypertensive status of participants was the cut-off point equal to or higher than BP levels of 140/90mmHg and within the ages 20 -60 years. The inclusion criteria recognized both the controlled and uncontrolled hypertensive Nigerian hypertensive adults that were on high levels of dietary salt/sodium consumption. The actual salt/sodium consumption per day relied on the routine urine sodium excreted by participants (obtained as secondary data from the facilities) estimated through laboratory analysis of early morning urine specimen.

### **Limitations**

The key limitations that may likely occur in this study is poor responses of participants to the questionnaire due to low level of literacy of some of the participants, thus prevent them from comprehending the questions and properly articulating their

responses, especially in Nigeria, with a predominantly low level of literacy. In order to meet the participants' local and cultural demands, I will slightly modify the data gathering process; using either self-administered questionnaire for the literate participants while the face to face interview/questionnaire will be for participants who were unable to read and write.

Cross-sectional survey design being a single-point in time data collection process which limits the opportunity for the researcher to adequately follow-up with participants to seek clarification of ambiguous information or obtains missing data. Nevertheless, the adoption of face-to-face interviews / questionnaire in this study enabled further probing of participants to gather more relevant and detailed information within the point in- time. Self-reporting could be challenged with the limitation of recall bias as well as the false-, under-, and over-reporting of information.

The estimation of dietary sodium levels from spot urine (early morning) sampling limits the data to daily dietary information, which may not be a true representative sample of the variety of diets of participants. However, the spots urine samples are validated by the large sample size of the study. Moreover, because the study relies on the mean estimate of the total sample, it sufficiently accounts for the variations in dietary intake.

The use of a purposive-homogenous sampling method and a non-random selection of participants could lead to sampling bias. Nevertheless, a purposive sampling method is an acceptable sampling method for a quantitative study that is required to meet special needs (Groenewald, 2004).

## **Significance of the Study**

### **Significance to theory**

The adequacy of MTM was tested in this study to address and present a good understanding of the underlying behavioral and attitudinal factors towards a change in behavior about health related matter. Consequently, I employed the constructs of the MTM theory to assess how peoples' decisions or intention to initiate and sustain health behavior changes may or may not be inimical to achieving successful health intervention or promotion. The importance of this study was premised on the need to be implicit in the investigation and analysis of the control and management of hypertension, the biggest single contributor to the global burden of heart, kidney diseases and mortality (Poulter et al., 2015; World Health Organization, 2013).

### **Significance to Practice**

I employed this study to promote the significance of behavioral change in the central role of nutrition (diet) as a health intervention in the prevention and control of HBP for the benefit of the Nigerian community and other populations in need of such information. Moreover, the cost-effectiveness of using inexpensive local food items as nutritional and alternative therapy for the control and management of hypertension as emphasized by Subramanian et al. (2011) and Kasilo et al. (2011) is highly significant especially among underserved populations with limited access and resources to maintain adequate healthcare services. In addition, the positive results on the adequacy of MTM model provides the opportunity to design an MTM health assessment instrument for use by healthcare professionals to measure the personal intentions and strength of individuals

at initiating and sustaining the appropriate behavioral changes that can prevent and control any health challenge, thereby promoting health education and health interventions.

### **Significance to social change**

Fixsen et al. (2005) highlighted the significance of applied research in promoting improved service delivery processes and contextual factors, as well as improving the efficiency and effectiveness of program implementation at local, state, and national levels. In this regard, many researchers and practitioners have become crusaders of social change in their respective areas of study and practice. Therefore, the study outcome becomes an evidence-based tool for health education and intervention programs that empower individuals to become responsible and self-reliant for their health and ill-health. This is in support of the Laureate Education's (2013) vision and mission that encouraged scholar-practitioners to develop research studies and apply the findings as evidence-based intervention programs that contribute positively to the lives of the people and the communities around them. This study result can provide an easy avenue through which to determine and select the correct preventive or corrective treatment strategy for the control of high blood pressure and hypertension in Nigeria.

### **Summary**

The prevalence of hypertension worldwide has been a major public health concern, especially in developing countries like Nigeria with high prevalence rate of hypertension among Nigerian adults. Copious empirical evidence was shown to portray that hypertension could be prevented and treated following the physiological association

of the disease with the high consumption of dietary salt/sodium. Also, several pharmacological studies had emphasized and predicated the control of hypertension on strict adherence to drug interventions to the detriment of the evidence- and theoretical-based, non-pharmacological and behavioral change approaches. These alternative approaches are often not only inexpensive, but have been evidently supportive in achieving the successful recovery of hypertensive patients in many developed countries and regions of the world.

Consequently, this study focused on testing the accuracy of MTM, a new theory by examining its predictive powers to mitigate or enhance decisions of Nigerians with hypertension' to initiate and sustain the behavioral change regarding the reduction of sodium/salt. I also assessed the impact of the MTM initiation model constructs in the attainment of the actual dietary sodium consumption levels of adult Nigerian hypertensives in relation to RDG levels.

In summary, chapter one provided an overview of the study. Chapter two reviewed the relevant literature regarding the relevance of behavior change strategies as panacea to influencing lifestyle modifications required to address the global challenges of hypertension. The chapter also included a review of the empirical findings of MTM in supporting behavior-change that are applicable to other areas of health challenges. Lastly, this study highlighted the contributions of the social and physical environment, in terms of our demographical, socioeconomic and environmental factors as well as the impact of the Nigerian dietary patterns and nutritional practices in the prevention and control of hypertension.

## Chapter 2: Literature Review

### **Introduction**

In this chapter, I reviewed the literature of interest to the focus of this dissertation. I discussed the theoretical framework and provide an assessment of past and current as well as associated published articles. I also identified the best practices in the application of evidence-based theoretical and conceptual frameworks guiding the use of health, educational and promotional interventions to achieve effective behavioral and lifestyle change (adopting low salt/sodium diet) in the prevention and control of high blood pressure (HBP).

The chapter begins with a discussion of the adopted literature search strategy and the place of a sound theoretical framework in this dissertation. After this, I explore published works on the MTM and its attributes as well as critique existing behavioral theories, and characterize features of primary or essential hypertension, among a few other types of hypertension. I also critically examine a number of alternative theories to ultimately contextualize the research problem within the theoretical framework.

A key outcome of the literature review was the paucity of research on the use of lifestyle modification and health behavioral changes (as health education and promotion interventions) in the management and control of in Nigeria, one major developing country in the sub-Sahara African region. Moreover, most researches had been undertaken without recourse to theoretical framework and conceptual perspectives. Responding to these observations, the investigative study reported in this presentation as informed by the literature review, focused on examining the utility of the MTM

constructs on the decisions of Nigerian adult with hypertension to initiate and sustain positive healthy behavior by consuming low sodium/salt.

### **Literature Search Strategy**

The search strategy that I adopted for the review involved identifying various search terms such as *hypertension, elevated/raised /high blood pressure*, “health promoting behaviors”, “behavior change theory “ “lifestyle modification” , and “theoretical framework”. The combination of these terms formed varying search titles relevant to the study topic for identifying related journal publications of interest ‘*Sodium/Salt intake of Nigerians*’, “*Control and management of hypertension and elevated/high blood pressure*”, “*Using behavioral change theory to control and manage high blood pressure (hypertension)*”, “*Health promoting behaviors of hypertensives*”, “*Dietary patterns and behavior in Hypertension*”, and “*The prevalence and non-pharmacological management of hypertension in Nigerian adults*”.

I explore the search terms systematically in databases like Walden Library, the Cumulative Index of Nursing and Allied Health Literature (CINHAL), PubMed, and ProQuest. Other databases include Scopus, Journal of Academy of Nutrition and Dietetics, Journal of Hypertension, Google Scholar, and general Internet searches. I also retrieve the bibliographies of some articles and reviewed manually to identify additional potentially useful journal publications. I use my primary search terms and titles to retrieve an initial total of 194 peer- reviewed articles at my first attempt. Later, I streamline the relevant articles to 25 published journals from 2007 to 2017. I also found

some relevant items of information from reports of local and international health agencies, textbooks, and editorials and commentaries published between 2002 and 2006. The outcomes of the review are presented in the ensuing discussions that started with the theoretical framework.

### **Theoretical Framework**

Theory has been established as an integral and important component of health education research and practices, which informs, enriches, and enhances the practitioners' skills, knowledge, and understanding of the processes for resolving health problems or issues (Glanz et al. 2008a; 2010; Rudestam & Newton, 2015; National Institutes of Health 2011). Theory also provides relevant structure and worldview to the research (Creswell 2013). In this study, I used theory to articulate assumptions, support the problem statements, establish explicit research questions, formulate hypotheses into appropriate conceptual models, and as noted by Sharma (2017), to facilitate the development of strategies for health education interventions. Health educators like Glanz et al. (2008a; 2010.), Green (2012) , and Sharma (2017) recognized and affirmed health behavior as the ultimate dependent factor in the specific contexts and perspectives of health education and intervention programs. Moreover, as evidence-based theory served as a crucial tool that enable researchers and practitioners predict and explain health behavioral changes.

Health behavior is a combination of knowledge, attitudes and practices, and those actions required to either promote healthy lifestyle or encourage risky health behaviors (National Institutes of Health, 2011; Sharma, 2017). The identified risky lifestyle patterns

and associated diseases have consistently justified the need to develop and test more health behavior theories (Connelly,2005). required to operationalize in the real world environments through health intervention initiatives (Glanz et a. 2010; Green, 2012; Sharma, 2017).

The inevitable role of theories in health intervention programs (Bartholomew & Mullen, 2011) is to ensure that target groups achieved positive health behavioral changes in order to enhance and promote healthy lifestyles that complement the health care systems (Pasick et al., 2009; Dastjerdi, 2011). In terms of contextual factors of health education and promotions, theories illuminates the understanding of the varied complex health situations, relied on the experiential knowledge of the health professionals, and evidence obtained from the environment, to channel the findings of empirical research towards developing intervention strategies required in achieving positive behavioral change and effective health interventions for the targeted audiences (Pasick et al., 2009; Grant et al., 2014).

### **Multi-Theory Model (MTM)**

Sharma (2015) developed and integrated a number of the mostly used, old, and individually tested constructs of some existing behavioral and cognitive theories to form the constructs of MTM. This is a major contribution to available knowledge in decreasing morbidity and mortality rates as well as enhancing quality of life. The initiation component of MTM activates the transition process of health behavior change, using the three distinct constructs (participatory dialogue, behavioral confidence, and changes in the physical environment). The constructs initiate a one-time action/activity, which could

be starting the yearly vaccination of infants/children or undertaking the initial take-off of physical activities as a health behavioral change for reducing obesity (Knowlden et al., 2016; Nahar et al., 2016; Sharma et al., 2016).

Furthermore, the sustenance component of the MTM, which is composed of three other distinct constructs (emotional transformation, practice for change, and change in the social environment) assist to maintain or sustain the actions /activities needed to influence the health behavioral change. Therefore, the sustenance component of MTM is the long-term performance or sustain the continuous execution other several actions and varied activities that served as platforms for overcoming the health problem such as engaging in regular physical exercises, reduction in portion size of food intake, and improving the quality and nutritional composition of meals. (Knowlden et al. 2016; Nahar et al., 2016; Sharma et al., 2016).

### **Initiation Component of MTM**

The initiation model of health behavior pattern (an outcome /dependent variable) featured as the first component of MTM, characterized by the decision of the individual or target audience to commence an action or activity that affects their health issues either positively or negatively. For example, Sharma et al. (2016) highlighted the reduction of food portion or size consumed daily as a behavioral change to control the incidence of overweight and obesity in college students. However, the eagerness to initiate the behavior is predicated on other motivational and independent factors or constructs as proposed by Sharma (2015). The constructs are

**Participatory dialogue:** The participatory dialogue is used as an independent variable in this study to engage the target audience in a two-way communications stream. The engagement of target audience is expected to be directed toward identifying the differences in the advantages and disadvantages of the activities in initiating the decision by adults with hypertension and consequently influencing the behavior change. These are the likely benefits and losses to reducing salt/sodium intake in the control of blood pressure/hypertension.

**Behavioral confidence:** The construct operated as a predictive variable in this study and referred to both the internal self-will power and external support that boost the individual's confidence in the decision to adopt a change of health behavior and attitude to aid the initiation of consuming small portion size or reduction of salt/sodium intake. Behavioral confidence construct encourages the individual to instigate commitment to the plan of action by obtaining the likely start time of executing the change of behavior from target audience. Behavioral confidence helped in mustering both inner and external confidence (Knowlden, 2016). Behavioral confidence could be likened to Bandura's self-efficacy of social cognitive theory and Ajzen's perceived behavioral control. However, differed in contest because behavioral confidence is focused more on continuousness of the activities in the future rather than just one-time immediate action (Sharma, 2015; 2017).

**Changes in the physical environment:** featured as an independent variable operated as the natural or physical reinforcements in form of available resources needed to support the decision to initiate behavior change. What influenced the adoption of low

sodium/salt diet. The examples of natural or physical reinforcement are the physical availability of restaurants or right food items that supported low salt diets or self-preparation of low salt meals.

### **Sustenance Component of MTM**

Sustenance component constituted the second dependent variable of MTM and represented by the decision to sustain the positive behavior changes that influence the reduction of sodium/salt intake by hypertensive Nigerian adults. The sustenance constructs are

**Emotional Transformation:** The construct relied on the emotional reaction of the individual in performing the health behavior change. These factors are facilitated by the ability of the participants to readjust emotionally by drawing on inner strength in the reassurance of sustaining healthy life modifications. Emotional confidence construct uplifts the feelings of the target audience and provides guidance on decisions to undertake less risky behavior. By continuous self-motivation and drawing on inner strength, individuals can avoid self-doubt inimical to sustaining healthy lifestyle and long term behavior change of reducing the salt /sodium intake.

**Practice for change:** The variable is the regular practice of certain activities and associated efforts to eliminating or filter those activities acting as barriers or inimical to progressing the change in behavior. The practice of retaining the necessary activities that support the sustenance of behavioral change also include keeping of self -diary in monitoring or tracking the intake of low salt diets or self- preparation and carrying to work. low salt diets.

Changes in social environment. The independent variable relied on the social support systems and relationships within the environment such as support from family members and friends to cushion the effects of change in behavior and to prevent renegeing on already attained positive behavior change.

In that connection, MTM has been developed in response to the identified needs for more health behavioral theories; to adequately account for the constructs, and more specifically, to modify and improve upon other constructs of some existing behavioral and social theories such as health belief model, transtheoretical model, and socio cognitive theory (Sharma 2015;2017).

### **Limitations of Existing Behavioral Theories**

Some of the earlier used behavioral theories such as health belief model transtheoretical model, and s Socio Cognitive theory were based on strong conceptual models and useful constructs that guided the development, implementation, and evaluation of health-related behavior change interventions. However, each of the earlier developed theories had limitations in addressing different behavioral challenges. Sharma, (2015; 2017) faulted some of the existing behavioral and social theories/ models by exposing their conceptual deficiencies and lack of predictive power, which made them barely comprehensible and altogether impracticable. Although some of these existing behavioral theories may have initiated short-term or one-shot positive behavioral change, they lacked effective predictive power to maintain the long-term health behavior change.

**Health Belief Model (HBM)**

The HBM was the first behavioral model, introduced in 1950 by a group of U.S. public health psychologist led by Irwin M. Rosenstock, (Pasick et al, 2009). It was developed for the understanding of health behaviors. The model's constructs included perceived susceptibility, perceived severity, perceived benefits, perceived barriers and cues to action. HBM was not exclusive to health behavior intervention, as noted by some researchers. Glanz et al. (2008b: 2010) reported that HBM, being a cognitively based model, it could not examine the emotional component of health behavior change. More recently, the public health practitioner incorporated the cue to action construct to improve the model. The HBM is a theory that dwelled on people's beliefs about exposure and associated risks of diseases, their perceptions of the merits of taking preventive action, and factoring the perceived barriers that influence their readiness to take preventive action (Crosby, DiClemente, & Salazar, (2013). HBM's limited success in the prevention of public some health issues like screening and vaccination of children was due to the use of identified fear or perceived susceptibility, which sometimes have been responsible for modest change in behavior. However, the use of fear-based communications to influence individuals' perception of a threat and the selection of a behavioral change to reduce the threat. Nevertheless, some significant limitations of the theory are that HBM constructs have diminishing mediating variables to health behavioral change. Moreover, the HBM is more of a descriptive theory than explanatory, because it does not provide a strategy for change (Glanz et al., 2008: Pasick, et al., 2009). The threat components predict only one-time intentions to effect behavior change and therefore unable to sustain the long term

motivation for continuous change (Sharma, 2017). Other limitations identified with HBM included facts such as

1. The theory does not reflect the environmental or economic factors that may impede or encourage the recommended action. This is a lapse that limited the outcome of the theory application in diverse groups and low- resource cultures.
2. Although, HBM constructs that brought about some outcome behaviors (Carpenter, 2010), but the relationships between and among theory constructs were not clearly defined.
3. 3. Therefore, ambiguity created resulted in variations in HBM applications (Boston University school of Public health, 2013).
4. Some studies attempted to establish each of the major dimensions of HBM as independent constructs, others had tried multiplicative approaches. The analytical approach was required to identify the relationships to further explain the utility of HBM in predicting behavior change.

However, because HBM have some predictive utility as well as the applicability to provide behavior change, it could be improved by incorporating self-efficacy and self-confidence to perform the behavioral change role. Sharma, (2015) tapped into this idea by integrating HBM constructs with other models and additional variables to form MTM multi-component constructs, a more robust purveyor for effective health behavior change

### **Transtheoretical Model (TTM)**

The TTM constituted an exclusive and unique theory of health behavioral change credited to Prochaska (1979): operating within specific time changes for the five stages of behavior processes: namely pre-contemplation, contemplation, preparation, action and maintenance (Prochaska and DiClemente, 1994; 2013). However, the predictive validity of this model as a behavior change became a subject of controversy (Sharma, 2015) with the classification of the behavioral stages as distinct stages instead of its acceptability as a continuous process. The over-reliance of the TTM model on cross-sectional studies design, although a cheaper and widely accepted method, is an indication of individually operated stages of behavioral changes (Nigg et al., 2013) DiClemente et al. (1991) confirmed the use of several cross-sectional studies to support the TTM's predictive validity, but other longitudinal studies disagreed with the claims (Bridle et al., 2005). Counter arguments and results provided findings that multivariate analyses of behavioral predictors based on transtheoretical model were weak predictors. TTM remained an influential theory in smoking research, but the model constructs were limited by the serious challenges and the inconsistency in applying the stages of change construct to complex health behaviors issues such as physical activity and dietary modifications (Adam & White, 2005). Therefore, TTM was proposed more as a descriptive model with weak predictive powers (Park et al., 2005), owing to the mismatch in the individualized stage-based intervention (Adam & White, 2004). This also limited the application of the model within diverse groups or culture.

**Social cognitive theory (SCT)**

SCT is a dynamic and interactive process derived from the re-modification and integration of Social Learning Theory (SLT) and incorporated with the construct of self-efficacy by Bandura in 1986 (Glanz 2008b; Denler et al., 2014). SCT consisted of nine constructs (knowledge, outcome expectation, outcome expectancy, situational perception, environment, self-efficacy, self-efficacy in overcoming impediments, goal setting/self-control and emotional coping for purposes of behavioral change), which had been successfully applied as underlying theory in behavior change of interest to health issues such as dietary interventions or in management of pain control (Denler et al., 2014). The limitations of SCT posed the difficulty of operationalizing the theory for health promotional purposes and its lack of discernible focus on emotion or motivation. In addition, Sharma (2015: 2017) noted that the self-efficacy of SCT projected low predictive power that was unable to ensure an effective behavioral change in other traditional cultures like China, contrary to the larger effects recorded in the studies conducted in the United States.

**Application of the Multi-Theory Model in Previous Research**

MTM was developed by Sharma (2015) and its potential benefits as a theoretical and conceptual framework have been empirically tested and found useful in predicting, describing and controlling behaviors and attitude in certain health-related issues. The model's versatility and attributes as an analytical tool had been demonstrated in studies and was found to have achieved the following:

1. predicted the initiation and sustenance of small food portion size to control obesity (Sharma, 2016).
2. predicted the initiation and sustenance of improved sleeping habit in compliance with prescribed guidelines that promoted health both by Knowlden and associates, (2016).
3. predicted and influenced the adoption of physical activities among college students, Nahar et al, (2016).

Sharma et al, (2016), in their study employed a non-experimental quantitative and cross-sectional method to investigate the utility of MTM as a health behavior theory using it to predict the initiation and sustenance of ‘small portion size’ consumed by college students in order to control overweight and obesity. A predetermined sample size of 135 college students of a Southern American University, that confirmed eating large portion sizes within 24 hours were included in the survey and electronically administered with a 35-item MTM structured questionnaire. A step-wise multiple regression analysis of the study revealed that about 37% of the variance initiated the consumption of small portion and was explained by two of the component’s constructs; participatory dialogue and behavioral confidence. The demographical factors indicated that as age increased, the likelihood of initiating small portion size consumption increased, whereas from the gender factor, outcomes suggested that females were more likely to initiate small portion size consumption than the males. In the case of sustenance, the 20% variance maintained the consumption of small portion size in the college students, which was largely explained by emotional transformation, changes in social environment, and race.

Knowlden et al, (2016) in their study tested the functionality and adequacy of MTM constructs as a predictive (independent) variable of adequate sleep behavior among college students, in order to encourage the adoption of quality seven hours sleep per night on a regular basis to promote optimal health. The quantitative and cross-sectional design study administered a 38-item MTM construct instrument to survey a carefully screened 151 sample of college students (selected from the initial list of 335 respondents for the study) with poor sleeping habits (sleeping below seven hours /per day). The participants cut across three American races/cultures of non-Hispanic (n = 146; 96.6%), Caucasian (n = 125; 82.7%) and African American (n = 25; 16.5%), females (n = 128; 83.7%). The multiple linear regression analysis of theoretical predictors was conducted in SPSS. And the results due to the initiation model, indicated that the MTM construct of behavioral confidence ( $\beta = 0.501$ ,  $p < 0.001$ ) significantly predicted 24.4% of the variance in the initiation of adequate sleep behavior. The combined sustenance model predicted a 34.2% of the variance in behavioral sustenance as suggested by the fact that the three MTM constructs for sustenance component; emotional transformation, practice for change, and changes in social environment were significant predictors for sustaining adequate sleep as a health behavioral change.

Another recent study conducted by Nahar et al, (2016) provided evidence of the considerable utility of the MTM health behavior change using its constructs in predicting, initiating, and sustaining physical activities among college students of an American University. This study by Nahar et al. (2016) equally employed a quantitative and cross-sectional design to electronically survey 141 students (from the initial 495 respondent

enrolled at a Southern United States University), who have not been engaged in more than 150 minutes of moderate to vigorous intensity aerobic PA the previous week to the study. A valid and reliable 35-item MTM constructs' instrument were administered on the student participants, who majorly were females (72.3%) and Caucasians (70.9%). The multivariate regression analysis indicated a 26% of the variance in the PA initiation, which was explained by the participatory dialogue (advantages outweighing disadvantages), behavioral confidence, work status, and changes in physical environment being significant predictors. Furthermore, the sustenance component recorded 29.7% of the variance explained by the significant predictive role of emotional transformation, practice for change, and changes in social environment in the sustenance of PA in the college students.

The findings of these MTM-driven studies provided sufficient evidence to support a legitimate conclusion that MTM justified a robust theoretical framework characterized by a versatile conceptual model for predicting (initiation and sustenance) positive behavior change. Nonetheless, few authors such as Knowlden et al. (2016), Nahar et al. (2016), Sharma (2016) pointed out the need for future research directions concerning the development of suitable intervention strategies for which the MTM appears to hold significant promise.

To this end, this current study focused on and evaluated the adequacy of MTM as a theoretical framework, in terms of the benefits of its conceptual model, and relevance of the motivational constructs as predictors in the decision to influence the initiation and sustenance of a healthy lifestyle through behavior change (an outcome variable) for low

sodium/salt consumption or diets in the control and prevention of high blood pressure (HBP). The conceptual merits of MTM varied from building an evidence-based health educational and promotional initiative that encouraged the consumption of low sodium /salt diets, but also assisted in addressing public health issues of high blood pressure (hypertension) among hypertensive Nigerian adults,

### **Global Challenges, Treatment and Control of Hypertension**

High/Elevated Blood Pressure (HBP) had been an independent risk factor to cardiovascular diseases, kidney failure, a comorbidity of diabetes, obesity, stroke that often led to physical disability and death in both developing and developed countries (Gu et al, 2008; Mezue, 2013; WHO, 2013). The blood pressures of individuals were determined by the quantum of blood pumped by the heart, the size and condition of the arteries. The different types and stages of elevated blood pressure (hypertension), as well as the physiological/ psychological factors had been identified as blood pressure trigger. It also included the genetic factors such as the kidney's condition and levels of various hormones in the body (Hendriks et al, 2012; Poulter et al 2015; Xie et al., 2016). HBP occurred in varying degrees of severity and was classified into different types and stages of hypertension.

### **Types of Hypertension**

#### **Primary or Essential Hypertension**

Primary or Essential hypertension was never associated with any identifiable cause, and therefore was referred to as “silent killer disease”. The origin of diagnosed essential hypertension may both be due to genetic or poor lifestyle habits such as poor

dietary habits, overweight and lack of physical activity (Briet & Schifrin, 2013; Ashraf, 2013). Primary or essential hypertension was the most common type of the disease found in about 95% of the cases, which was also more prevalent in black Africans descendants (Briet & Schifrin, 2013; Koliaki & Katsilambros, 2013).

### **Secondary or Comorbidity Hypertension**

As the name denoted, these types of HBP were caused by some known conditions such as kidney problems, use of certain medications and some other medical problems such as diabetes or during pregnancy (Behrens et al., (2016).

**Pulmonary arterial hypertension:** The type of HBP caused by lung disorder occur as a result of the narrowing of the pulmonary arteries carrying blood from the heart to the lungs, making it difficult for free –flow of blood through the vessels.

Consequently, expanding the arteries far above normal levels, and progressively increased the pulmonary vascular resistance and right ventricular failure (Montani et al., (2013). McLaughlin, Davis, & Cornwell, (2011) reported that the cause of the hypertension disease is often unclear and as such the disease was referred to as idiopathic pulmonary hypertension because it may occur as a comorbidity to other illnesses.

**Preeclampsia:** Another secondary type of hypertensive disorder diagnosed during pregnancy, with the systolic blood pressure greater than or equal to 140 mm Hg and diastolic greater than or equal to 90 mm Hg. (Vest & Cho, 2012). The classification systems by Behrens et al. (2016) separated the chronic and gestational hypertension from preeclampsia that caused significant morbidity and mortality for mother and

child. Lei et al. (2016) defined these conditions as elevated BP diagnosed at more than 20 weeks' gestational age without signs of end-organ damage (gestational hypertension) or preeclampsia/eclampsia with associated signs of end-organ dysfunction and with seizure.

More specifically, the consensus on the stages of hypertension was premised on the scientific recognition of the differentiation in readings of the two values known as systolic and diastolic blood pressure levels as shown in the Table 1- classification of hypertension provided by two public health agencies, the Joint National Consultation (JNC) for the treatment and control of hypertension (Chobanian et al, 2003) and the World Health Organization (WHO, 2002). Hypertension may be diagnosed when one or both readings are high: the systolic pressure generated as the heart pumps blood around the body recorded as first reading and the diastolic pressure generated as the heart relaxes to refill with blood, which is provided as the second reading in the unit of mmHg. For the normotensive or at regular blood pressure levels, the systolic and diastolic blood pressure (BP) values are expected to be less than 120/ 80 mmHg respectively. The pre-hypertensive stage is indicated by the systolic blood pressure values ranging from 120 to 139mmHg, while the diastolic BP values ranges from 80 to 89 mmHg. The hypertensive stage is characterized by systolic BP level values equal to or higher than 140 mmHg over diastolic BP level values equal to or higher than 90 mmHg (Ogah et al., 2012a).

Table 1

Joint National Council (JNC) Classification			
<i>Category</i>	<i>Systolic BP(mmHg)</i>		<i>Diastolic(mmHg)</i>
Normotensive	<120	&	<80
Pre-Hypertensive	120-139	or	80-89
Stage 1 –Hypertensive	140-159	or	90 -99
Stage 2-Hypertensive	>160	or	>100
WHO/ISH 1999 Classification			
<b>Category</b>	<b>Systolic BP (mmHg)</b>		<b>Diastolic BP (mmHg)</b>
Optimal	<120		<80
Normal	<130		<85
High normal	130 – 139	or	85 – 89
Grade 1 hypertension	140 – 159	or	90 – 99
Grade 2 hypertension	160 – 179	or	100 – 109
Grade 3 hypertension	>180	&	>110
Isolated systolic hypertension	>140	&	<90
Borderline	140	&	90

Courtesy: World Health Organization. [www.who.int/about/licensing/copyright\\_form/en/index.html](http://www.who.int/about/licensing/copyright_form/en/index.html)

### **Impact of Pharmacological approach on hypertension**

The 8<sup>th</sup> Joint National Commission (JNC) for the treatment and prevention of hypertension in 2012 highlighted by James et al. (2014) recommended eight types of medication therapy guidelines believed to effectively reduce high diastolic BP levels for

the different stages of hypertension in adults, based on systemic reviews of some randomized clinical trials (RCT). The studies reviewed included those with more than 100 adult participants of ages 18 years and above, whose BP levels fell within the different categories of hypertensive status for not less than six months before the study; while the control study participants included hypertensives with comorbidity such as kidney diseases, diabetes, stroke, kidney problems and heart diseases (James et al, 2014). The review panel emphasized that drug recommendation and dosages be tailored to meet with individual circumstances, drug tolerability, patient and the clinician preferences. In conclusion, the study, identified the urgent need to manage the adverse effect of long term medication suggesting the use of lifestyle modification and approaches through the potential benefits of healthy diets, weight control, and regular exercise highly recognized to improve BP control, thereby reducing medication needs

Despite the array of available medicated treatment options directed towards the control of hypertension and its comorbidities frequently paraded by many clinical studies (Bakare et al. (2016), Oparil & Schmieder (2015), and Busari et al. (2014), I also confirmed from observations of several other prevalence studies (Akinlua et al, 2015; Hendricks et al, 2012; Ogah et al, 2012b; Rahimi, 2016) that there has been no significant reduction in the prevalence of hypertension as a global disease. A projection on global prevalence of hypertension issued by WHO (2013) indicated a substantial increase from the current estimate of 1.15 billion to 1.56 billion of adults that will be living with the disease globally by 2025 (Poulter & Prabhakaran 2015). Another recent global study conducted by NCD Risk Factor Collaboration (2016) investigated the worldwide trends

in blood pressure from 1975 to 2015. The World Health Organization (WHO) study was conducted by a team of scientists from around the world. The global study employed about 1500 population-based studies that involved the pooled and analyzed data of blood pressure of about 19 million participants in every country of the world from 1975-2015. Nevertheless, the study concluded that the prevalence and the highest levels of high blood pressure (hypertension) remained most rampant in the middle-income and low-income countries in South Asia and sub-Saharan Africa, relative to the high-income countries. However, the findings of the study provided the current evidence of the low chances of realizing the global target in the middle and low-resource regions of the world like Nigeria, because a higher percentage of the hypertension prevalence and estimates were concentrated in the developing countries of sub-Saharan Africa (Akinlua et al, 2015; Isezuo et al., 2011; NCD Risk Factor Collaboration, 2016).

Many developed countries benefitted tremendously from using both the upstream and downstream strategy of the “Innovative care for chronic conditions” (ICCC) model initiated by WHO in 2002. The model involved the integration and use of community health care system to launch direct campaigns and monitoring of effective behavioral change in the control and management of the NCD. Epping-Jordan et al. (2004) attributed the success of the ICCC model in some of these regions largely to the existence of the more structured and well-equipped modern primary healthcare facilities and systems, built around the local communities. On the contrary, the ICCC model made very marginal impact in the developing and low-resource countries like Nigeria with its comatose and inadequate primary healthcare system (Aranda, 2010; Akinlua et al., 2015)

and worsened by poor health policy implementation (Eneji, Dickson, & Onabe, 2013). The challenges of poor and inadequate infrastructure in Nigeria is further worsened by the improvised socioeconomic status of a larger number of the Nigerian population, with poor living conditions, which had directly and indirectly compounded the control and treatment of NCD such as hypertension. William et al. (2008) underscored the need to reduce the gaps in healthcare needs of the populace by paying greater attention to the issues surrounding the social determinants of health within and outside of the healthcare system. Williams' study highlighted poverty-reduction by creating employment opportunities to improve the social determinants of health, while also providing upstream intervention factors such as housing, clean and secured neighborhood environment, which dovetailed into increased socioeconomic status and health improvements. The "anticipatory care model" of Dr. Juan Hart and his team in 1993 was projected as a proactive model to medical care practice because the model involved the patients in the management of their illnesses. The approach was reported to have yielded significant impact in reducing blood pressure levels among hypertensive patients, brought down the rates of smoking among men, and mortality rates in the European community of Glyncorrwg relative to other neighboring communities (William et al., 2008).

Given the increase in absolute number of people affected by hypertension in the low and middle income countries, which had escalated due to ageing, population growth, poor health patterns, urbanization, and lack of adherence to pharmacological methods, it became urgently necessary to seek alternative models of health-care delivery that are less dependent on healthcare professionals, thus making evidence more directly feasible and

accessible to end-users and target audience through varying intervention methods such as community promotions (Webber et al., 2014 ). In this regard, Iwelumor et al. (2014) carried out a meta-analysis study in the West African region and reported outcomes that strongly emphasized that the desirability of the application of varying therapeutic options (in the healthcare and other operating systems) to effectively manage hypertension and other NCD; was dependent on the assessment of the complexity of human behaviors and interactions with other operating systems. The Iwelumor study of 2014 identified as a corollary, the urgent need for appropriate application of “system thinking” in analyzing the inherent challenges within the environment for the optimum control and management of hypertension.

#### **Impact of Diet treatment (non-pharmacological) on Hypertension**

Many behavioral risk factors were identified in the development of cures and control for hypertension. They included the consumption of highly salted, fatty foods, and not eating enough fruits and vegetables, use of harmful alcohol, physical inactivity and lack of exercise, as well as poor stress management. (Cecchini et al., 2010; McCartney Byrne, & Turner 2015; WHO, 2012a, 2013). Public health researchers and practitioners understood that changing health behaviors were the core of most public health intervention programs. Similarly, the health practitioners had consistently showed that change in health-risk behaviors have significantly decreased morbidity and mortality as well as enhanced quality of life. However, given the understanding that medications alone often had not adequately control HBP, (Akinlua et al., 2015; Eckel et al., 2013; Mezue, 2013) and coupled with the high incidences of non-adherence to drug therapy by

a larger percentage of hypertensive patients globally (Boima et al., 2013; Bisognano, 2016; Tomaszewski et al., 2014), it was imperative to reinforce other less expensive and easy-to-follow preventive and corrective strategies for the adoption of health behavioral change and lifestyle modification, using global health educational and health promotional programs that supported the intake of low dietary sodium/salt in the control and management of the HBP (Akinlua et al., 2015; Eckel et al., 2013; Rahimi et al., 2013. Society for Public Health Education (2011); Subramanian et al., 2013; WHO 2012a; 2012b; 2013)

In that regard, the many health challenges associated with HBP had been linked to the consumption of high sodium, (a major nutrient and constituent of dietary salt) to become a global public health concern after the Intersalt study (1988) and the Lifestyle and Heart Trial (Ornish et al., 1990), provided important contributions to the development of successful interventions and to the current understanding of risk factors for hypertension disease (Mezue, 2013). The findings of the Intersalt studies brought about the public awareness that excessive intake of certain micronutrient like sodium had been identified with adverse physiological effects of escalating the blood pressure levels. Reduction of sodium/salt intake support the undeniable fact about the natural dependence of human on food as the source of nutrients, not only to sustain healthy living, but also as therapeutic diets to correct human ailment (Kasilo et al., 2011). According to Mezue, (2013), the findings of the Intersalt study showed the Yanomami Indians with no case of hypertension, because as native Brazilian people, they were culturally forbidden to consume salt in food or other forms. Consequently, the Yanomami people recorded a

decreased systolic blood pressure with increased age. The findings in the Yanomami was contrary to findings from other areas of world with high salt intake that recorded a corresponding increase in blood pressure with increased age.

In fidelity to the cause of sodium/salt restriction, the WHO at the 2013 World Health day, reiterated the critical need to employ public health measures in decreasing population exposure to high blood pressure and heart diseases through the reduction in sodium/salt intake and the need to increase the potassium consumption worldwide. However, it became increasingly pertinent to update the national dietary sodium/salt consumption guidelines in order to support and encourage compliance (Koliaki.et al., 2013). Public health practitioners and researchers devised several strategies to respond to the associated responsibility through concerted and coordinated efforts including

1. partnering with food manufacturers to influence and ensure reduction in the amount of salt in processed foods like meat, bread, purees, and soft drinks.
2. Insistence on the use of product labels that display nutritional composition of foods.
3. promoting consumer health education and awareness that encourages behavioral modification towards the intake of low sodium /salt diets to a safe level of 1500 to 2000mg or two-third teaspoon per day.

The limit had been targeted in order to achieve a 30% relative reduction in mean population sodium/salt intake by 2025, predicated on the global adherence level of sodium/salt intake that is associated with reduced blood pressure (Flack et al., 2010; He et al., 2012; Koliaki, et al., 2013). More specifically, the WHO's Global Action Plan for

hypertension (2013-2020) endorsed salt restriction campaigns in form of health education and promotion approaches as the population-wide preventive strategies for resource-poor settings of sub-Saharan Africa like Nigeria with limited experience. Therefore, the consumption of reduced sodium/salt served as an attractive complementary and possible alternative to drug treatment for the control of primary or non-essential hypertension.

Majority of the epidemiological evidence that confirmed the association of low sodium/salt with reduced HBP emanated from developed countries, and only few researches were conducted on this topic in the low-resource countries including Nigeria. One of the early RCT study conducted in Nigeria by Forrester et al, (2004) estimated a comparison of the actual sodium/salt intake between Nigerian (adults from the western part) and Jamaican adults within a period of 30 days. In addition, two other cross-sectional studies conducted in both the rural and urban centers in the western part and Yoruba –speaking area of Nigeria, by Ijarotimi & Keshiro, (2007) and Tayo et al., (2012). These studies showed outcomes that suggested the efficacy of sodium reduction in developing countries, being as positively effective as those identified within the richer cultures. However, these studies' conclusions concurred with many studies from the developed countries (Muchiri et al., 2016; Sacks et al., 2001; Subramanian et al., 2013) showed that employing health promotional interventions for wide scale change in behavior towards sodium/salt reduction program was imperative as evidence –based research to support the treatment of established HBP as well as to prevent increases in its prevalence in poor communities.

Khalesi et al. (2016) investigated the level of influence that health education programs (nutrition knowledge) and non-pharmacology approaches (dietary patterns and lifestyle) brought to blood pressure levels of Australian adults. This quantitative cross-sectional study included 407 participants aged between 25 and 65 years. The authors incorporated food frequency questionnaire with surveys information for nutrition knowledge and lifestyle to gather self-reported data. A logic regression analysis was conducted to assess the association between three independent variables and level of blood pressure as the dependent variable. Whereas, the results showed no significant association or impact of nutrition knowledge on the likelihood of participant HBP. However, the poor dietary patterns in this study by Khalesi et al. (2016) was predicated on the highly westernized and snack diets of the participants, which was found to be associated with and having influence on the likelihood of HBP. The study described in the foregoing differs conceptually from the study of interest to this dissertation, which nonetheless, employs a similar quantitative and cross-sectional research design. Whereas, the second part of the current investigations was directed at an outcome variable-projecting the reduced HBP levels in participants, the independent variables of the two studies differed considerably from each other. The study of Khalesi et al. (2016) did not engage any theoretical framework in structuring the investigation because the impact of nutritional diets and knowledge were directly examined on HBP levels. On the other hand, the current research was undertaken as an evidenced-based and theory-structured study. I premised this study on the theoretical/conceptual perspectives of MTM multi-components and constructs as dependent/independent variables respectively in initiating

and sustaining the decisions of Nigerian adults with hypertension to adopt intake low salt diets for the management and control of hypertension.

### **Use of Alternative Behavioral Theories, Concepts and Designs in the treatment of Hypertension**

In the attempt to identify the appropriate research methods/designs in the prevention and control of the growing prevalence of hypertension both locally and internationally, several epidemiological and empirical studies undertaken in the management of high blood pressure (HBP) hypertension were reviewed. The studies have evaluated the association between the dietary sodium levels, (as independent variables) to the different stages of blood pressure; normotensive, prehypertensive and hypertensive, (as the dependent variables) in different target audiences. Many of these studies have similarly concluded that lifestyle interventions with reduced salt intake or with DASH diets have significantly improved the blood pressure in the population. As shown in the ensuing discussions, many of these studies differed in structure, design, and their application from the MTM model of interest to this presentation, but they offer useful theoretical frameworks for behavior change to influence changes in physical activities and dietary outcomes to effecting reduction in hypertension prevalence metrics.

Landry et al, (2010), evaluated the extent to which the changes in processes of change were predictive of changes in physical activity (PA) and diet as well as determining the impact of socio- demographic factors as predictors of combined psychosocial constructs (PSC) change. In the study, polytheoretical approach was incorporated with the key constructs of transtheoretical model and social support

framework to predict the behavioral lifestyle change of different races residing in the community area of Hattiesburg in the attempt to increase physical activity and improve diets. This study involved the health education and campaign on the use of low salt and low fat diets as a community intervention programs to reduce HBP. Only adults aged 18 years or older and who were English-speaking, non-institutionalized, and resident in the area were pre-qualified. Participants with systolic/diastolic BP of 180/110 mm Hg or higher were directed to obtain immediate medical attention and those without were disqualified from further participation in the study. This quantitative pre-test and post-test experimental research design constructed PSC questionnaires characterized by

1. 15 items each, 4 subscales: a motivation, external regulation, introjection, identification, and integration; score range, 30–150.
2. processes of change for PA (30 items, 10 subscales: stimulus control, social liberation, reinforcement management, helping relationships, counter conditioning, self-liberation, self-re-evaluation, environmental re-evaluation, dramatic relief, and consciousness raising; score range, 30–150.
3. social support from walking group (11 items, 3 subscales: guidance, reliable alliance, and reassurance of worth) and from coach for PA (12 items, 3 subscales: guidance, reliable alliance, and social integration; score range for both, 23–115.

The 6-minute walk test, described as an objective, simple, inexpensive, and safe exercise test, was used as a measure of fitness, based on its reliability to discriminate between functional levels in a high-functioning population. The 6-month active

intervention phase included three (3) motivational enhancement sessions provided by intervention staff, continuous social support provided by walking coaches, and walking groups, weekly pedometer diary self-monitoring, and five (5) monthly education sessions. The authors assessed the dietary intake using the National Cancer Institute's 5-Factor Screener, to capture the valid 18-item screener that approximated intakes of fruit, vegetable, and dairy (servings); fiber- added sugar, and calcium. The descriptive measures were used to summarize demographic characteristics, PSCs, and outcome variables. Only the 10 constructs with acceptable reliability indices and potential for post-intervention significant changes were included in mixed-model linear regression analyses for changes in PSCs. Sex and marital status represented a combined significant predictor of change for diet motivation. A significant decrease was apparent for women and married participants, but the change was not significant for men and unmarried participants. The results of the mixed-model linear regression analyses for changes in dietary outcomes predicted by PSC changes indicated that behavioral processes of change, helped relationships, and reinforced management were significant predictors of fitness change, but not diets. Constructs of self-determination theory, external regulation gave significant positive prediction of changes in both sugar and fiber intake, while interjected regulation was a significant negative predictor of change in sugar intake. However, none of the self-regulation constructs of interest to the treatment were significant predictors for fitness or intakes of calcium, dairy, and fruits and vegetables. Landry et al. (2010), revealed that ten of twenty-four post intervention factors and three constructs of Transtheoretical model positively impacted on behavioral changes for

adults. The findings confirmed that the participants were influenced to adopt low-fat diets, increase the rate of physical activities, which reduced blood pressure in participants

Meuser et al. (2011) evaluated the relevance of DASH diet (diets approved to stop hypertension) and sodium intake in the reduction of blood pressure. The authors hypothesized that socio cognitive theory (SCT) constructs; knowledge, self-efficacy, and self-regulation will mediate behavioral change in the 3-month nutrition intervention using DASH diets of fruits and low fat for adolescent participants with pre-hypertension. Meuser et al. (2011) engaged 57 pre-hypertensive adolescents within the ages of 11-18 years who were randomized into two experimental conditions; DASH-4-Teens intervention (DASH, 29) or usual hospital-based nutrition care (UC, n 28). In addition, the DASH participants received a counselling session with a registered dietician, a DASH manual including 10-modules on DASH food servings, lists, tips, and behavioral strategies, 10 behavioral counselling phone calls by a trained interventionist and biweekly mailings. Outcomes of a 3-day diet recall, and knowledge, self-efficacy, and self-regulation session were measured by questionnaire at baseline and post-intervention. Results showed that in the DASH group, self-efficacy mediated change in fruit intake and self-regulation mediated change in low-fat dairy intake were significant. The findings of this study confirmed the relevance of nutritional interventions in boosting confidence to make dietary changes and the self-control in food selection that supported positive changes in dietary intake that may in turn, improve health: This corroborated the need to design a system of analysis to correlate problem behavior and associated conditions with hypothesized causes of the behavior.

The need to achieve rapid success for health management is in consonance with the position of the Multi Theory Model by Sharma (2015), which highlighted the role of multiple theoretical approaches to behavioral change interventions. MTM not only initiated the change in attitude and behavior, it buttressed the need to maintain or sustain the behavior to achieve a turnaround in different health issues across diverse culture and diverse geographical settings (Knowlden et al., 2017; Nahar et al., 2016; Sharma et al., 2016). From the foregoing review, a key conclusion was that efforts in sodium restriction was crucial to the management of hypertension as part of national and global health policies in reducing dietary salt/sodium intake per day. Results of such approaches would serve as an evidence-based data to propagate or reject the non-pharmacological intervention in the prevention and treatment of hypertension in Nigerian (Gradual et al. 2011; McCartney et al. 2015; Subramanian et al. 2011).

### **Contributory Factors to the Development of Hypertension**

Good health is a critical success factor for improving the quality of life; it is not limited to wellness and natural capacity for existence, but extended to the personal, interpersonal, and environmental resources to sustain being in existence. The Ottawa Charter for Health Promotion (1986), emphasized that achieving optimal health included identifying and realizing individual or peoples' aspirations to satisfying their needs and to changing or coping with their environment. Furthermore, WHO (2012) underscored the importance of health promotion in dealing with health improvements that influences lifestyles, health services, and environments - including physical, cultural and socioeconomic factors with significant impact on health status. Therefore, it was

imperative that in addressing the high prevalence of hypertension among Nigerian adults, it was necessary to review the impact of other social health determinants/variables in Nigeria that may have contributed to the facilitation or impeding the decisions of hypertensive Nigerians to effect a change of behavior in initiating and sustaining the consumption of low salt/sodium diets. It involved identifying a range of independent, though interacting factors—individual, intrapersonal, organizational, and environmental that influenced the choice of diets by hypertensive Nigerian adults.

### **Individual Factors**

The unit of analysis and the main focus of attention of the study included hypertensive Nigerian adults, whose decisions for change of behavior must be initiated and sustained. However, the individual food consumption patterns have shifted from more complex carbohydrates form of traditional diets to refined carbohydrate diets. The neglect of the traditional “African” foods that provide high levels of dietary fiber in favor of the refined Western foods that have been implicated in the rising incidence of chronic, diet-related non-communicable diseases (Non-Communicable Disease Control Programme/Federal Ministry of Health 2014; Morland et al., 2004; Ngwu & Njoku, 2007). Decisions on food selection patterns and dietary habits of an individual hypertensive adult often depended on the socio-demographic predictors (such as age, gender, socio economic status and educational level) as well as established impacts of diet on the health outcomes of hypertension. People’s behavior or attitude to health issues can be influenced by their society, community, peers or circumstances (Denler, Wolters, & Benzon, 2014; Bisognano, 2015), and the changes in behaviors are equally

premised on other external factors such as information provided by media communication or interaction with other members of the society (Non-Communicable Disease Control Programme/Federal Ministry of Health., 2014). These parameters have been associated with different health behavioral changes, and as such largely impacted decision of hypertensive Nigerian adults to initiate and sustain low salt diets.

### **Age and Gender Factor**

There are differences in individual's response to metabolic risk factors with age and gender variables, a major influence on the individual body composition, which in turn affects food consumption pattern in type (quality) and size (quantity) of diets (Motamed, 2013). Age and gender were found to be significant risk factors of hypertension in most areas of hypertensive studies in both urban and rural population (Jelekela et al. 2014). And as a consequence, research instruments are obliged to including considerations that effectively account for these factors. Anyanwu, (2011) and Ezekiel et al. (2011) reported the correlation of blood pressure with age as well as other anthropometric parameters like weight, height and BMI in the Igbo-speaking area (east and west parts) of Nigeria. The NCD Risk collaboration study (2016) associated the ageing structure and population growth (partly counteracted by other trends) with the absolute number of people affected by HBP. However, with the Nigerian population heavily concentrated toward the young and middle age adulthood, as indicated in the 2009 Nigeria population censuses, it therefore implies the possibility of HBP to continue to grow within middle age adult (these larger categories) of the Nigerian population (Nigeria Demographic profile, 2013). The gender factors often differ from one

environment to the other, as shown by some empirical evidence of Hendriks, (2012), Institute of Medicine (2011), and McCartney et al., (2015) that the male recorded higher salt intake than the quantity consumed by the female. This may be due to the fact that men are more exposed to the more vigorous and laborious duties that often results in increased sweats, an avenue of losing some of the dietary sodium/salt.

### **Socioeconomic and Educational Factors**

The behavioral risk factors such as poor feeding patterns, drinking harmful quantum of alcohol, physical inactivity, lack of exercise and poor stress management constitute the negative lifestyle that are highly influenced by people's working and living conditions such as income level, academic background, housing, globalization and urbanization (Iwelumor et al., 2014; WHO, 2012c). Iwelumor et al. (2014) associated the cause of hypertension in most African countries with globalization, affirming the latter as a driver of sedentary lifestyles and poor dietary behavior that led to the rapid spread of hypertension and ancillary diseases in both the rich and low-income countries, especially in many developing countries in the sub-Sahara region of Africa like Nigeria. The findings of the comparison analysis undertaken on the rural and urban Nigerian adults with cardio-vascular diseases conducted by Ekezie et al. (2011), reported higher adiposity and blood pressure indicators in the urban dwellers than in the rural residents. The authors associated the results of poor dietary habits with indiscriminate food consumption as a result of negative lifestyle that was characterized by poor nutritional knowledge, which, in turn, affected the correct selection or purchase of foods and high rates of sodium/salt or fats intake.

Rahimi (2016) reiterated the findings of the NCD Risk Factor Research (2016) noted that disadvantaged individuals and many societies varied in their experiences with burden of hypertension due to the variation in economic inequality and poor knowledge of the disease. The poor socio economic status and inadequate literary knowledge were known contributory factors to people's inability to control exposure to violence, infection, poor access to health services, high-risk behavior, and mortality rates. It was therefore concluded that the most favorable the social circumstances in terms of income or education, the better the chances of enjoying good health and a longer life.

### **Interpersonal Factor**

Behavior and attitude were often impacted by social interpersonal interactions and environmental factors, which are in turn salient variables of health behavior and health education (Hendriks, 2012; Vaccaro et al., 2014). Interpersonal factors espoused by the positive social relationships with families and friends are very salient to human behavioral change; relying on the belief that a particular behavioral change can occur through the intervention of support persons. Osamor & Owumi (2015) in their research on poor adherence to hypertension treatment, noted the high level of compliance to treatment when friends or relatives assisted patients or family exhibited some level of concern about the patients' health issues. Social relationships are imperative to a healthy positive lifestyle, helping to relieve stress, while families and friends are able to provide support and strengthen hypertensives (other type of illnesses) to prevent the feeling of neglect or loneliness and rough times of illnesses. Olowookere et al., 2013 and Vaccaro et al. (2014) highlighted that poor social connectedness and weak cohesion of the family

members, friends and community affected people's behavior and capacity to adhere to their treatment schedules; having a corresponding and direct relationship with poor health and increased mortality rates. The efficacy of a nutritional education and health promotional intervention in reducing dietary intake of salt was conducted in 12 different communities (both rural and urban) of West African countries (Hendriks et al., 2012). The study concluded that health promotion initiatives and nutritional information awareness were effective at getting people to show interest in the efforts at reducing salt intake and consequently in reducing blood pressure in the population.

### **Environmental Factors**

The environment and community we reside are known to directly affect the peoples' health, because the physical, cultural, and organization or environments determine the food availability and food policy, and cost, which in turn impact and shape the peoples' dietary habits or health behavior (Ngwu & Njoku, 2007). Bisognano, (2014) reported the enormous number and diverse local population of hypertensives having difficulty to lower their blood pressure because they are part of a salt-rich culture and therefore are faced with challenges of not being able to adhere to the sodium-restricted limit of 2 gm per day. Apart from the food environments being very crucial in promoting the health behavior change, Morland, (2004), McCartney et al. (2015), and Subramanian et al., (2011) emphasized the disparity in accessing healthy and affordable food/meals that often affected the food pattern of the populace, but also constituted potential risk factors for many nutritional-related illnesses such as hypertension, obesity, and diabetes.

### **Impact of Nigerian Diets on Hypertension)**

Nigeria is richly endowed with a wide varieties of natural and fresh foodstuffs such as rice maize, corn, sorghum soy beans, poultry, and beef, which constitute the energy-yielding group in form of carbohydrate and body-building protein foods. In addition, a high quality and quantity of fruits and vegetables containing protective nutrients (vitamin and minerals), are widely grown and harvested all-year round at different seasons in Nigeria (Non-Communicable Disease Control Programme/Federal Ministry of Health. 2014). Given that foods are typically consumed in combinations with each other rather than individually, the availability of these arrays of good quality food products ordinarily contributed positively and increased the potential of food availability in the country to achieve improved dietary patterns and eating habits that should result in good and positive health status of Nigerian populace. Since dietary choices are influenced by a variety of factors such as not only by availability of food materials, (Iwelumor et al., 2014) but by the cost of food, including knowledge of the causative and preventive effects of certain nutrients like sodium/salt and certain therapeutic diets like DASH (Diets approved to stop hypertension) respectively, it is possible to have positive health outcomes for most diet-related illnesses like hypertension and other non-communicable diseases in Nigeria. However, it appeared as if people with poor dietary habit or pattern are less concerned about their health status, largely due to inadequate nutritional knowledge and poor lifestyle activities that made them more susceptible to illnesses such as hypertension, (Hendriks et al., 2012; Mezue, 2013; Oyebode et al., (2016).

The recommended dietary allowances or guidelines (RDA/G) are sets of advisory dietary statements and advice issued routinely in several countries to encourage and guide the public on ways to change their eating habits, promote healthy living, and good health, to address all diet-related diseases and conditions. The Nigerian RDG was developed by the joint partnership of Federal Ministry of Health and WHO (1999) and was patterned after the America RDG, therefore explaining the similarity between the two countries' dietary benchmarks (Ngwu et al., 2007).

Meanwhile, Ngwu et al. (2007) undertook an assessment of the nutrition knowledge, self-perceived quality of personal or family diet, and factors influencing food selection of Nigerian adults in Ebonyi State University Community, in Nigeria. The study was motivated by the observation, that a wide gap existed between the sodium/salt recommendation by dieticians and the quantity achieved through food eating habits of the Nigerian adults, (partly attributed to poor or lack of nutritional knowledge and partly due to poor determinants of eating behaviors of the people). Seventy percent (74%) of the respondents were from ages 19 -56 years, and had tertiary education. The nutritional knowledge was found to be significantly low, and there were significant differences in perceived benefits of healthy eating between academic staff, non- academic staff and students. Students perceived benefits were statistically lower than academic and non-academic staff. Over 85% of the respondents rated their diet or that of their families as fair, poor or very poor, due to the Nigerian's economic recession and difficulties at the time. There were more females than males with more frequent selection of less fatty foods, more fruits and vegetables, variety and balanced and fresh natural foods as

characteristics of their healthy eating pattern. The reason was not unconnected to the fact the women were generally more responsible in their food purchases, food preparations and services, having more exposure in gathering nutritional information. Taste of food was the most influencing (determinant) factor for choice of food especially among the males than females, while food habit and cost of food follows; the nutritional quality and freshness of food was rated least and poorly in the class of determining factors for food selection. The study concluded that there was an urgent need to improve the nutrition awareness and knowledge of people, which was observed to be grossly inadequate among the low income members of the society in Nigeria.

In 2014, the Centers for Disease Control and Prevention (CDC), reported that more than 90% of children aged 6 to 18 years in the United States consumed too much sodium and 43% of this sodium consumption are obtained from packaged foods such as pizzas, bread-rolls, cold cuts/cured meats (e.g., hot dogs), salty snacks, sandwiches, cheese, processed chicken (nuggets, patties, etc.), pasta dishes, and soups. This American living style and eating habit became a more fashionable and commonly replicated trend in Nigeria, especially among the young age bracket whose lifestyle dominated and impacted the dietary habits of their families, in particular the middle age adults. In addition, there were other sources of sodium/salt in foods, which include those naturally-present in the raw food materials, the quantity added as concentrate or preservative during the industrial food processing, the discretionary salt added during home cooking, and at table. Eckel et al. (2013) reported the America Heart Association (AHA/ACC) panel guidelines on dietary pattern and sodium intake as a single nutrient based on the

understanding that little sodium is found naturally in food. The guideline highlighted the dangerous levels of sodium /salt was added to foods primarily during preparation, at preservation, and at the time of consumption, therefore altering the sodium intake without altering intake of specific foods or overall dietary pattern. However, since little could be done with naturally existing sodium content in food, the quantity of discretionary man-made sodium/salt introduced during industrial processing, home-cooking and at table could be controlled through promotional interventions that lay emphasis on the total dietary delivery of sodium/salt intake of hypertensives (Eckel.et al., 2013; Gradual et al., 2011; Oyebode et al., 2016). Moreover, the Nigerian diets are typically highly spiced with many seasonings and preservative agents, such that the likelihood of exposure of Nigerian hypertensives to the consumption of huge amounts of dietary sodium/salt are considerably high (Mezue, 2011).

Furthermore, the emergence of the ‘fast food or eateries market’ in the country could have altered the composition of the available Nigerian natural diets. With increasing number of people obliged to engage in eating outside the home or doing ‘take home’, there are limited opportunity to control high intake of sodium/salt contained in condiments such as the mono-glutamate food seasonings and canned packed foods used lavishly in the preparation of many traditional delicacies in most fast-food and eateries. These diets were identified as high sources of dietary fat and salt causing high blood pressure, kidneys dysfunction with high risk of heart problems and stroke (Bahadoran, Mirmiran, & Azizi, 2016). The indubitable conclusion of these authors investigation of the exposure to fast food pattern is that many people are highly exposed to high

sodium/salt diets, including the over-use of the regular cooking and table salt added to raw food materials during food preparation and at table (Fisk, 2014).

Fortes et al. (2003) reiterated the importance and protective effects on blood pressure the Mediterranean –type diets basically rich in varieties of vegetables, grains, lean meat, and low fat, which have also been beneficiary in the reduction of blood pressure. The efficacy of the vegetarian diets was investigated by the intervention study of Flack et al. (2010) structured as randomized clinical trial (RCT). The sodium trial was directed at authenticating whether or not reduced sodium intake and a diet rich in fruits and vegetables and low saturated fats called the Dietary Approaches to Stop Hypertension (DASH diet) could reduce blood pressure of 412 randomly selected participants. The study revealed that the groups with lower salt intake had lower blood pressures after 30 days of observation, same effect was found to be greater in the control group that also had the DASH diets. Therefore, contrary to the use of fast foods, result of the ‘‘Dash diet’’ study demonstrated that salt reduction as a strategy was efficacious in blood pressure reduction. No doubt that similar status of low salt diets could be achieved using the local Nigerian and traditional diets and when also combined with other diet-based strategies. In this regard, Mezue (2011) proposed the use of salt substitutes such as Pan-Salt, which are ordinary placebos employed to create the salt taste-effect, without any nutritive or sodium values that could have any physiological impact on the blood pressure.

Consequently, it became a research challenge to develop effective strategies for encouraging people in general especially hypertensives, to take extra caution and be more

aware of what food types are safer to consume, in view of the high rate of exposure to more salt/sodium intake than the quantity added during cooking and at table. The development of such behavioral change strategies, as this dissertation proposed would require a systematic assessment of both the dispositions and real lifestyle behavioral changes of adult Nigerian hypertensives, as measured by compliance with the RDG.

### **Summary and Conclusions**

The comprehensive reviews of the open literature presented in this chapter affirmed the preponderance of empirical evidence linking dietary habits and the health status of individuals and groups of individuals. Outcomes of various investigations reported in peer-reviewed articles published in journals in the particular case of the research problem of interest to this dissertation, consistently revealed that high, uncontrolled dietary consumption of sodium/salt could invariably be associated with increased cases high blood pressure (hypertension), thereby confirmed that HPB could be prevented and treated by adopting lifestyle modifications and behavioral change.

Some of the current theories have their limitations to the extent of influence and control on health behavioral changes and lifestyle modification in the application of non-pharmacological approach to promote good health. More importantly, the behavioral theories and models reviewed in this study supported the position that health education and associated intervention strategies are potent and effective tools for promoting quality lifestyle as well as enhancing population health through persuasion of individuals/groups to initiate and sustain healthy dietary habits. In hypertensive/high blood pressure prone environments, for example, the use of low sodium/salt diets as a non-pharmacological

approach for the control of hypertension and in compliance with recommended dietary guidelines are supported by reported research outcomes.

After identifying the place of theory in a research-based development of suitable and effective intervention strategies, I discussed the characteristic features of the newly proposed multi-theory model (MTM) as a tool for use with the development of a strategy found appropriate to the environment and target population towards the health education for promoting desirable dietary habits, food costs, and nutritional literacy. These factors influence the decisions of Nigerian adults with hypertension to initiate and sustain reduced sodium intake for the ultimate healthy citizenry, free of hypertension.

The impact of a number of evidence – based theoretical constructs of similar epidemiological studies, reported to have effectively employed DASH diets in the control of HBP and other health issues, was also reviewed. The reviews revealed that certain health determinants or factors typically influenced decisions of people to initiate and sustain the control and management of the health issues, with the consequence that research models and theoretical instruments must incorporate relevant aspects of individual belief and habit, interrelationships, cultural and environmental factors when prescribing research-informed roles of behavioral change. Therefore, in the context of strategies for mitigating the health related problem of hypertension, the main thrust of this study, I proposed an innovative nutritional therapy model to assist the Nigerians with hypertension in the initiation and sustenance of the decision to adopt the consumption of low sodium/salt diet. These considerations informed the discussions engaged in chapter three of this dissertation. The chapter focused on details of the method of inquiry, the

study design, the sampling strategy used, the instruments of data collection and the rationale for the choice of the research method are provided

## Chapter 3: Research Method

### **Introduction**

This chapter includes the research methodology I adopted for the investigations conducted towards the development of this dissertation. Details presented include the methodological considerations, the reasoned purpose of the study, the research design, and rationale for choice. In this methodology, I also systematically prescribed the sampling strategy associated with the sample size, and eligibility criteria, as well as data gathering process, validity, and application of the research instruments. Other issues comprehensively discussed in this chapter include the strategies for pilot testing of the research instruments, the review of identified external and internal threats to validity, and the options for addressing the ethical concerns, which arose during field investigations in this type of research interest. All these matters culminated in deriving answers to the research questions on the development of sustainable healthy lifestyle behaviors in the control and prevention of hypertension among Nigerian adults.

### **Purpose of the Study**

The purpose of this investigative study was to test the adequacy of the MTM constructs namely participatory dialogue, behavioral confidence, and changes in physical environment (independent variables) to predict the behavioral change or lifestyle modification of Nigerian adults with hypertension to initiate the intake of low salt/sodium (dependent variable). Similarly, I evaluated the suitability of the MTM sustenance constructs that include emotional transformation, practice for change, and change in the social environment (independent variables) to predict the behavioral changes of Nigerian

adults with hypertension in sustaining low intake of sodium/salt diet as a dependent variable. Lastly, I also assessed the impact of MTM's initiation constructs on the level of sodium/salt consumed by the Nigerian adults with hypertension, in compliance with the WHO recommendations as a metric.

### **Research Design and Rationale**

The choice of the design is a crucial aspect of research planning, which is precipitated by the nature of the research problem and questions (Punch 2005, p 67; Röhrig, du Prel, & Blettner, 2009). Therefore, as indicated by the outcomes of the comprehensive reviews of the literature presented in Chapter 2, I used the exploratory quantitative research method and the cross-sectional survey design approach as a means of projecting the positivist/ post-positivist worldviews, an approach that has been described elsewhere by Creswell (2013, p 21) and University of Kansas (2012). The cross-sectional survey design and strategy of inquiry is very appropriate and advantageous for a study of this variety. This is because, cross-sectional design offered the opportunity of conducting a snapshot (representative sample) survey of the larger population at a time; it is also relatively inexpensive, and easy to implement (Buck, 2005: Creswell, 2013, p 21).

I converted data from the quantitative cross-sectional survey with the closed end questions into numerical measures of observation, which was used to evaluate how MTM variables predicts reduced sodium/salt intake in Nigerian adults with HBP. Consequently, with the quantitative and cross-sectional approaches of this study. I embraced some established statistical procedures in the analysis of the acquired data and subsequently

ascertained the utility of MTM constructs and its multi-components as the desirable independent and dependent variables respectively. The variables were used with the necessary and sufficient attributes of inquiry for the purposes of this study, within the target population of hypertensive Nigerian adults. The method and design strategy had additional merit of automatically accommodating the secondary research need of assessing the impact of the initiation variables on the level of sodium/salt intake of hypertensive Nigeria adults.

## **Methodology and Materials**

### **Sampling Procedure**

The sampling strategy employed in any research is necessarily predicated on the peculiarity of the target participants that the study was investigating (Bryman, 2006; Olsen & St. George, 2004). Despite the fact that this is a quantitative cross-sectional study, I adopted a non-probability design; the convenience homogenous sampling method. The choice of this sampling method was pertinent, in order to meet the specific traits and characteristics, as well as the demand for the type of target participants. The study participants are Nigerian adults with hypertension: systolic/diastolic blood pressure level should not lower than 140/90 mmHg. The decision to employ the convenient sample method for data gathering was consistent with the Laerd's observation that quantitative researchers were obliged to rely on non-probability sampling method at instances when an exploratory or evaluation research was embarked on (Bryman, 2006; Laerd, 2011).

### **Sample size and Target Population**

I derived a representative sample size of 149 consenting respondents through the statistical method of G\* power analysis, (A with the medium effect size of 0.10, at the specific significant level  $p = 0.05$  and statistical power of 0.80). The target population were from ages 20 to 60 years, who were hypertensive with systolic and diastolic blood pressure level not lower than 140/90 mmHg and without any comorbidity. The cut-off point for hypertension used in this study was based on the standard stipulated by World Health Organization (WHO) and the Joint National Commission (JNC) for the treatment and control of hypertension as shown in Table 1.

The target participants were recruited from people with hypertension attending the facility of Lagos University teaching hospital (LUTH) in Nigeria. It was imperative that participants were registered for treatment with the health care provider in order to establish their hypertension status. The health provider continued managing the use of antihypertensive drugs that could impact blood pressure or nutrient metabolism conditions during the period of data collection. More importantly, to avoid the inclusion of other life-threatening conditions, the selection criteria excluded pregnant women, those with comorbidity of heart disease, renal insufficiency, and those with presence of insulin controlled diabetes mellitus.

### **Data collection process**

I planned the data collection processes would cover a month. The questionnaire design was only one step in the data collection process that ultimately led to generating

answers to research questions of interest. Therefore, prior to the original data collection, the questionnaire was first pilot-tested to ensure that participants had common understanding of items of information stated on the questionnaire. Other processes included the design of the research promotion leaflets/fliers that were distributed to the patients attending the cardio clinic of the hospital. I conducted a self-administered questionnaire and a face-to-face interview with consenting participants, particularly for those who were unable to read and write. All participants were treated with respect during the data gathering process and participants asked questions and had freedom to opt out of the study whenever they chose.

### **Instrumentation**

MTM instrument developed by Sharma, (2015) is structured into a 39-item scale is used to address the three research questions of this study. Nahar et al. (2016), Knowlden et al. (2016), and Sharma (2016) had measured, validated, and adopted MTM constructs and multi-components as a reliable instrument, in respect of other health-related behaviors.

In this study, the first three questions of the MTM instrument aided in eliciting data to verify whether or not candidate participants met the inclusion criteria of having been diagnosed as people with hypertension within a required blood pressure level and range, as well as those with the habit of consuming high salt/sodium diets. The next five questions of the MTM instrument facilitated gathering data on socioeconomic, demographic, and educational background, such as distribution in terms of the gender, age, ethnicity, income status/group, and educational attainment of the participants.

In response to the investigative requirements of the first and second research questions, the last 31 items of the MTM instrument served the purposes of been the logical theoretical framework for distilling the necessary data, which is required in modeling how the MTM initiation constructs - participatory dialogue, behavioral confidence, changes in physical environment influenced decisions to initiate consumption of low sodium/salt among Nigerian adult with hypertension. Secondly, to also show how the MTM sustenance constructs (emotional transformation, practice for change, and change in the social environment) influenced decisions to sustain the consumption of low sodium/salt among Nigerian adult with hypertension.

### **Initiation Model**

The initiation component is the first dependent variable assessed by using one-survey item that was based on participants' response to the question "How likely is it that you will eat low salt foods every day in the upcoming week?" The response options ranged from not at all likely (= 0) to completely likely (= 4). In order to satisfy the conceptual perspective of the MTM model, the following initiation constructs were also assessed.

**Participatory Dialogue construct** is an independent factor in this study employed a five-survey items to respectively evaluate the advantages and disadvantages components of the behavioral change. An example of the advantage components survey item assessed the positive impact of salt reduction with participants through such question as "If you reduced sodium (salt) intake in diet to 1,500 milligrams a day (about 2/3 teaspoon) every day, you may be healthy.'" The responses from the five- survey items with each ranked

from never (= 0) to always (= 4), and when summed up range from scores of 0 to 20. On the other hand, the five -survey items for the disadvantage component assessed the negative impact experienced by participants in reducing sodium/salt intake by responding to such question as “If you reduce sodium (salt) intake in the diet to 1,500 milligrams a day (about 2/3 teaspoon) every day, you may not enjoy food’”? With the response’ scores ranging from never (= 0) to always (= 4), the total score of the five-survey items for the disadvantages component cannot be more than 20. However, when summed up, scores ranged between 0 to 20 scores. The actual total responses for participatory dialogue construct were achieved by subtracting the total score of disadvantage component from the total score of advantage component ( $20 - (+20)$ ). According to Sharma (2015), the higher the participatory dialogue- score the greater the possibility of initiating a positive behavior change; For example, the likelihood of reducing the consumption of sodium/salt as a lifestyle modification is greater

**Behavioral confidence**, the second independent variable of MTM was accessed using five- survey items based on such question as “How sure are you that you will reduce sodium (salt) intake in diet to 1,500 milligrams a day (about 2/3 teaspoon) every day this week’”? The responses for each survey item ranged from “not at all sure “(= 0) to “completely sure” (= 4). When the scores for the five-survey items were summed up, it had a total possible score for behavioral confidence ranging from 0 to 20. The higher the score obtained, the more likelihood of initiating the behaviour to reduce sodium/salt intake.

**Changes in physical environment** construct, the last predictive variable of MTM, was accessed using the three- survey items premised on question such as “How sure are

you that you will have low salt foods available to you for all meals?” The response to the five-survey items ranged from “not at all sure” (= 0) to “completely sure” (= 4). The scores for each item was added to achieve a total possible score ranging from 0 to 12 for physical environment.

### **Sustenance Model**

The sustenance component of MTM health behavior, a dependent variable was accessed when participants responded to the one-survey item question; “How likely is it that you will eat low salt foods every day from now on?” The response options ranged from “not at all likely” (= 0) to “completely likely” (= 4), to determine the possibility of sustaining the behavior of reducing sodium/salt consumption. In addition, the sustenance constructs of MTM supported the conceptual perspective in the assessment of MTM construct impact on behavioral change that were highlighted as follows:

**Emotional transformation** is the first independent variable of sustenance model was assessed by using the three- survey items of MTM to question participants concerning, “How sure are you that you can direct your emotions/feelings to the goal of eating low salt foods every day?” Each item response ranged from “not at all sure” (= 0) to “completely sure” (= 4). The scores for each item when added ranged from 0 to 12 that was likely to achieve a total positive score for emotional transformation of sustaining low sodium/salt intake by hypertensive Nigerian adults

**Practice for change** is the second independent variable of sustenance model that employed the 3- survey items of MTM to assess the impact of such question as “How sure are you that you can keep a self-diary to monitor total eating low salt foods every day?”

The responses obtained from the three-survey items ranged from “not at all sure” (= 0) to “completely sure” (= 4). The scores of these items when added ranged from 0 to 12 that was likely to achieve a total possible score for practice for change for sustenance of low sodium/salt diet.

**Changes in social environment** is the last independent variable for sustenance model, that used the -three- survey items premised on such question as, “How sure are you that you can get the help of a family member to support you with eating low salt foods every day?” The response from each item was ranked from “not at all sure” (= 0) to “completely sure” (= 4). The scores for each item when summed up ranged from 0 to 12 achieved a positive total score for changes in social environment to sustain the use of low sodium/salt among Nigerian adults with. Hypertension.

### **Biochemical Assessment of Spot urine samples**

The third research question assessed the impact of the initiation constructs in establishing the real behavioral patterns of hypertensive Nigerian adults to estimate the actual salt/sodium consumed by Nigerian hypertensive adults. It was achieved through the laboratory result of urine excreted sodium (biochemical assessment of spot urine [early morning] samples of participants) obtained as a secondary analysis. The spot urine analysis was in support of Mclean’s (2014) physiological assumption that the body excretes approximately 90% of ingested sodium in the urine within a period of 24 hours. Consequently, the acceptable biomarker for dietary assessments is the 24-hour collection or spot urine analysis of excreted sodium. The various traditional dietary methods, such as 24-hour dietary recall and food frequency questionnaire approach, previously used in

the past to assess and estimate the food (macro/micro) nutrients intake had been reported to be subjective and fraught with a number of biases (Olubodun et al, 1997; Mclean, 2014). In particular, the challenge with micronutrients estimates was predicated on the inability of the consumers to accurately quantify the salt content of their respective meals per day using food composition tables, even though the person preparing the food did not know the amount of salt added during food preparation. Indeed, nutritional researchers like Bates & Thurnham (1997), Mclean (2014), and Melse-Boonstra et al. (1999) had earlier emphasized the use of nutritional biomarker, such as 24-hour urine or spot urine sodium excretion as the gold standard for adult individuals with normal renal function for biochemical analysis, in order to objectively measure and accurately estimate the sodium/salt intake of the previous day. Moreover, the spot urine samples were validated by the large sample size of the study, because the mean estimate of the total sample was required to sufficiently account for the variations in dietary intake of the large number of participants (Mclean, 2014).

### **Pilot Testing of Questionnaire**

The pilot testing process involved the validation of the instruments (questionnaire) by collecting and analyzing sub-samples to assess the accuracy of the instrument and also utilizing some statistical tests and measures to assess the validity of quantitative instruments (Hasson & Arnetz, 2005). However, in this study, the pilot testing process involved administration of the questionnaire among non-clinical sample of (n= 8) friends and family members with hypertension. Olsen & St. George, (2004) posited that the results of research that correctly employ pilot-tested (validated)

questionnaires was more reproducible and provided the researcher with some good measurements of the phenomenon or phenomena of interest. The validity of measurement instrument determines the validity of conclusions after testing hypotheses.

### **Internal and External Threat to Validity**

Validity is concerned with ensuring that the research design and method (including research tools and instruments) directed attention to correctly measuring the variables expected to measure (Frankfort-Nachmias & Nachmias, 2007, p 145), and assign correct interpretations to measurement outcomes. Although the conventional wisdom was that there was no fool-proof validity in any research findings because the validity of measurement was difficult to fully establish, but researchers were obliged to identifying and providing remediating actions against internal and external threats to validity, and consequently minimize (if not eliminate) their effects. Common examples of such threats that this study guided against includes the following:

#### **Poor Sample Size**

Use of inadequate sample size was one major internal threat to validity, as remarked by (Faul et al., (2007) and Scott, (2013). It was generally accepted that larger sample sizes enhanced the ability to detect treatment effects and that sample sizes that were too small or excessively large were potential causes of incorrect findings (Laerd, 2013). For this study therefore, the indicated choice was to ensure that sample sizes were not only moderate accurately, and statistically determined to meet the quantity and quality required. It was also cost effective enough to meet the associated demands of the research problem. (Faul et al., 2007: Sherpris, 2011). Accordingly, the sample size for

this study was determined using the statistical process of G\* power to analyze the required effect sizes at the specific significant level and with appropriate statistical power as indicated in the sample size and target population for this study.

### **Inappropriate sampling method**

Correct choice of sampling method to appropriately addressing the research questions, and hence improve the quality of results in terms of validity and reliability of findings were good means of reducing the possible effects of threats (Olsen & St. George 2004). For this study, the purposive homogenous sampling processes was assessed the most desirable attributes (Laerd, 2013) and consequently adopted as the most appropriate sampling method to identifying the right type (quality) and right size (quantity) of participants for this study.

### **Using the right type of Instruments for data gathering**

This type of threats arose from the use of invalid instruments. The data gathering method for this research employed the pre-tested and validated MTM structured questionnaire designed by Sharma (2015). Other researchers (Knowlden et al, 2016; Nahar et al, 2016; Sharma, 2016), adapted the questionnaire for investigations of other risky health behaviors such as those concerning large food portion sizes and obesity, improvement in the daily sleeping order, and reduction of binge drinking and physical inactivity. However, my study investigated the adequacy of the MTM instrument for the purposes of obtaining information from the participants to determine the psychosocial and environmental factors influencing the initiation and maintenance of reduced salt intake information using constructs of multi-theory model. While the confirmatory factor

analysis was conducted to test the construct validity, the reliability of the variables was measured utilizing the Cronbach alpha method.

### **Poor response to Instruments (Questionnaire)**

If the instrument must correctly measure the desired type of information, it was imperative to be pilot-tested to ensure that the needed information was clearly understood and easily provided by the target audience- the respondents. Olsen & St. George, (2004) highlighted the significance of pilot testing as the evaluation of attributes such as precision (reliability) and accuracy (validity) in the critical development of a questionnaire. The sampling validity of pilot-tested instrument was therefore addressed to ensure the instrument elicited valid and unbiased answers to the research question(s), in order to support the inferences arising from research findings and conclusions (Kimberlin & Winterstein 2008; O'Connor, 2011).

### **Conduct of Questionnaire/ Interview**

It was imperative to reduce the possibility of misinterpretation of the questionnaire-instrument (when not applied as self –administered questionnaire) in the Nigerian environment, where the level of literacy remained typically low. Therefore, participants had the choice of selecting to be interviewed in any of the Nigerian languages of convenience, for effectiveness. I personally conducted the questionnaire/interview with some participants using any of the three widely spoken Nigerian local languages (Igbo, Yoruba, and Hausa or ‘pidgin’ English) in order to meet with the local and cultural demands of the target audience in Nigeria. The process of eliciting responses to interviewer-administered questionnaires was partly predicated on

the respondent's disposition as well as the interviewer's expertise, experience, and the nature of interactions between the two parties involved ( Olsen & St George, 2004; Trochim, 2006), Therefore, I used my professional interviewing skills and appropriate ways of eliciting information from the respondents, to avoid interview and social desirability biases that might affect the validity of the research (Trochim, 2006).

### **Data Processing and Analysis**

The data analysis involved the translation of the responses measured by the instrument across all respondents, into corresponding numerical estimates. The versatile SPSS software (version 23) was used to conduct the descriptive statistics of all variables and to determine the interrelationships between the study variables through multiple linear regression analysis. (Statistics Solutions, 2013). In particular, the association among MTM variables was examined to determine if any significant correlations existed between these variables and the decision of hypertensive Nigerian adults in initiating and sustaining reduced sodium/salt consumption. Moreover, to determine the interrelationship between the MTM's construct and evaluated sodium/salt intake of Nigerian hypertensive adults, in compliance with the nutritional recommended allowance, in order to inform research findings, recommendations and conclusions.

### **Ethical Considerations**

Ethical considerations of interest to the research study were expected to include those issues concerning beneficence, respect of human dignity, and justice (American Psychological Association (APA) 2010 b, p11; Polit et al., 2000). In case of beneficence of this study, the participants, who were typically patients, were protected from possible

physical and psychological damage during the period of this research.in line with guidelines for research with human participants. Polit et al., (2000), Piper & Simons, (2005), and David & Resnick (2015) reported that if there was a possibility of participants being harmed or exposed to undue stress as a result of the investigation, the study should be terminated or the particular activity creating the stress be excluded. It was for this reason, that approval was obtained from Instructional Review Board (IRB) of the Walden University, where the study resided. Since this was a clinical research study, I also demonstrated to the IRB that the benefits of this research to participants outweighed the cost of partaking in the research (Walden, n .d) .More specifically, before approval to data collection was granted, I affirmed to IRB that the data collection methods and processes of this study did not expose any participants and their family members to any harm for participating in this research. In addition, the consents of the ethics committees of the participating hospital was obtained (before the initiation of raw data collection) to legitimize the research and to ensure the cooperation of other staff members within the facilities. Given that this study was a research and not an intervention study, I also confirmed to IRB that during the data collection, the treatment and management of the study participants with hypertension was under the responsibility of the hospital (Walden, n.d). From the point of view of respect for human dignity and fair play (justice), the target audience (sample) for this research consented and participated in the research by signing a written informed consent (APA, 2010b, p11; David & Resnick, 2015; Walden, n.d). The signed consents included confirmation and willingness to provide other information required in the research questionnaire and authorized the researcher to

access, as a secondary data, the estimated results of laboratory analyses of the participants' urine excreted sodium.

The completed questionnaire and spot urine estimation were code- labelled to protect participants' personal information. Also, whenever so indicated or desirable, participants were compensated with souvenirs or monetary equivalents as a token of appreciation for their participation. The aforementioned activities, minimized the risk of using procedures that were inconsistent with sound research design and did not unnecessarily expose participants to risks.

### **Summary**

In this chapter, I set forth details of the methodological considerations, which defined the characterizing features of this investigative study. First, I highlighted the research purpose statement to set the context and consequently identified options for research design and methodology, which systematically provided implicit answers to the research questions. I presented the research design largely as an exploratory quantitative approach and a cross-sectional survey. This was informed by evaluating the utility of MTM constructs, the framework adopted to meet the needs of environment and the research nature. Components of the research methodology included the sampling strategy, data collection process, pilot- testing of research instrument, and the validation of instrument were then comprehensively described. Furthermore, the ethical concerns that could cause harm or negatively impact human dignity, or affect the principles of fair play (justice) were carefully addressed. Weaknesses in each of these components as possible threats to the validity of the research outcomes were identified, and remediating

actions established by published works were discussed, in terms of how best to accommodate the issues in the course of these investigations, to strengthen and validate my research results. Chapter four documented the analysis of the results, inference of findings that paved the way for the conclusion and recommendations offered in Chapter 5.

## Chapter 4: Results

### Introduction

The quantitative cross-sectional study was designed to investigate the adequacy of multi-theory model (MTM) of behavior-change in predicting the usage of low salt diets among Nigerian adults with hypertension attending Lagos University Teaching Hospital (LUTH). Consequently, I investigated three hypothetical research questions in the study.

1. To assess how MTM initiation component was impacted by its constructs (participatory dialogue, behavioral confidence, and changes in the physical environment) in the decision of Nigerian adults with hypertension to initiate intake of low salt/sodium diets.
2. To evaluate how the MTM sustenance component of behavior change has been impacted by its constructs (emotional transformation, physical changes and changes in social environment) in the decision of Nigerian hypertensive adults to sustain low salt/sodium intake.
3. To determine the association between the MTM initiation constructs and the actual salt/sodium consumption.

This chapter includes the pilot study and the results provided appropriate insights to the likely issues that arose in the final data collection. I presented a comprehensive data collection process and procedure. while detailing the data gathered from consenting participants, I ensured that they were not subjected to any form of abuse or disrespect. Lastly, I outlined the results of the study carefully in tables and figures and discussions.

### **Pilot Study**

Prior to the collection of the original data for the study, I conducted a nonclinical pilot study of ( $n = 8$ ) among family members and friends in the first 2 days of the data collection period. The pilot study was to test the comprehension of the instructions by participants in completing the self-administered questionnaires and/or interviews in this study. However, none of the eight pilot participants' information was included in the final data analysis, but the pilot study offered useful insight to avoid mistakes in the original data gathering process, and assisted in validating the final data of this study. Moreover, there was the assurance that the time frame of 15-20 minutes was sufficient for participants to complete questionnaire or interviews session for data gathering. In general, the pilot study results showed that there was no need to adjust or amend the instrument used in this study

### **Data Collection Process**

#### **Study Design**

For this cross-sectional study, I employed the convenient homogenous sampling method to recruit an initial 199 Nigerian adults with hypertension. The exclusion criteria included only hypertensive adults from ages 20-60 years, with consistent high systolic blood pressure level  $\geq 140$  mm Hg or diastolic blood pressure level  $\geq 90$  mm Hg over a period of 6 months. The initial 199 participants were reduced to 149 consenting participants based on the other exclusion criteria of incomplete data, unwillingness to continue with the study, and those with low intake of salt/sodium diets. The actual

number of sample participants for the study was statistically derived using alpha of 0.05, power of 0.80, an effect size of 0.20 that resulted in 145 participants to build the models.

### **Protection of Study Participants (Ethical Consideration)**

Prior the initiating of data collection, I identified LUTH, Nigeria as the appropriate facility for gathering data from sample participants for the study, because the facility had the highest number of patient' attendance in the south west area of the country. I sought and obtained the official approval and cooperation of the institution's research ethical committee to undertake the dissertation study as a visiting researcher.

The cooperation with the facility included:

1. Access to the hospital hypertensive patients to directly engage them into the study without any form of coercion;
2. Provision of an office space to administer the questionnaire/interview;
3. Authorization of working under the supervision of a cardiologist who supervised the urine data collection and provided the laboratory results of the urine sodium analyses of consenting participants, as a secondary data.

The approval of LUTH research ethical committee and my Walden application forms to commence data collection were submitted to the Institutional Review Board (IRB) of Walden University. The Walden University IRB granted approval to commence data collection on May 22, 2017 with the approval number 05-022-17-0440798. The Walden IRB approval covered for a non-clinical pilot study, the stated specification of the consent form, as well as the methods, processes, and procedures for obtaining raw and secondary data for this study.

### **Recruitment of Study Participants**

Following Walden IRB approval, the data gathering process spanned a period of 3.5 weeks from May 22, 2017 to June 16, 2017. As a guest researcher at facility, I had access to people with hypertension on scheduled visits at both the cardio and family health Care clinics of the hospital. In order to invite and encourage participation in the study., I distributed the research fliers/leaflets every day of the data gathering period to people with hypertension, on scheduled visits to the hospital. In the separate office assigned to me at the hospital, interested patients were further briefed on the study purpose, the exclusion criteria, and the data collection processes. As patients expressed willingness, they were allowed to read the Walden IRB approved consent forms and to freely asked questions or decline further participation in the study. Interested patients endorsed the consent forms before undertaking either the self- administered questionnaires or interviews. Participants received 500 Naira (\$1.50) for transportation and a soup dish as souvenir (a symbolic reminder of low salt diets) for participating in this study.

### **Instruments**

I employed the newly designed MTM by Sharma (2015), structured into a 39 – item questionnaire to collect raw data from the participants. The consenting participants had the option of either completing a self-administered questionnaire or undertaking a questionnaire/interview. The two methods of data gathering lasted about 15-20 minutes.

### **Urine Salt/Sodium Results**

Since traditional dietary recall of food nutrients assessment methods were found subjective and had been associated with a relatively large bias. McLean, (2014) observed the need to objectively measure dietary salt intake of participants through other nutritional biomarkers and analyses such as estimates of urine sodium excretion more commonly carried out in adults. The results of urine-excreted salt/sodium of participants in this study were based on the laboratory analyses of early morning urine specimen of consenting participants that was obtained directly by the hospital. The information on participants' urine excreted sodium was given to me as a secondary data through the cardiologist I worked with at the hospital. More importantly the laboratory data were code-labelled to de-identify the participants.

## **Results**

### **Statistical analysis**

The Statistical Package for the Social Sciences (SPSS) version 23 on Windows 10 was used to carry out the statistical analyses of all the data obtained. The generated data included the descriptive statistics of variables (theory constructs) and that of participants, as well as the multiple regression analysis that focused on the three hypothetical research questions of the study. Additionally, the confirmatory factor analysis of the collected data was undertaken in SPSS Amos version 23.0 to evaluate the adequacy of the theory as an acceptable model for this study.

### **Characteristics of the Study Participants**

The demographic and socioeconomic characteristics of sample population are displayed in Table 3 with the group frequencies of the gender, ages, Nigerian ethnicities, and academic, work and income status. The total number of 149 sample Nigerian hypertensive adults shown in the table participated in the study. A larger population of the sample were from the Nigerian Yoruba people of the South West, 40% were Nigerian Igbo from the South East, and Nigerian Hausa of the North were 1% of the sample size, while other minority ethnic groups constituted 14.1% of the study participants. The gender analyses showed women as 55% with more representation than the 45% male study participants. The ages of respondents ranged between 20-60 years, the mean ages of the male and the female participants were  $48.8 \pm 7.9$  years and  $47.6 \pm 7.6$  years respectively. The frequency distribution of the participants' age groups revealed that 20-29 years were represented by 6%, 30-39 years had 15.1%, 40-49 years recorded 38.2%, and 50-60 years constituted the largest number of the respondent with 42.6%. The age data showed that the number of Nigerian hypertensive increased with age, which is a confirmation that the disease was more associated with old age.

The data on income earned established that a larger percentage of the sampled participants earned different grades of salaries. About 43% of the studied participants chose not to disclose their earnings, only about 14% earned below 50,000 naira per month and 6.7% earned between 50,000-1 00,000 naira/month. 9.4% earned above 200,000naira/month and 26.9% which constituted majority of the respondent earned between 100,000-200,000 naira/ month.

Table 2

*Demographic and Socioeconomic factors of study Participants*

	%	N
<b>Gender</b>		
Male	35.6	53
Female	64.4	96
<b>Ethnic Groups</b>		
Nigerian Igbo	32.2	48
Nigerian Hausa	0.7	1
Nigerian Yoruba	53.0	79
Others	14.1	21
<b>Age Groups</b>		
20-29	6.0	9
30-39	13.4	20
40-49	32.2	48
50-60	48.4	72
<b>Educational Background</b>		
No Schooling	15.4	23
High School/Secondary	15.4	20
College/Technical School	22.8	34
Graduate degree	33.6	50
Professional degree	2.7	4
Post graduate	11.4	17
<b>Work Status</b>		
No Work	16.8	25
Working	83.2	124
<b>Income Earned</b>		
Below 50,000/month	14.1	21
Between 50,000-100,000	6.7	10
Between 100,000-150,000	12.8	19
Between 150,000-200,000	14.1	21
Above 200,000	9.4	14
Prefer not to disclose	43.0	64

### **Characteristics of the study variables**

In Table 3, the descriptive statistics of variables showed that the construct of advantages with a mean score of 14.46 (SD: 4.29) indicated that the participants' attitude toward intake of low salt/sodium diets was highly beneficial. The construct of disadvantages with a mean score of 5.31(3.69) showed that to a very large extent, participants considered consumption of low salt/sodium as a disadvantage. The mean score for behavioral confidence was 12.59 (SD: 3.95), thus portrayed participants as moderately sure of their decisions to initiate a change in behavior by initiating intake of low salt diets within the week, even when eating outside their homes, and enjoying the food, while also not feeling depressed about the decision to start consuming low-salt diets.

In addition, the mean score of 7.48(SD: 2.70) for the changes in physical environment, indicated that participants were moderately sure of being able to have low salt/sodium diets available within their physical environments to assist effect the behavior changes as well as encourage use of low salt/sodium diets. The mean score for initiation of behavior change was 2.90 (SD: 2, median 2.5, range 1-4), which established that participants were very likely to reduce consumption of salt/sodium in the upcoming weeks.

In the analyses of the sustenance model, emotional transformation construct recorded a mean score of 7.95 (SD: 2.51) showed that participants were moderately sure

of encouraging self and redirecting their emotions/feelings toward a lifestyle modification to sustenance of low salt diets

Table 2

*Descriptive statistics of variables for participants (149study)*

Constructs	Possible Ranges	Observed Ranges	Mean (SD)	Cronbach alpha
Initiation	0-4	1-4	2.90(0.79)	-
Participatory Dialogue: Advantages	0-20	5-20	14.46(4.29)	0.84
Participatory Dialogue: Disadvantages	0-20	0-16	5.31(3.69)	0.74
Participatory Dialogue: Adv.-Disadv.	20-(+20)	-3-(+20)	9.15(5.43)	0.74
Behavioral Confidence	0-20	2-20	12.59(3.95)	0.76
Changes in Physical Environment	0-12	0-12	7.48(2.70)	0.76
Sustenance	0-4	1-4	2.95(0.80)	-
Emotional Transformation	0-12	0-12	7.95(2.51)	0.83
Practice for Change	0-12	0-12	7.26(2.45)	0.73
Changes in Social Environment	0-8	1- 12	7.76(2.33)	0.62
Combined Constrts. of Initiat. & Susten. Models	-	-	-	0.66
Combined Scale items	-	-	-	0.87

The practice of change construct with similar mean score of 7.26 (SD: 2.45) also confirmed that participants were moderately prepared to engage in certain activities that motivated the sustenance of behavior change in the consumption of low salt diets. In addition, the mean of 7.76 (SD: 2.33) for the construct of changes in social environment showed that participants were moderately sure of benefitting from the support of family members, friends and some professionals in their efforts to reduce salt intake. However,

the mean score for sustenance behaviour of 2.90 (SD: 0.80), median score of 2.5. and ranges from 1-4. The results thus established that participants were very likely to maintain salt/sodium intake to about 1500mg or two-third teaspoon per day.

### **Face and content validity of MTM instrument**

This study relied on the face and content validity analysis of the MTM-structured instrument by Dr. Sharma. In a two round process, Dr. Sharma engaged a professional panel ( $n=6$ ) of health behavior researchers to determine the face and content validity of the MTM structure questionnaire. The experts confirmed the readability, relevance, and clarity of the items, with the unanimous vote of confidence on the adequacy of the face and content validity of the MTM subscales.

### **Construct validity of MTM instrument**

The construct validity of the MTM model constructs were examined through a confirmatory factor analysis (CFA) using SPSS Amos version 23. CFA was used to estimate the small set of variables of latent variables (factors variable) that accounted for the covariance existing in a set of observed dependent variables (factor indicators). CFA also had the advantage of testing hypothesis of particular factor structure and therefore, was considered an appropriate statistical method to assess the pre-existing relationships between measurement scales and subscale items (Albright, 2008; Statistics Solutions, 2013). As displayed in Figure 3, the application of CFA for theory measurement is an imperative design for quantitative research study. I used the CFA to specify the number of factors required in the data as well as to establish the particular measure of variables related to a particular latent variable. To achieve the purpose of this study, I conducted

the CFA in order to confirm or reject the measurement of the MTM model under investigation. Moreover, I carried out the maximum-likelihood estimation method for all outcome types. In the same vein, I relied on three key indicators to determine the extent of goodness of fit between the model and the data namely: chi-square ( $\chi^2$ ), root mean square error of approximation (RMSEA), comparative fit index (CFI). RMSEA values of 0.06 or less, in conjunction with CFI values of 0.95 or greater were considered indicative of good fit. Models were considered to have adequate fit if they met the less stringent, but traditionally accepted values of 0.90 or greater for CFI, and values less than 0.08 for RMSEA (Albright, 2008; Hu & Bentler, 1999)

The path diagram in Figure 2 depicted the results for the CFA for initiation model. A good fit for the model was established with:  $\chi^2 = 232.99$  ( $df = 143$ ),  $P < 0.001$ ,  $\chi^2/df=1.63$ , CFI = 0.93, RMSEA = 0.07 (90% CI: 0.06-0.09). Meanwhile, the chi-square difference tests showed that applying an alternative one-factor model achieved poorer fit ( $\chi^2 = 1386.16$  [ $df= 157$ ],  $< 0.001$ , CFI = 1.00, RMSEA = 0.22 (90% CI:0.21-0.23) SRMR = 0.17). Furthermore, the item loadings were significant at  $P < 0.001$ .

The latent covariance between disadvantages and advantage constructs to initiation model ranged from (0.00) to (0.20) and may be low, but stronger latent covariance existed between behavioral confidence with (0.63) to initiation model and between change for physical environment with (0.64) to initiation model. Similarly, a very strong latent covariance of (0.75) exists between behavioral confidence and change for physical environment constructs

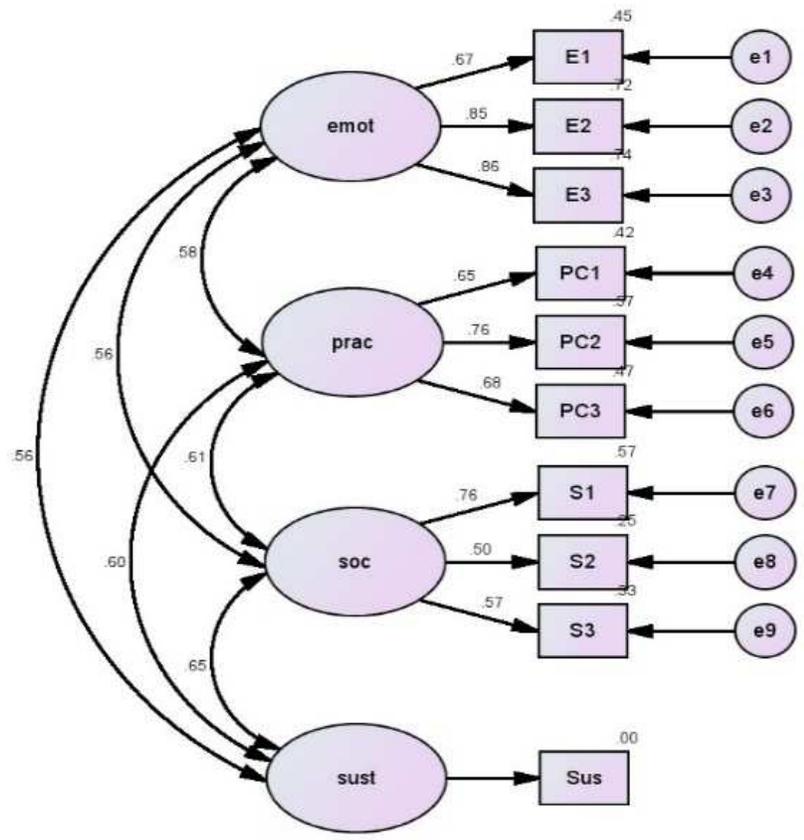


Figure 3

Confirmatory factor analysis (CFA) for initiation. Model. Abbre. adv = Advantages; dis = Disadvantages behcon=Behavioral confidence; phys = Changes in Physical. Environment. init = initiation. All loadings were significant to  $P < 0.001$

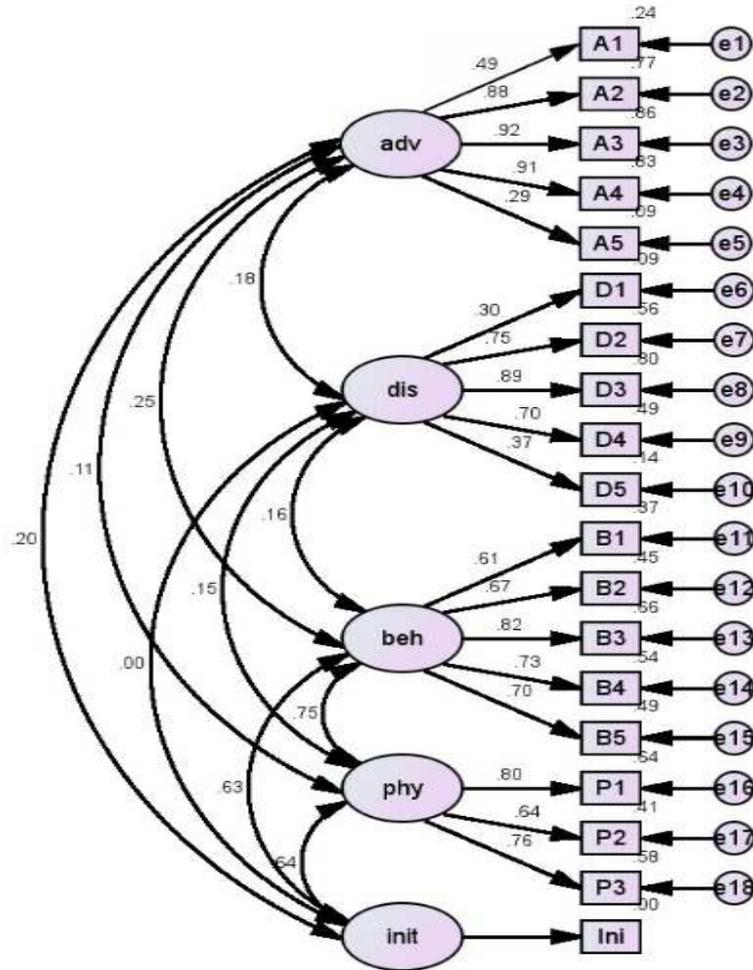


Figure 4

Confirmatory factor analysis (CFA) for sustenance model; Abbre. emot =Emotional transformation; prac = Practice for Changes; soc = Change in Social Environment. sus. = Sustenance All item loadings are significant at  $P < 0.001$ .

The path diagram in Figure 3 presented the results for the CFA in sustenance model with a good fit for the model at:  $\chi^2 = 44.68$  (df = 30),  $P < 0.001$ ,  $\chi^2/df = 149.88$ , CFI = 0.97, RMSEA = 0.57 (90% CI: 0.01-0.09). Moreover, applying the chi-square difference tests showed that an alternative one-factor model achieved poorer fit ( $\chi^2 = 542.78$  [df = 45],  $P < 0.001$ ,  $\chi^2/df = 12.17$ , CFI = 1.00, RMSEA = 0.28 [90% CI: 0.25-0.30]) Furthermore, all item loadings were significant at  $P < 0.001$ .

The three main sustenance construct recorded latent covariance for emotional transformation (0.56), practice for change (0.60), and change for social environment with (0.65) to sustenance model. Nevertheless, the summations of the analyses for both models supported the hypothesized factor structure of the variables.

### **Reliability**

The instrument items were essential tools to the measurement of outcome of interest especially in clinical research (Moonseong, Namhee, & MylesM, 2015). To this end, the internal consistency and reliability of the instrument scale items were tested using Cronbach's alpha ( $C_{\alpha}$ ) and the scale scores were displayed in Table 4. In this study, the reliability test for the combined MTM subscale items yielded a Cronbach's alpha of 0.80. MTM initiation constructs reported coefficient ranged from 0.76 to 0.84. each of MTM sustenance constructs reported figures that ranged from 0.62 to 0.82. Meanwhile, the combined constructs of Initiation and Sustenance reported a Cronbach alpha of 0.66. However, many methodologists recommended a minimum  $\alpha$  coefficient between 0.65 and 0.8 for subscales and whole scale. The  $\alpha$  coefficients that were less than 0.5 were usually unacceptable purported to be unidimensional (Sharma & Petosa, 2014

### **Multivariate Analyses of the Research Questions and Hypothesis**

The main focus of this study was to investigate three research and hypothetical questions for assessing the adequacy and the utility of MTM as a predictive theory. To this end, the multiple regression analysis was used to establish whether or not there were association and the extent of association between each of the MTM constructs (independent variables) and the respondents' decisions to initiate and/or sustain consumption of low salt/sodium diets (the dependent variables).

**Research Question 1:** How do MTM constructs: participatory dialogue (advantages outweighs disadvantages), behavioral confidence, and change in physical environment) {independent variables influence Nigerian hypertensive adults' decision to initiate the consumption of low sodium diet (dependent variables)?

Table 5 revealed the results of the multiple regression analysis of initiation model. It confirmed that the three MTM initiation constructs were significant. With participatory dialogue ( $\beta = 0.205$ ,  $p = 0.04$ ), behavioral confidence ( $\beta = 0.305$ ,  $p = 0.00$ ), and changes in physical environment ( $\beta = 0.305$ ,  $p = 0.00$ ) reported p-values lower the assumed p-value 0.05. A combination of these three constructs revealed that initiation model predicted 40.6% of the variance in the behavioral change to initiate ( $r^2_{\text{adjusted}} = 0.406$ ,  $F(3, 146) = 34.687$ ,  $p < 0.001$ ) the decision to sustain consumption of low salt/sodium diets. This was because the results of estimated p-values were found lower than the assumed p-value 0.05. Therefore, the results justified the acceptance of the alternative hypothesis ( $H_{A1}$ ) that MTM constructs; participatory dialogue, behavioral confidence, and changes in physical environment (independent variables) were

associated with Nigerian adults' decision to effect the behavior change and initiate consumption of low salt intake (dependent variables).

Table 3

*Parameter estimates based on Multiple regression analysis(List-wise) to predict behavior change of initiating the consumption of low salt/sodium diets by Nigerian adults with hypertension (n = 149)*

Variables	B	Std. Error	Beta	t	P-value	95.0% C I for B	
						LL	UL
Advantages outweighing disad.	0.019	0.009	0.134	2.095	0.038	0.001	0.038
Behavioral confidence	0.101	0.016	0.348	4.349	0.0001	0.038	0.101
Changes in Physical Environment.	0.069	0.023	0.348	4.378	0.0001	0.056	0.147

$F(3, 146) = 34.687, P < 0.001, r^2$  (Adjusted  $r^2$ ) = 0.406 (0.606). Dependent variable is the behavior change; initiating the consumption of low salt/sodium; B = unstandardized coefficient; SEB= standard error of the coefficient;  $\beta$  = standardized coefficient; P = level of significance

**Research Question 2:** How do MTM constructs influence hypertensive Nigerian adults' decisions to sustain low sodium/salt consumption levels?

Table 5 presented the results of the multiple regression analysis for the sustenance model. It showed that the three MTM sustenance constructs were significant. With emotional transformation ( $\beta = 0.205, p=0.01$ ), practice for change ( $\beta = 0.305, p=0.00$ ), and changes in social environment ( $\beta=0.307, p=0.00$ ) reports p-values lower than the assumed p-value 0.05. A combination of the three constructs revealed that sustenance model predicted 41.8% of the variance in the behavioral change ( $r^2$  adjusted

= 0.418,  $F(3, 146) = 34.727$ ,  $p < 0.001$ ) to sustain the decision to consume low salt/sodium diets. The above results evidently justified the acceptance of the alternative hypothesis ( $H_{A2}$ ) and stated that MTM constructs; emotional transformation, practice for change, change in social environment (independent variables) were associated with Nigerian hypertensive adults' decision to sustain low salt intake (dependent variables).

Table 4'

*Parameter estimates based on regression analysis(list-wise) to predict behavior change of sustaining the consumption of low salt/sodium diets by Nigerian adults with hypertension (n = 149)*

Variables	B	Std. Error	Beta	t	P-value	95.0% C I for	
						LL	UL
Emotional transformation	0.064	0.024	0.203	2.689	0.008	0.017	0.112
Practice for Change	0.099	0.024	0.305	4.083	0.0001	0.051	0.147
Changes in Social Environ	0.105	0.025	0.307	4.236	0.0001	0.056	0.154

$F(3, 146) = 34.727$ ,  $P < 0.05$ ,  $r^2$  (Adjusted  $r^2$ ) = 0.418 (0.613). Dependent variable is the behavior change; sustaining the consumption of low salt/sodium; B = unstandardized coefficient; SEB= standard error of the coefficient;  $\beta$  = standardized coefficient; P = level of significance

**Research Question 3:** How do the initiation constructs; participatory dialogue (advantages outweighs disadvantages), behavioural confidence, and change in physical environment) influence the actual salt intake of Nigerian hypertensive adults of the study?

Since MTM was concerned with participants' health behavioral change, it became imperative to investigate the association between MTM constructs of initiation

and the actual salt/sodium content consumed by participants the previous day manifested in the laboratory analyses of the salt/sodium excreted by the participant's urine.

Table 5

*Parameter estimates based on regression analysis(list-wise) to predict influence of initiation constructs on the actual salt/sodium diets consumed by Nigerian adults with hypertension (n = 149)*

Variables	B	Std. Error	Beta	t	p-value	95.0% C I for B	
						LL	UL
(Constant)	2.540	.254		9.999	.000	2.038	3.042
Participatory dialog.(adv. outweighs disadv.)	.011	.013	.073	.879	.381	-0.014	0.036
Behavioral Confidence	-.001	.022	-.006	-.060	.952	-0.044	0.041
Physical Environment	-.033	.031	-.110	-1.064	.289	- 0.095	0.028

The results of the multiple regression analyses shown in Table.6 confirmed that all the three MTM initiation constructs were separately not significant with actual salt/sodium consumed by the study participants. With participatory dialogue ( $\beta = 0.073$ ,  $p = 0.38$ ), behavioral confidence ( $\beta = -0.01$ ,  $p = 0.952$ ), and changes in physical environment ( $\beta = -0.12$ ,  $p = 0.289$ ) reported estimated p-values above the assumed  $p = 0.05$ . Moreover, the combination of these three constructs revealed that initiation model predicted a negative influence of -0.002 of the variance in the actual salt/sodium consumed. Evidently, the results of estimated p-values were higher than the assumed p-value 0.05. Therefore, the result justified the acceptance of the null hypothesis ( $H_0$ )

that MTM constructs; participatory dialogue, behavioral confidence, and changes in physical environment (independent variables) were not positively associated with actual salt/sodium consumed (dependent variables) by Nigerian hypertensive adults.

### **Summary**

In this chapter, I gave a detailed account of the processes and procedures to the data gathering methods of the study and presented the results of the findings to the research questions that addressed the purpose and focus of this study. I investigated the adequacy of multi-theory model (MTM) in predicting behavior-change of reducing salt/sodium intake among Nigerian adults with hypertension attending LUTH. I addressed the three research questions as I engaged a statistically derived, convenient, and homogeneous study population of 149 Nigerian adults with hypertension (male and female) of ages 20-60 years. I gathered data with the self - administered MTM structured questionnaire or through formal interview session. In addition, there was the laboratory analyses of urine samples to assess actual sodium consumed in validating these investigations. I used SPSS Amos version 23 to construct confirmatory factor analysis (CFA) that assessed the internal consistency of the theoretical model. The cronbach's alpha and multivariate regression analysis were conducted with SPSS version 22. The SPSS measured the constructs reliability as well as evaluated the type and the extent of association between each of the MTM constructs (independent variables) and the respondents' decisions to initiate and/or sustain consumption of low salt/sodium diets (the dependent variables).

The final outcome showed some participants' response indicative of a very likely assurance of being able to initiate behavior-change of low intake of salts/sodium diets when they ate outside, and tried to enjoyed the food and were not depressed about the decision to start consuming low salt diets. Other participants' expressed moderate confidence in being able to have low salt/sodium diets available within their physical environments to assist effect the changes as well as encourage use of low salt/sodium diets. A more detailed report on the findings and recommendations of the study is presented in Chapter 5.

## Chapter 5: Discussion, Conclusions, and Recommendations

### **Recommendations and Conclusions**

This chapter includes the findings, conclusions, recommendations, and proposed areas for further studies. It also includes study limitations and the implications for social change. In this study, I investigated three overarching hypothetical research questions and hypotheses: what impacts did MTM's constructs (participatory dialogue, behavioral confidence and physical environmental changes) have on the decision of Nigerian hypertensive patients to initiating low salt/sodium diets? What was the evaluation of MTM sustenance component? How has the association between MTM initiation constructs and the actual salt/sodium consumption been determined?

### **Interpretation of the Findings**

In this study, I assessed the type and extent of relationships that existed between MTM variables (constructs and its multi-components) and a sample of Nigerian adults with hypertension. The outcomes were expressed using correlation coefficients of the multi-components with their respective constructs. The two multi-components models consist of initiation of behavior change and sustenance of behavior

### **Hypothesis1 (Ha1)**

The intention of initiating or commencing behavior change to reduce the quantity of dietary salt/sodium intake revealed that all the three MTM constructs: advantages outweighed the disadvantages (participatory dialogue), behavioral confidence, and changes in physical environment were significant. The significant relationship was accounted for by 40.6% of the variance in the intention for initiation and this measure of

variance was considered very high for a new behavioral study. This implied that the decision to initiate reduction of salt/sodium diets was highly predicted and influenced by each of these constructs. It was noteworthy that the construct of “advantages outweighing disadvantages,” to some extent was similar to the constructs of “perceived benefits/barriers” or “pros and cons” as applied in the decisional balance of several nutritional programs that had employed health belief theory and TTM respectively (Harvey & Lawson 2008; Tuah, et al, 2011). Similarly, the construct of behavioral confidence is synonymous with self-efficacy and perceived behavioral control. It shows the ability of the persons to control and undertake the required behavior. In the same vein, the behavioral confidence of MTM was designed to also engage in health behavioral changes, which is expected to manifest in the future rather than the present. However, despite the differences in their meaning and application. I observed a significant alignment in their relationship as shown by the report obtained from other nutrition studies using the initial constructs (Fila, & Smith, 2006; McDermott et al., 2015; Pooreh, & Hosseini-Nodeh 2015). Furthermore, the contribution of behavioral confidence to this study was relatively larger than what was obtained in previous health-related studies. The wide gap in variances appeared connected to the apparent change in the concept of behavioral confidence as a construct of MTM health behavioral change. With MTM, behavioral confidence did not exclusively rely on self-confidence, but also derived its supports from external sources. (Sharma,2015; Knowlden et al., 2016).

In the initiation model, there is a significant relationship between changes in physical environment construct and the initiation of intention. It thus confirmed a

moderate availability and preparation of low salt meals whether at home or at the eateries (such as restaurants). This was also consistent with the understanding that the type of foods available in the environment highlighted by Fortes (2003), Iwelumor et al. (2014) and Meuser et al. (2011) were very salient contributory factors that influenced behavior modification to reducing salt/sodium intake.

### **Hypothesis 2 (Ha1)**

The behavioral change to sustain the intake of low salt/sodium diets, the three constructs: emotional transformation, practice for change, and changes in social environment ( $P < 0.001$ ) show 41.6% of the variance. This is a very high variance result for health behavior studies. Although the construct of emotional transformation might have been derived from emotional intelligence, it was a relatively new construct to health behavior research, because it had not been applied to dietary/ therapeutic management of Nigerian hypertensive adults in the intake low salt/sodium diets.

In addition, the construct of practice for change was derived from Freirean praxis and it support peoples' deeper reflection of the need for behavior change and reflective attitude in the sustenance of positive health behavior such as maintaining low salt diets in Nigerian adults. However, the practice for change construct was never operational and applied in previous nutrition behavioral change programs such as the consumption of reduced salt/sodium diets of Nigerian hypertensive patients. Nevertheless, components of the construct, like diary keeping, had been effectively applied in previous studies (Sharma, 2017). Lastly, the construct of change in social environment, also significantly impacted at consolidating social and external supports from family members and friends

for influencing change in nutrition behavior practices used the social and behavior change communication study (Lamstein, Stillman, et al., 2014; Sanghvi, Jimerson, et al. 2013). The role of family, friends, and professional counsellors remained a very significant factor that sustained best nutritional health behavior and practices and encouraged consumption of low salt/sodium in Nigerian hypertensive adults.

### **Hypothesis 3 (Ho2)**

This study found no significant association between the MTM constructs (advantages outweighing disadvantages [participatory dialogue], behavioral confidence, and changes in physical environment) and the actual salt /sodium consumed by the Nigerian hypertensive patients. This was because no intervention was conducted to influence the initiation constructs. Since there was no intervention conducted it was unlikely that these constructs would influence the salt consumption. However, despite the fact that participants on antihypertensive medication were not excluded from the eligible sample participants, the average actual salt intake of 2,357mg was confirmed from the urine excretion. This finding showed that average sodium consumed in this study was slightly higher than recommended allowance of 1500 mg -2000 mg/person/day (WHO, 2013), but was considerably lower than the 10.5gm quantity reported by Ijarotimi et al. (2008) and the 2,850mg found in South West Nigerian adults with hypertension by Tayo et al. (2012). However, since I relied on results of sodium excreted from early morning urine, the participants' variety of dietary intake of the previous day might not have been fully taken into consideration or perhaps the participants might have unconsciously reduced or increased their salt consumption on this particular day. Similarly, the

demographic features (age, gender, and, ethnicity) socioeconomic status (education, work status, and income earned) of the Nigerian hypertensive patients were also not significant with their intentions of initiation or sustenance of consuming low salt/sodium diets. It was confirmed that hypertension was currently limited to a particular population, but cuts across ages, gender and socioeconomic status (WHO, 2013b).

This study evidently showed that the two models of MTM, (initiation and sustenance) with their three respective constructs accounted for a substantial proportion of variance in the intention of Nigerian adults with hypertension to initiate and sustain the consumption of low salt/sodium. More importantly, the regression results confirmed that the constructs had little to no shared variance, thus the constructs were less independent of each other, being mutually exclusive and provided support to this new theory for application to other health behaviors.

### **Limitations of the Study**

The limitations of the study included the use of a cross-sectional design, and a single-point in time data collection that limited the opportunity for follow-up of participants to seek clarification of ambiguous information or obtain missed data. However, previous theories like the planned behavior theory (Sharma, 2017) confirmed that attitudinal and environmental constructs preceded behavior, while intentions were largely predictive of behavior. In view of this information, the same assumptions were applied for MTM constructs and intention to initiate/sustain the consumption of low salt/sodium by Nigerian adults with hypertension. Hence, the measurement of behavior change was justified in this study.

The use of convenience and homogenous sampling method, is a limitation in this study. The non-probability selection of participants indicated selection bias as well as poor-representation of the sample. This disallowed the generalization of the results of this study beyond the sample. Moreover, participants could have been biased as they self-reported. Self-reporting is susceptible to recall bias as well as false-, under-, and over-reporting of information. Meanwhile, assessing attitudes have limited choices and so the limitation had to be considered in that context.

A spot urine specimen used in estimating the laboratory analyses of salt/sodium consumed by the study participant could be considered a limitation to the dietary nutrient information, because it was not a true representative sample of the variety of diets consumed daily by the participants. However, in view of the challenges associated with the collection of the 24-hour urine specimens, (the gold standard method), the large sample size of the study employed in this study validated the spots urine samples analysis. More importantly, the variations in dietary intake of sample participants could be sufficiently spread out among the large sample participants for

However, the results of the actual salt/sodium consumed lower, because respondents in the study were on antihypertensive medication and those on drug treatment and aware of their hypertension status were not excluded from the study. It is imperative to note these salient information, where the study is directed at making generalization of results.

Moreover, future studies either replicating this research or working on with behavior change of other health-related issues, should endeavor to include test-retest reliability assessment, which was not conducted with this study

### **Recommendations**

The implications of hypertension--a chronic lifestyle disease--on public health practice demanded urgent primary intervention approach that is directed at lifestyle modifications and behavioral changes to control risk factors and eventual prevention of diseases. The findings of this study provided additional motivation for such quick intervention strategies on reduced intake of high sodium diets

Considering the average level of nutrition knowledge and attitude exhibited by Nigerian adults with hypertension about nutritional behavior in this study, especially with the inherent complexity of keeping with the right types and choice of diets to reduce salt intake, it was important to encourage and counsel patients comprehensively on nutritional behavior change and practices required for optimal health. Moreover, researchers have identified improved nutritional knowledge to influence food choices, (being the causative and preventive effects of certain foods), the cost of foods, and the availability of different foods in the control and management of hypertension (Morland, Wing & Roux 2002).

Result-based targeting, more rigorous health education, and health intervention promotions at clinics, hospitals, and local community town halls have improved the implementation of current nutritional guidelines. This ought to be sustained. This study has also empowered patients to take responsibility for their own health in order to improve prevention as well as treatment of HBP. Stecker, (2014), highlighted the

mandatory responsibility of public health practitioners in creating general awareness program of enlightening the public to adopt better health lifestyle and behavior for education of diseases such as hypertension. Furthermore, a better characterization of patients in the hospitals would enable and support more individualized prevention and treatment, increased effectiveness and better patient compliance in the adoption low salt diets that supported the control and prevention of hypertension

In addition, public health education campaigns should be promoted as government and privately sponsored health discussions on mass and social media based on salient and relevant public health topics and issues around the communities. The programs on health talks could be operated as weekly television or radio programs giving useful health advice and providing for participatory feedbacks as well as call-in audiences to share their views on different health issues. The print media can also publish a weekly or monthly health magazine to offer similar and more detailed information for those people who may not have benefited from the electronic media.

Furthermore, the positive results of this investigative study supports the design of MTM model into a nutritional assessment tool that could be used to facilitate health promotions and health interventions in the control of hypertension and other non-chronic diseases. The resultant MTM–structured assessment tool could be programmed as a clinical instrument and used by nutritionists and dieticians to gather data on individual's lifestyle as well as the plan to effect a change of behavior. The MTM nutritional assessment tool would be used to determine the ability of people with health challenges to initiate and

sustain the required lifestyle modification, such as the consumption of low salt diets. to prevent and control the health challenges of hypertension.

Further salient areas of future studies include:

1. Evaluate on a larger scale, the adherence of Nigerians to recommended allowance/ guideline on dietary sodium/salt intake to establish a more generalized overview of the population that meet the WHO recommended guidelines and to update national dietary guidelines.
2. Conduct population –based interventional studies applying MTM to foster low salt intake in hypertensives.
3. Several studies from the developed countries have been reported on the prevalence of micronutrient deficiencies and miss-use, including the potential role of dietary salt in collaboration with other nutrients such as potassium, magnesium, chloride and bicarbonate for proper nutrient metabolism. However, very limited study and data are available locally to project the adverse effects of imbalance in sodium and potassium intake in the developing countries like Nigeria and other African countries.

### **Implication for social change**

The concept of social change demands that an individual or organization finds ways of making positive changes in the lives of people or environment such as the work within the families or the community at large. This study addressed social change by creating awareness in lifestyle modification. However, since change in behavior and health quality will not effectively occur if promoted only on individual basis, but as a responsibility of an entire system of operations. The implication of this study for positive

social change is to ensure that health behavioral changes are effectively translated to the whole community in order to maintain good health, lifestyle, and improve in the quality of life of millions of people.

This study empirically demonstrated the building of evidence-based programs and initiatives in the evaluation of predictive role of MTM as a theory and the assessment of the model's constructs impact on the decision of Nigerian adult with hypertension in reducing consumption of salt/sodium for the control and management of HPB. More importantly, the social relevance and positive impact of my dissertation is premised on Kasilo et al, (2011) postulations of the natural efficacy in nutritional and therapeutic diets (programs) in the control and management of hypertension. The natural potency of certain diets across the world, gives credence to the pertinent issues of encouraging others through health behavioral education and health promotions. Since public health practitioners highly recognize the importance of health programs in improving the health status of individuals, families, communities, and the nation at large. Public health education and programs are in great need to help disseminate and promote the positive health information to reduce premature deaths and enhances the quality of life of the population, thereby reducing cost expended on medical treatment of diseases.

### **Conclusion**

Hypertension has remained a risk factor for stroke and cardiovascular diseases that had been recognized in developed countries since the 1950s, but only recently came into focus in developing countries, especially in the sub-Saharan region of Africa. As the prevalence and mortality of some chronic diseases rapidly declined in most developed

countries, a sharp but steady and continuous report of high prevalence and increased incidences of hypertension occur in in the developing countries, like Nigerian.

To this end, I investigated the predictive role of MTM and confirmed its adequacy as an acceptable theoretic model. I employed he quantitative research method that relied on statistical analysis and three hypotheses. The research sampling design was a cross-sectional survey that assessed the pattern of behavioral changes of Nigerian adults with hypertension in their decision to initiate and sustain reduction in the low intake of sodium/salt diets. More specifically and in support of the findings of this study, several public health educators and researchers like Bartholomew (2016), Muchiri et al. (2016), and Sharma (2017) highlighted the significance and need to utilize theory in research. The use of theory in research offers the rationale in establishing a background and a sense of structure that guide the research in providing framework of variables. The variables in this study have been measured to determine the particular relationships of interest needed to understand and explain the given research problems.

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## Appendix A:

**Multi –Theory Model Instrument for Assessing Change in Behavior for the  
Restriction of Salt (Sodium) in the Diets of Adults with Hypertension**

IRB #05-022-17-0440798

Directions: This survey is voluntary, which means you may choose not to complete it or not to answer individual questions. There is no direct benefit of this survey to you but your responses will help in developing effective hypertension education programs. All data from this survey will be kept confidential. Please put an X mark by the response or fill the response that correctly describes your position. Thank you for your help!

1. Have you been diagnosed with hypertension by a health care provider?

Yes

No

*If your response is No, please STOP taking this questionnaire. Thank you for your time*

.....  
2. Are you currently taking medication for hypertension?

Yes

No

.....  
3. Are you currently taking less sodium (salt) -- 1,500 milligrams a day (about 2/3 teaspoon a day) in your diet?

Yes

No

*If your response is No, then complete the full questionnaire. If it is yes, please STOP taking this questionnaire. Thank you for your time*

.....  
4. What is your gender?

Male

Female

Other, \_\_\_\_\_

.....  
5. How old are you today? \_\_\_\_\_ years

.....  
6. What is your race/ethnicity?

Nigerian Ibo

Nigerian Hausa

Nigerian Yoruba  
 Other \_\_\_\_\_

7. What is your highest level of Education? \_\_\_\_\_  
 Some schooling but not completed high school  
 Completed high school or GED  
 Some college  
 Completed college/ Graduate degree  
 Post graduate degree  
 Professional degree

8. Do you work for pay? No  
 Yes, \_\_\_\_\_ average hours/week (put a single number not a range)

9. What is your occupation? \_\_\_\_\_

10. What is your monthly household income? \_\_\_\_\_  
 Less than N50,000  
 N50,001 to N100,000  
 N100,001 to N150,000  
 N150,001 to N200,000  
 More than \$200,000  
 Prefer not to answer

Never Hardly Sometimes Almost Always  
 Ever Ever Always

***Participatory dialogue: Advantages***

**If you reduce sodium (salt) intake in diet to 1,500 milligrams a day (about 2/3 teaspoon) every day you may...**

- 11. ... be healthy.
- 12. ... have less chance of getting a stroke.
- 13. ... have less chance of getting heart disease.
- 14...have less chance of getting kidney disease.



.....

Not At All Sure	Slightly Sur	Moderately Sure	Very Sure	Completely Sure
--------------------	-----------------	--------------------	--------------	--------------------

---

### *Changes in physical environment*

#### **How sure are you that you will...?**

27. ... are low salt foods available  
to you for all meals?

.....

28. ... be able to eat low salt food  
at a restaurant?

.....

29. ... be able to make low salt foods  
for meals?

.....

Not At All Sure	Slightly Sure	Moderately Sure	Very Sure	Completely Sure
--------------------	------------------	--------------------	--------------	--------------------

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### *Emotional transformation*

#### **How sure are you that you can...?**

30. ... direct your emotions/feelings  
to the goal of eating low salt foods  
every day?

.....

31. ... motivate yourself to eat  
low salt foods every day?

.....

32. ... overcome self-doubt in  
accomplishing the goal of eating low  
salt foods every day?

.....

Not At All Sure	Slightly Sure	Moderately Sure	Very Sure	Completely Sure
--------------------	------------------	--------------------	--------------	--------------------

---

### *Practice for change*

#### **How sure are you that you can...?**

33. ... keep a self-diary to monitor  
eating low salt foods every day?

.....

34. ... be able to eat low salt foods

every day if you encounter barriers?

- .....
35. ... change your plan for eating  
low salt foods every day if you face  
difficulties?
- .....

Not at Slightly Moderately Very Completely  
All Sure Sure Sure Sure Sure

---

***Changes in social environment***

**How sure are you that you can get the help of a...**

- 36 ...family member to support you with eating  
low salt foods every day?
- .....

37. ...friend to support you with eating  
low salt foods every day?
- .....

- 38 ...health professional to support  
you with eating low salt foods every day?
- .....

Not At Somewhat Moderately Very Completely  
All Likely Likely Likely Likely Likely

---

***Behavior change: Initiation***

**How likely is it that you will...?**

38. ...eat low salt foods every day in the  
upcoming week?
- .....

Not At Somewhat Moderately Very Completely  
All Likely Likely Likely Likely Likely

---

H<sub>a1</sub>

***Behavior change: Sustenance***

**How likely is it that you will...?**

39. ... eat low salt foods every  
day from now on?
- .....

*Thank you for your time*