

# The influence of locus control on adherence to treatment regimen among hypertensive patients

Obiageli Omeje  
Chinenye Nebo

Department of Psychology, Enugu State University of Science and Technology, Enugu, Enugu State, Nigeria

**Background:** The purpose of this study was to investigate the influence of locus of control on adherence to a treatment regimen among hypertensive patients.

**Methods:** The participants were 100 previously diagnosed hypertensive patients drawn from the Ituku-Ozalla University of Nigeria teaching hospital, using a purposive sampling technique. All participants were individually administered the Wallston, Wallston & Devellis (1978), Multidimensional Health Locus of Control (MHLC) scale, and Drug Adherence Questionnaire (DAQ) by the researchers. A one-way factorial design and analysis of variance with unequal sample sizes were used to analyze the data.

**Results:** Internally-oriented patients adhered more to their treatment regimen than externally-oriented patients,  $F(1.98) = 18.2$  ( $P < 0.01$ ).

**Conclusion:** Locus of control should be taken into consideration in the review of treatment packages for patients. This is because the efficacy of drugs depends to a reasonable extent on adherence to the schedule. If drugs are not taken as prescribed, their potency may be affected or wrongly assessed.

**Keywords:** locus of control, adherence, treatment, hypertension

## Introduction

The various physiological conditions of the human organism have equilibrium points for normal functioning. Any deviation from the set points results in unpleasant experiences or pathological conditions that could lead to death if not restored. Some of these physiological conditions include temperature, hydrogen-ion balance, blood sugar level, and blood pressure. Of these physiological conditions, blood pressure was of interest in the present study. Blood pressure appears to have devastating consequences if the normal level is not maintained.<sup>1</sup> This is because it is blood pressure that indicates the volume and speed with which blood circulates in the system. This seems to have implications for the amount of oxygen, sugar, and other products that circulate in the system for normal physiological functioning. Blood pressure indicates the force of blood flowing against the walls of arteries. It is measured with a sphygmomanometer, and the highest pressure in the cycle is recorded when the heart contracts or beats to pump blood. This is called systolic blood pressure. When the heart relaxes between the beats, the lowest pressure recorded is known as diastolic blood pressure. Thus, the blood pressure measurement yields two numbers, ie, systolic and diastolic pressure. According to Morrow,<sup>2</sup> a typical normal blood pressure reading for adults is 120/80 mmHg and 90/60 mmHg for children. Vander et al<sup>3</sup> noted that the dividing line between normal pressure and hypertension is approximately 140/90 mmHg. Thus, a blood pressure

Correspondence: Obiageli Omeje  
Department of Psychology, Enugu State University of Science and Technology, Enugu State, Nigeria  
Tel +234 70 3580 4421  
Email obyomeje@yahoo.com

above a level of 140/90 mmHg could be considered to be high, and this condition is known as hypertension.

## Hypertension

High blood pressure, ie, hypertension, indicates that blood is traveling through the arteries at a pressure too high for good health. High blood pressure has been linked with death, as a result of stroke, heart attack, and kidney failure. Untreated hypertension can affect cognitive functioning, and cause problems with hearing, memory, attention, abstract thinking, mental flexibility, and other cognitive skills.<sup>1,4,5</sup> According to Giles and Materson,<sup>6</sup> hypertension is often the precursor to congestive heart failure, chronic occlusive peripheral vascular disease, renal failure, and stroke. The most dangerous aspect of this pathological condition is that it has no characteristic symptoms, hence it is referred to as a “silent killer”,<sup>7</sup> and is diagnosed only when blood pressure is measured. In more than 90% of cases, the etiology is unknown.<sup>8</sup> It has been reported that 50 million people in the US are hypertensive, and 600 million people are affected worldwide.<sup>9</sup> In Nigeria, the incidence seems high.<sup>10</sup> The World Health Organization has reported that the total estimated deaths from cardiovascular disease for Nigeria in 2004 was 20,1500, and 10,700 of these cases were recorded as hypertensive heart disease. This ranks Nigeria at the sixteenth position globally, and first in sub-Saharan Africa. Hospital admissions reflect the high prevalence of hypertension in these countries. Cases of stroke, heart attack, and cardiac arrest abound. Cappuccio et al<sup>11</sup> observed a rapid increase in the prevalence of hypertension in adults in Africa. Onwubere<sup>12</sup> noted that both diastolic and systolic pressures affect the cardiovascular system. Sudden cardiac deaths have been reported in offices, homes, hotels, and even on football pitches.<sup>13</sup> Quiping et al<sup>14</sup> asserted that high blood pressure is an important preventable cause of premature death from heart disease and stroke. The etiological factors have remained speculative, especially for essential hypertension. There is no known cause, except that it has been linked with genetic predisposition,<sup>15</sup> genetic mutation,<sup>16</sup> negative emotions,<sup>17</sup> excessive salt intake, lack of exercise, smoking, poor diet, obesity,<sup>18</sup> lack of potassium and/or calcium, sedentary lifestyle, Type A personality, and stress. This variant accounts for 95% of hypertension cases, and is referred to as primary hypertension.<sup>19</sup> The remaining 5% are classified as secondary hypertension, resulting from other conditions, including renal and endocrinal disorders,<sup>19</sup> or can be drug-induced, and is more common generally among city dwellers<sup>20</sup> and also in urban dwellers in Nigeria.<sup>21</sup> Hypertension has been associated with a number of risk factors. Efforts

should be made to reduce, control, and normalize blood pressure as much as possible. Because hypertension has been linked with many causes, there is a wide range of treatment available, including medication, lifestyle modification, ie, weight loss, exercise, dietary adjustment, salt restriction, quitting smoking, and reducing alcohol intake. The efficacy of treatment depends largely on the patient being able to adhere to the treatment regimen.

Adherence refers to the extent to which a person's behavior with regard to taking medication, following a diet, and/or implementing lifestyle changes corresponds with the recommendation from a health care provider.<sup>22,23</sup> Adherence to therapy is a potent factor in determining the success of a treatment regimen. Poor adherence reduces optimum clinical benefits from drug use, as well as the overall effectiveness of the health care system. According to Bernard and Bloom,<sup>24</sup> adherence is a major problem in effective control of hypertension, despite the availability of effective drugs and knowledge of etiology. Burnier<sup>25</sup> contended that compliance with medication is a critical factor in blood pressure control. Adherence to a treatment regimen is a major psychological factor in a patient's recovery. It is a complex behavioral process and is related to people's knowledge and beliefs about their illness, their motivation to manage it, confidence in their ability to engage in illness-management behaviors, expectations regarding the outcome of treatment, and knowledge of the consequences of poor adherence.

Many hypotheses have been proposed to explain the phenomenon of adherence. One of these is the health belief model. The health belief model postulates that health behaviors are expressions of health beliefs. The model is designed to predict a person's health behaviors, which include the use of health services, behaviors that justify an intervention strategy/program, as well as alteration of maladaptive behaviors. The health belief model components include the person's own perception of their susceptibility to disease, perceived likelihood of contracting a disease, perceived benefits of care, perceived barriers to preventive behavior, and internal and external stimuli that enable appropriate health behavior.<sup>26</sup> In other words, the health belief model predicts health-related behaviors in terms of certain belief patterns. Based on this model, adherence to a medical regimen depends on the individuals' belief about certain aspects of his/her illness. Therefore, the person's belief with regards to perceived susceptibility to illness, severity of illness, and the benefits and risks of adherence, play an important role in whether or not an individual would comply with a treatment regimen.

The patient's ability to take drugs and their other treatment perceptions according to dosage and dosage schedule have implications for recovery from illness. Omeje<sup>27</sup> noted that the effectiveness of drug therapy for any pathological condition could be accurately assessed if the patient adhered strictly to the treatment dosage and schedule. Poor adherence has been blamed for low treatment success, and has been found to contribute to lack of blood pressure control in more than two-thirds of patients, and is a critical factor in determination of response to antihypertensive medication.<sup>28</sup> Gerbino et al<sup>29</sup> posited that blood pressure control is significantly better with improved compliance with medication. Snider and Oparil<sup>30</sup> contended that people with high blood pressure under good control can go on to live a healthy life as long as they are willing to follow a doctor's instructions. However, it has been observed that some people do not always adhere to their prescriptions, hence the condition persists. Stephenson<sup>31</sup> stated that noncompliance rates can range from 20% to 80%. Dubbar-Jacob et al<sup>32</sup> noted that noncompliance may be responsible for as many as half of antihypertensive drug failures.<sup>33</sup> observed that among patients with hypertension, 20% take less than 80% of their medication, and that this is a major obstacle to good control of high blood pressure. Gottlieb<sup>34</sup> reported that most patients do not follow their doctor's instructions. Adherence is a human behavior with many determining factors, and critical among these is locus of control.

Rotter<sup>35</sup> defined locus of control as a person's belief about the location of controlling forces in their lives. It is believed that human behavior is caused by many factors, but people differ in their beliefs about what causes it. Some people believe that events in their lives are caused by their own attitudes and behavior, while others believe that they are controlled by forces outside themselves. This belief as the cause of behavior or events has yielded two dimensions of location of causality, hence we have an internal dimension and an external dimension.

The internal dimension seems to imply an active and controlling approach to life. An internally-oriented person is one who approaches situations with a direct and alert posture. The individual believes that events in their life are under their own control and that what happens to them results from their own actions, personality characteristics, innate predispositions, and abilities. Externally-oriented persons, on the other hand, believe that events in their lives are controlled by external forces, such as fate, luck, God, or imperatives that are beyond their control.<sup>36</sup> Internally-oriented individuals feel effective in pursuit of their goals, and are ready to take responsibility for the

outcome of their actions, whereas externally-oriented individuals believe that efforts do not necessarily result in reward.

Moreover, individuals who tend to perceive reinforcement as contingent upon their own behavior, are more likely to engage in adaptive behaviors in order to improve themselves and are likely to attend to, learn, and remember information that will affect future goals.<sup>37</sup> Thus, locus of control in the health setting implies a generalized expectation about whether one's health is controlled by one's behavior or by forces external to self.<sup>38</sup> Rodin<sup>39</sup> asserted that an individual with a high perceived health locus of control may have better health because he or she is more likely to take health-enhancing actions.

Locus of control has been linked to a wide range of behaviors, with internality associated with a number of adaptive behaviors,<sup>40</sup> taking steps to improve health,<sup>41</sup> ability to stop smoking,<sup>42</sup> ability to lose excess weight,<sup>43</sup> get dental checkups,<sup>44</sup> and adherence to the recommendations arising from a medical checkup.<sup>45</sup> Lefcourt<sup>46</sup> contended that locus of control mediates any actions taken to prevent health problems. It correlates positively with conformity, attitude change, and achievements.<sup>47</sup> Externally-oriented individuals believe that illness is caused by something or someone elsewhere, while internally-oriented individuals believe that illness is caused by their own unhealthy attitudes and actions. Morowatisharifabadi et al<sup>48</sup> found that a positive association exists between internal locus of control and adherence to a treatment regimen in diabetic patients. Because previous studies have shown that locus of control correlates positively with behaviors that affect human health, the present study investigated the effect of locus of control on adherence to a treatment regimen by patients diagnosed with hypertension in the Igbo cultural environment in Nigeria.

## Hypothesis

It was hypothesized that locus of control would have a significant effect on adherence to a treatment regimen, such that internally-oriented subjects would adhere more than externally-oriented subjects.

## Methods

### Participants

A total of 100 participants (54 males and 46 females) diagnosed by physicians as hypertensive, with blood pressure >140/90 mmHg, were recruited for this study. Using a purpose-sampling technique, they were drawn from the Outpatients Department of the University of Nigeria Teaching Hospital, Enugu, in southeastern Nigeria. They were sampled as they came to consult with their doctors. The mean

age of the participants was 42 years, with senior secondary school certificate as the minimum educational qualification. They were all married, had an Igbo cultural background, and were working in government institutions. Of the 100 participants, 53 were deemed to be internally-oriented and 47 to be externally-oriented on the basis of the instruments administered to the patients in the waiting room.

## Instruments

Two set of instruments were used for the study, ie, the Multi-dimensional Health Locus of Control (MHLC) scale devised by Wallston et al<sup>38</sup> and a drug adherence questionnaire (DAQ, see Appendix) developed by the investigators.

The MHLC scale is an 18-item questionnaire with six response options designed to determine the degree to which individuals believe that their health is controlled by internal or external factors. It reflects the tendency to see oneself as having a strong influence over events (internal orientation) in contrast with seeing oneself as being influenced by events that are out of one's control (external orientation). It is scored in the external direction, so that the higher the subject's scores, the more external the subject is. To establish the reliability and validity of this instrument in the Igbo cultural environment in southeastern Nigeria, 20 patients from Park Lane Hospital, Enugu, were administered the instrument. A split-half reliability coefficient of 0.78 was obtained using the Pearson product moment correlation. A corrected value of 0.88 using the Spearman Brown formula was obtained, indicating very high reliability. A validity index of 0.9 was obtained using intrinsic validity.<sup>49</sup> The instrument was considered reliable and valid for research in Nigeria.

The DAQ is a 16-item questionnaire with four response options, ranging from 4 (almost always), 3 (often), 2 (sometimes) to 1 (rarely) developed by the researchers. The scoring was reversed for items 6, 12, 13, and 14, which were negatively worded. A highest possible score of 64 and lowest score of 16 could be obtained; scores in the range 16–40 indicate low adherence, while a score of  $\geq 40$  indicates high adherence. The median point was 40, so was chosen as the norm for classifying the participants, and was used to determine the degree to which patients adhered to their treatment regimen. A split-half reliability coefficient of 0.71 was obtained using the Pearson product moment correlation, and a Spearman Brown formula of 0.83 was obtained. For validity, the items were subjected to scrutiny by five professionals, two clinical psychologists, and three

medical practitioners, who agreed that the items were valid. Intrinsic validity<sup>49</sup> was also calculated, and a value of 0.91 was obtained. The questionnaire was considered reliable and valid for the study.

## Procedure

The researchers engaged the services of the nurses attending to the patients as they came to consult with their doctors. After obtaining a letter of permission from the chief medical director of the University of Nigeria teaching hospital, Enugu, the researchers went to the Outpatients Department and met the chief nursing officer in charge of the unit, explained the purpose of the research, and asked the nurses to help them in administering the instrument. The chief nursing officer agreed, and allowed the researchers to interact with the nurses on duty each day. After that, the researchers were allowed access to the patients, and the instruments were administered individually while they were in the waiting room. This exercise lasted for six weeks. At the end, 100 copies of the instrument were able to be used for the study, with 20 copies of the instrument excluded because of being incorrectly completed.

## Statistical analysis

A single design was adopted, and a one-way analysis of variance and *F*-statistics with unequal sample sizes were used for the study. This statistic analysis was chosen because the independent variable had two levels (external locus of control versus internal locus of control) and the sample size was more than 30.

## Results

Table 1 shows the mean and standard deviation scores for adherence to the prescribed regimen which indicate that internally-oriented individuals adhered better than externally-oriented individuals. Table 2 showed that the locus of control had a significant effect on adherence to treatment,  $F(1.98) = 18.20$  ( $P < 0.001$ ). This confirms the hypothesis that locus of control would have a significant effect on adherence to a treatment regimen among hypertensive patients.

**Table 1** Mean scores and standard deviations of internals and externals on drug adherence questionnaire

| Mean           | Standard deviation |
|----------------|--------------------|
| External 47.57 | 5.39               |
| Internal 52.23 | 5.69               |

**Table 2** Summary of one-way analysis of variance for the difference between internally-oriented and externally-oriented patients on the drug adherence questionnaire

| Sov | SS       | Df | MS     | F     | P      |
|-----|----------|----|--------|-------|--------|
| A   | 550.66   | 1  | 550.66 | 18.20 | <0.001 |
| S/A | 2965.174 | 98 | 30.257 |       |        |
| T   | 3515.834 | 99 |        |       |        |

**Abbreviations:** SS, sum of squares; Df, degrees of freedom; MS, mean squares.

## Discussion

Our results show a significant difference between internally-oriented and externally-oriented patients for adherence to the treatment regimen. This supports the hypothesis that there would be a significant effect of locus of control on adherence, such that internally-oriented individuals would adhere more to their treatment regimen than externally-oriented individuals. This finding is consistent with the results of previous studies showing that internally-oriented patients seek information, see themselves as responsible for maintenance or improvement of their physical health, know more about conditions that cause poor health, and are more likely to take steps to improve or maintain their health,<sup>41</sup> engage in health-protective behaviors,<sup>50</sup> stop smoking,<sup>42</sup> and lose excess weight.<sup>43</sup> Carlise-Frank<sup>40</sup> posited that the relationship between locus of control and health-facilitating behaviors as a whole point to an internal locus of control as a mediating factor for any action taken to prevent health problems. Internally-oriented patients are more likely to engage in positive health behaviors and generally have good health, engage in preventive health care activities, cope adequately with illness, and have good adherence to a medical regimen.

Moreover, the results of this study have contributed to our knowledge about the power of locus of control in terms of human actions. The location of the cause for actions has implications for what one does and how one does it. Medical practitioners should take into consideration the locus of control variable when they interact with their patients, particularly with regard to patient assessment and drug prescribing. Recognizing the locus of control orientation of their patients would enable health care providers to assess the efficacy of the drugs and treatment modalities prescribed more effectively, and to ensure that an effective treatment regimen is maintained and avoid unnecessary expenditure. Thus, if the patient is internally-oriented, it will be most likely the drugs would be taken as prescribed, vis-à-vis dosage and dosage schedule. Also, because locus of control has been shown to be a powerful factor influencing human behavior, it is suggested that agents of socialization should encourage

children to be responsible for their own actions and the outcomes, ie, to become internally-oriented. If children grow into internally-oriented adults, it is more likely that they will engage in behaviors that foster good health and, in the event of physical or psychological health breakdown, they would engage in actions that would return them to their status quo. In addition, clinical and health psychologists should take note of the effect of locus of control on adherence to a treatment regimen when they are interacting with their clients. Any psychotherapy technique, especially if built upon learning principles, should take the dimension of locus of control of their clients into consideration. This should be done during assessment in order to predict the likelihood that the client would be faithful to the terms of the therapy contract and to assess the efficacy of the technique adopted in helping the client deal with any psychological issues. This would also enable the clinician to plan a modification program to facilitate a change in orientation in case the client is externally-oriented.

Although this research focused on hypertensive patients, it could be applied to other pathological conditions, especially ones warranting prolonged treatment, eg, acquired immunodeficiency syndrome, asthma, and cancer. It has been shown that noncompliance with drug therapy, which is crucial for maintenance of vital physiological functioning, is more likely to have serious consequences than compliance with drug therapy intended for relief of symptoms.<sup>51</sup> Thus, any factor that negatively influences adherence should be considered in planning health care services, given that good adherence forestalls relapse, complications, and inaccurate assessment of drug efficacy.

Although our results support the hypothesis that locus of control influences adherence to treatment, the study has its weakness. The population and sample size are small compared with the number of possible pathological conditions and the size of the general patient population, so it is suggested that further studies be carried out. To broaden the applicability of this finding, a larger sample size is advocated. Other variables, including locality, age, gender, socioeconomic background, personality attributes, and other clinical conditions should be studied in relation to adherence and locus of control. Findings from such research would not only widen the areas of application of the results, but would also strengthen the validity of our observations and would inevitably lead to development of the health sector and actualization of good health for every citizen of any nation.

## Conclusion

Adherence to a drug regimen is a very important factor in drug efficacy. It is a very important aspect of behavior that promotes good health and promotes longevity. It helps to forestall economic waste and the psychosocial consequences of nonadherence. It also helps to assess accurately the degree of drug efficacy.

The importance of adherence to treatment cannot be overemphasized. Studies have shown that adherence to drugs contributes a great deal, not just to pharmaceuticals but also in treatment. For instance, Dracup and Meleis<sup>52</sup> reported that 80% compliance with a treatment regimen for hypertension was shown to lower blood pressure effectively, whereas a 50% compliance rate was ineffective in lowering blood pressure. Urquart<sup>51</sup> noted that reliance on intention-to-treat analysis, whereby one ignores doses actually taken and analyzes the results on the basis of the treatment to which patients are assigned in drug trials, has created a number of problems and biased estimates of drug efficacy. In other words, even in the pharmaceutical industry, adherence must be considered when developing new drugs. Therefore, it is recommended that any variable that has an impact on adherence should be taken into consideration. Based on the findings of this study, locus of control in patients should be kept in mind for all aspects of the health care delivery system, starting from laboratory investigations where collection of a specimen requires certain behaviors eg, the time of day at which the specimen needs to be collected. In obstetrics and gynecology, adherence to antenatal instructions is necessary. In surgery, it is also important. In conclusion, because research has shown the importance of adherence in health care and the present study shows the influence of locus of control, health care providers should take these variables into consideration when planning and implementing health policies in order to achieve the desired objectives.

## Disclosure

The authors report no conflicts of interest in this work.

## References

- American Heart Association. *Heart and Stroke: Statistical Update*. Dallas, TX: American Heart Association; 2001.
- Morrow R. Mayo Clinic Family Health Book. Maya; Foundation for Medicine Education and Research. 1990;25:699–712.
- Vander A, Sherman J, Lucina D. *Human Physiology: The Mechanism of Body Function*. Boston, MA: McGraw-Hill; 2001.
- Larson DE. Mayo Clinic Family Health Book. Mayo Foundation for Education and Research. 1990;2:796–801.
- Taylor SE. *Health Psychology*. 5th ed. New York, NY: McGraw-Hill; 2003.
- Giles TD, Materson BJ. Testing Stage 2 hypertension. *J Clin Hypertens (Greenwich)*. 2005;7:464–470.
- Columbia Encyclopedia. *Hypertension*. Available from: <http://www.answers.com/topic/hypertension>. Accessed September 27, 2010.
- Snider AJ, Oparil S. *Hypertension*. Chicago, IL: Building Press; 1976.
- World Health Organization. Cardiovascular Disease Prevention and Control; 2002.
- Mathers CD. Uncertainty and data availability for the global burden of disease estimates: 2000–2002. Evidence and Information for Policy Working Papers. Geneva World Health Organization. Available at <http://www.who.int/evidence/bod>.
- Cappuccio FP, Micah FB, Emmett L, et al. Prevalence, detection, management and control of hypertension in Ashanti, West Africa. *Hypertension*. 2004;43:1017–1022.
- Onwubere B. *Essentials of Hypertension Management*. Enugu Campus: Institute for Development Studies, University of Nigeria; 2005.
- Ifeagwazi CM. A review of aspects of clinical management of hypertension. *Journal of Sociological Sciences*. 2004;2: 90–100.
- Quiqing Gu V, Burt L, Paulose-Ram R, Yoon S, Gillium RF. High blood pressure and cardiovascular disease mortality and risk among US adults: The Third National Health And Nutrition Examination Survey mortality follow-up study. *Ann Epidemiol*. 2008;18:302–309.
- Smith TW, Turner CW, Ford MH, et al. Blood pressure reactivity in adult male twins. *Health Psychol*. 1987;6:209–220.
- Dickson ME, Sigmund CD. Genetic basis of hypertension: Revisiting angiotensinogen. *Hypertension*. 2006;48:14–20.
- Jonas BS, Lando JF. Negative affect as a prospective risk factor for hypertension *Psychosom Med*. 2000;62:188–196.
- Wofford MR, Hall JE. Pathophysiology and treatment of obesity hypertension. *Curr Pharm Des*. 2004;10:3621–3637.
- Wikipedia. *Hypertension*. Available from: <http://www.answers.com>. Accessed on September 27, 2010.
- Shyrock H. *Modern Medical Guide*. Boise, ID: Pacific Press Publishing Association; 1979.
- Awa AE. Hypno-behavioral approach – an adjunct to medication in the treatment of essential hypertension. *Clinical Psychology and the Nigerian Society*. 1984;372–386.
- World Health Organization. Adherence to long term therapies: Evidence for action. Geneva: World Health Organization; 2003.
- Rand CS, Weeks K. Measuring adherence with medication regimen in clinical care and research. In: Shumaker SA, Schron EB, Ockene JK, McBee WL, editors. *The Handbook of Health Behavior Change*. New York, NY: Springer Publishing; 1998.
- Bernard S, Bloom BS. Daily regimen and compliance with treatment. *BMJ*. 2001;323:647.
- Burnier M. Medication adherence and persistence as the cornerstone of effective antihypertensive therapy. *Am J Hypertens*. 2006;19: 1190–1196.
- Rosenstock IM. Why people use health services. *Milbank Mem Fund Q*. 1966;44 Suppl:94–127.
- Omeje O. *Physiological Psychology*. Enugu: Glanic Books; 2005.
- Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure. The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure. *JAMA*. 2003;282:2560–2572.
- Gerbino PP, Nightengale BS, Bramley TJ, Frech F. Effect of medication on compliance with antihypertensive therapy on blood pressure control. *Am J Hypertens*. 2004;17 Suppl 5:222.
- Snider AJ, Oparil S. *Hypertension*. Chicago, IL: Budlong Press; 1976.
- Durbar J. Issues in assessment. In: Cohen NSJ, editor. *New Directions in Patient Compliance*. New York, NY: Lexington Books; 1979.
- Stephenson J. Non-compliance may cause half of antihypertensive drug failures. *JAMA*. 1999;28:313–324.

33. Dubbar-Jacob J, Burke LE, Puczynski S. Clinical assessment and management of adherence to medical regimens. In: Nicassions PM, Smith TW, editors. *Managing Chronic Illness*. Washington, DC: American Psychological Association; 1995.
34. Gottlieb H. Medication non-adherence: Finding solutions to a costly medical problem. *Drug Benefit Trend*. 2006;12:57–62.
35. Rotter JB. Generalized expectancies for internal versus external control of reinforcement. *Psychol Monogr*. 1966;33:300–303.
36. Wallston KA, Wallston BS. Who is responsible for your health? The construct of health locus of control. In: Sanders GS, Suls J, editors. *Social Psychology of Health and Illness*. Hillsdale NJ: Lawrence Erlbaum and Associates; 1982.
37. Seaman M. Alienation and social learning in a reformatory. *Am J Sociol*. 1963;9:270–284.
38. Wallston KA, Wallston BS, Devellis R. Development of the multidimensional health locus of control scales. *Health Educ Monogr*. 1978;6: 160–170.
39. Rodin J. Aging and health: Effects of the sense of control. *Science*. 1986;233:1271–1276.
40. Carlise-Frank P. Examining personal control belief as a mediating variable in health-demanding behaviors of substance use: An alternative approach. *J Psychol*. 1991;125:381–397.
41. Lau RC. Origins of health locus of control beliefs. *J Pers Soc Psychol*. 1982;42:322–334.
42. Coan CN. Compliance in HIV/AIDS therapy: Why don't patients take their pills? *Can Med Assoc J*. 2001;160:64–65.
43. Balch PN. *Physician's Guide to Compliance in Antiretroviral Therapy*. Westpoint, PA: Merck & Co; 2005.
44. Lefcourt HM, Davidson-Keitz K. Locus of control and health. In: Snyder CR, Forsyth DR, editors. *Handbook of Social and Clinical Psychology. The Health Perspective*. New York, NY: Pergamon Press; 1991.
45. Lewis EK. Role of viral load in the pathogens of HIV-2 infection in West Africa. Unpublished PhD thesis: Open University Abidjan; 2000.
46. Lefcourt KC. *Locus of Control: Current Issues on Compliance to Antiretroviral Drugs*. Hillsdale, MN: Erlbaum; 2001.
47. Phares EJ. *Locus of Control in Personality*. Mornstown, NJ: General Learning Press; 1976.
48. Morowatisharifabadi MA, Mahmoodabad SM, Baghiannimoghdam MH, Tonekaboni NR. Relationship between locus of control and adherence to diabetes regimen in a sample of Iranians. *Int J Diab Dev Ctries*. 2010;30:27–32.
49. Guilford JP. *Psychometric Methods*. New York, NY: McGraw Hill; 1954.
50. Strickland BR. Internal-external expected and health related behaviors. *J Consult Clin Psychol*. 1978;46:1192–1211.
51. Urquhart J. Patient non-compliance with drug regimens: Measurement, clinical correlates, economic impact. *Eur Heart J*. 1996;17 Suppl A: 8–15.
52. Dracup KA, Meleis AI. Compliance: An interactional approach. *Nurs Res*. 1982;31:31–36.

## Appendix

### Drug adherence questionnaire

Please choose one of the four options below that best describes how you react to medical treatment.

Tick: (AA) for “almost always”; (O) for “often”; (S) for “sometimes”; or (R) for “rarely”

| S/No |   | AA | O | S | R |
|------|---|----|---|---|---|
| 1    | I check my blood pressure regularly as advised by my doctor                                 |    |   |   |   |
| 2    | I take my drugs regularly according to the schedule   |    |   |   |   |
| 3    | I keep to my drugs even when my blood pressure has normalized                               |    |   |   |   |
| 4    | My antihypertensive drugs are readily available to me                                       |    |   |   |   |
| 5    | I can cope financially with the purchase of my drugs  |    |   |   |   |
| 6    | The adverse effects of the drugs on me make me abandon them                                 |    |   |   |   |
| 7    | I go to my doctor for an alternative immediately I experience any adverse drug reactions    |    |   |   |   |
| 8    | I take my drugs every time I remember to take them  |    |   |   |   |
| 9    | I take my drugs with me whenever I travel to make sure I keep to the schedule               |    |   |   |   |
| 10   | I adhere strictly to medical advice pertaining food, exercise, and other health habits      |    |   |   |   |
| 11   | The cordial relationship between my doctor and I makes me adhere to the drugs prescribed    |    |   |   |   |
| 12   | Lack of information about my treatment pattern affects my adherence to drugs prescribed     |    |   |   |   |
| 13   | The severity of my illness affects my adherence to drugs                                    |    |   |   |   |
| 14   | I stop taking my drugs whenever I feel they are not working and I feel worse with the drugs |    |   |   |   |
| 15   | I keep taking my drugs despite its long duration  |    |   |   |   |
| 16   | I take my drugs even when I feel alright  |    |   |   |   |

#### Patient Preference and Adherence

Dovepress

### Publish your work in this journal

Patient Preference and Adherence is an international, peer-reviewed, open access journal focusing on the growing importance of patient preference and adherence throughout the therapeutic continuum. Patient satisfaction, acceptability, quality of life, compliance, persistence and their role in developing new therapeutic modalities and compounds to

optimize clinical outcomes for existing disease states are major areas of interest. This journal has been accepted for indexing on PubMed Central. The manuscript management system is completely online and includes a very quick and fair peer-review system. Visit <http://www.dovepress.com/testimonials.php> to read real quotes from published authors.

Submit your manuscript here: <http://www.dovepress.com/patient-preference-and-adherence-journal>