

Differences and Similarities in Explanatory Models of Hypertension in the United States of America, Tanzania and Jamaica

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ABSTRACT

Background: Misperceptions detract from effective disease management in a number of conditions but the nature of underlying illness beliefs and their relative consistency in patients with chronic hypertension (cHTN) who present to the Emergency Department (ED) with poor blood pressure control is not known.

Objectives: 1) To explore disease knowledge in ED patients with cHTN using explanatory modelling; and 2) to compare gaps in cHTN knowledge across racially similar but geographically divergent ED patients.

Methods: Emergency department patients of African origin with cHTN were recruited from three sites: Detroit Receiving Hospital (DRH - Detroit, MI, USA), the Tanzanian Training Center for International Health (TTCIH - Ifakara, TZ) and the University Hospital of the West Indies (UHWI - Kingston, JA). Demographic and baseline data were collected along with open-ended responses to a series of questions related to cHTN. Qualitative responses were coded into predefined, disease-relevant quantitative domains by two separate, blinded reviewers and multilevel comparisons were performed using Kruskal-Wallis or analysis of variance (ANOVA) tests, where appropriate.

Results: One hundred and ninety-seven patients were enrolled; mean age (50.5 years vs 51.6 years vs 50.8 years; $p = 0.86$) and gender distribution (% male: 49.5 vs 44 vs 40; $p = 0.53$) were similar across sites but patients at DRH (vs TTCIH vs UHWI) were more hypertensive at presentation (mean systolic BP in mmHg: 166.8 vs 153 vs 152.7; $p = 0.003$), had a longer mean duration of cHTN (12.1 years vs 4.6 years vs 9.1; $p < 0.0001$), and were less likely to be on antihypertensive therapy (84.5% vs 92% vs 100%, $p = 0.001$). Explanatory models revealed limited recognition of cHTN as a "disease" (19.6% vs 28% vs 16%; $p = 0.31$) and consistency in the belief that cHTN was curable (44.3% vs 36% vs 42%; $p = 0.62$). Stress (48.4% vs 60% vs 50%; $p = 0.31$) and, especially at DRH, diet (62.2% vs 22% vs 36%; $p < 0.0001$) were identified most frequently as causes of cHTN and an association with symptoms was common (83.5% vs 98% vs 78%; $p = 0.15$). Clear differences existed for perceived benefits of treatment and consequences of poor control by site, but in general, both were under-appreciated.

Conclusions: Misperceptions related to cHTN are common in ED patients. While specific areas of disconnect exist by geographic region, failure to recognize cHTN as a dire and fixed disease state is consistent, suggesting that a uniform educational intervention may be of benefit in this setting.

Keywords: Blood pressure, emergency medicine, ethnic divergence, health beliefs, hypertension, illness perceptions

Diferencias y Similitudes en Modelos Explicativos de la Hipertensión en los Estados Unidos de América, Tanzania y Jamaica

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RESUMEN

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Antecedentes: Las concepciones erróneas van en detrimento de un tratamiento eficaz de las enfermedades en una serie de condiciones, pero no se conoce la naturaleza de las creencias subyacentes acerca de la enfermedad, y su relativo carácter sistemático en los pacientes con hipertensión crónica (HTC) que acuden al Departamento de Emergencias (DE) con pobre control de la presión sanguínea.

Objetivos: 1. Explorar el conocimiento de la enfermedad en pacientes del DE con HTC utilizando modelos explicativos. 2. Comparar las lagunas de los conocimientos acerca de HTC abarcando pacientes del DE racialmente similares pero geográficamente divergentes.

Métodos: Se reclutaron pacientes de urgencias de origen africano con HTC provenientes de tres sitios: Detroit Receiving Hospital (DRH – Detroit, MI, EEUU), el Centro de Entrenamiento de Tanzania para la Salud Internacional (TTCIH – Ifakara, TZ) y el Hospital Universitario de West Indies (HUWI – Kingston, JA). Se recopilaron datos demográficos y de referencia, junto con respuestas abiertas a una serie de preguntas relacionadas con la HTC. Las respuestas cualitativas fueron codificadas en dominios cuantitativos predefinidos pertinentes a enfermedades, por dos revisores cegados independientes, y se realizaron comparaciones a niveles múltiples utilizando pruebas de Kruskal-Wallis o pruebas de análisis de varianza (ANOVA), cuando era apropiado.

Resultados: Ciento noventa y siete pacientes fueron registrados; la edad promedio (50.5 años vs 51.6 años vs. 50.8 años; $p = 0.86$) y la distribución de género (% varones: 49.5 vs 44 vs 40; $p = 0.53$) fueron similares en todos los sitios, pero los pacientes en DRH (vs TTCIH vs HUWI) fueron más hipertensos al momento de presentarse (PA sistólica promedio en mmHg: 166.8 vs 153 vs 152.7; $p = 0.003$), tenían una duración promedio mayor de HTC (12.1 años vs 4.6 años vs 9.1; $p < 0.0001$), y tenían menos probabilidades de estar bajo terapia antihipertensiva (84.5% vs 92% vs 100%, $p = 0.001$). Los modelos explicativos revelaron un reconocimiento limitado de la HTC como una “enfermedad” (19.6% contra 28% vs 16%; $p = 0.31$), e indicaron sistematicidad en la creencia de que la HTC era curable (44.3% vs 36% vs 42%; $p = 0.62$). El estrés (48.4% vs 60% vs 50%; $p = 0.31$) y, sobre todo en el DRH, la dieta (62.2% vs 22% vs 36%; $p < 0.0001$) fueron identificados con mayor frecuencia como causas de HTC, a la vez que fue común una asociación con síntomas (83.5% vs 98% vs 78%; $p = 0.15$). Existieron claras diferencias en relación con los beneficios percibidos en cuanto al tratamiento y las consecuencias de un pobre control en cada sitio, pero en general ambos fueron sub-valorados.

Conclusiones: Las concepciones erróneas relacionadas con la HTC son comunes en los pacientes en los departamentos de emergencias. Si bien existen áreas específicas de desconexión por región geográfica, no reconocer la HTC como una condición patológica grave y fija es algo que ocurre de forma sistemática, lo cual sugiere que una intervención educativa uniforme puede ser beneficiosa en este escenario.

Palabras claves: Presión arterial, medicina de emergencia, divergencia étnica, creencias en relación con la salud, hipertensión, concepciones con respecto a las enfermedades

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INTRODUCTION

Chronic hypertension (cHTN) is the most common cardiovascular risk factor worldwide, and one of the most important treatable causes of premature cardiovascular death (1). Despite such an understanding, there has been a steady rise in the prevalence of cardiovascular sequelae secondary to cHTN, particularly in developing nations where urbanization has led to a transition from communicable to non-communicable diseases (2–5). While much of this can be attributed to poor blood pressure (BP) control, solutions to improve risk among those with cHTN have remained elusive.

Patient perceptions about cHTN can influence health behaviours which, in turn, contribute to BP control (6–8). The nature of patient interactions with the healthcare system undoubtedly reflect these underlying beliefs and have a profound effect on the ability to manage conditions such as

cHTN. In recent years, there has been concern about the increased use of the emergency department (ED) as a principal locus for ambulatory care (9). Hypertensive patients who use the ED for this purpose have lower levels of disease awareness and more frequently develop pressure-related cardiovascular consequences than those with a stable primary care relationship (10). This paradigm is especially common among non-Hispanic blacks who, on the whole, are more likely to utilize ED services in a given year and are more likely to present with severely elevated BP than other racial groups, even after adjusting for age, income and insurance status (11, 12).

By analysing beliefs surrounding cHTN in non-Hispanic black ED patients with poor BP control, a high-risk but understudied subgroup, we may be able to exact more effective, population-specific approaches to disease manage-

ment (13–17). While awareness and knowledge of cHTN have been previously investigated (18–23), no study to date has assessed disease-specific perceptions related to cHTN in such a patient population. To address this, we conducted a qualitative study of ED patient health beliefs as they relate to cHTN across culturally divergent, yet racially similar patient populations within the context of presumed therapeutic and dietary variance.

Goals of this investigation

The primary goal was to explore disease-specific perspectives in a high-risk subset of ED patients with cHTN using explanatory modelling. Secondly, we sought to compare perceived causes, symptoms and consequences of cHTN within this cohort, focussing on differences among those who, despite originating from widely disparate locations, would typically be assigned to a single (*ie* “black”) racial subgroup.

SUBJECTS AND METHODS

This was a prospective, observational study of self-reported black patients with cHTN presenting to the ED of three study sites: Detroit Receiving Hospital [DRH] – Detroit, Michigan, United States of America (USA), the Tanzanian Training Center for International Health [TTCIH] at St Francis District Hospital – Ifakara, Tanzania and the University Hospital of the West Indies [UHWI] – Kingston, Jamaica. Patients with a triage BP > 140/90 mmHg and a self-reported history of cHTN who were non-pregnant and between the ages of 25 and 65 years were approached for participation by trained study personnel. All patients with acute illness or injury that necessitated emergent hospital admission, altered mental status, alcohol/drug-induced intoxication or baseline cognitive defects were deemed ineligible.

Once identified, eligible patients were asked to read (using a translated version at UHWI and TTCIH) an information sheet outlining the study with a subsequent request to participate in the investigation. This approach and the study itself were approved with a waiver of written informed consent by the Ethics Review Board, Human Investigations Committee or its equivalent at all three sites prior to initiation. Willing participants were then asked to complete a questionnaire which ascertained baseline information (demographics, medical history, current medications and family history) along with quantitative and qualitative responses to a series of questions including an individual explanatory model (EM) of HTN (Table 1). The EM is a validated approach that uses open-ended inquiries to elicit patient-level views about illness including aetiology, time and mode of onset, pathophysiology, prognosis and treatment (24, 25).

Data were collected by specifically trained individuals at all sites (three at UHWI and two each at DRH and TTCIH)

using translated, region-specific versions of a standardized data collection instrument. Each translation was reviewed by the respective international site leader to ensure accuracy. Whenever possible, responses were written directly by the patient; when unable, verbatim recording of verbal responses by the interviewer was permitted.

The primary outcomes of interest were the open-ended patient perceptions related to cHTN as ascertained using the EM. To enable group-wise comparison, these responses were coded by study personnel into predefined domains specific to each question (Table 1). Responses for each patient were coded independently by two separate investigators and inter-rater reliability was assessed using Cohen’s Kappa analysis. Any discrepancies were adjudicated by a third, independent investigator.

Descriptive statistics were derived for study patients as a whole and were stratified by study site. Study site comparisons were performed using Chi-square for categorical data and Kruskal-Wallis or analysis of variance (ANOVA) for continuous data where appropriate. Since this was a descriptive study designed to obtain information for future work and no primary hypotheses were implicated, there were no pre-specified adjustments for multiple group-wise comparisons. Statistical significance was set at a p -value < 0.05 and all analyses were performed using SAS version 9.2 (Cary, NC).

RESULTS

A total of 197 patients were enrolled: 97 (49.2%) at DRH, 50 (25.4%) at TTCIH and 50 (25.4%) at UHWI. As shown in Table 2, there was a great deal of dissimilarity between subjects at the three sites with patients from Detroit having higher mean systolic BP at baseline and a longer mean duration of cHTN. They were also more likely to smoke cigarettes and report a history of cocaine use and less likely to be on chronic antihypertensive therapy or consume a low-salt diet than patients in either of the international arms.

There was strong agreement between investigators with regard to conversion of qualitative responses to quantitative domains (Cohen’s kappa = 0.99). Explanatory models revealed limited recognition of cHTN as a “disease” (DRH, 19.6% vs TTCIH, 28% vs UHWI, 16%; $p = 0.31$) across all three sites (Table 3). In the overall cohort (Fig. 1), stress was identified most frequently (51.8%) as a cause of cHTN, followed by diet (45.7%), salt intake (31%), lifestyle (21.8%), genetics (11.7%) and obesity (9.1%). Between groups, the highest degree of variability was noted in their attribution of diet as a cause of cHTN (62.2% vs 22% vs 36%); $p < 0.0001$.

An association of cHTN with symptoms was also common (83.5% vs 98% vs 78%; $p = 0.15$) with headache (41.2% vs 40% vs 40%; $p = 0.98$) and dizziness (26.8% vs 10% vs 30%; $p = 0.032$) cited as the symptoms most closely

Table 1: Open-ended questions and domains for explanatory model answers

Explanatory model questions	Pre-defined question-specific domains
What does it mean to have high blood pressure?	<ul style="list-style-type: none"> Identified high blood pressure or hypertension as a disease Trigger words: disease, illness, sickness, condition, disorder, or variations thereof
What do you think causes high blood pressure?	<ul style="list-style-type: none"> Diet Nicotine Alcohol Salt specifically Lifestyle Genetic Obesity Stress
Can you tell when your blood pressure is elevated? If so, how?	<ul style="list-style-type: none"> Yes/No Headache Palpitations Dizziness Shortness of breath Chest pain
Could your blood pressure be high without these symptoms?	<ul style="list-style-type: none"> Yes/No
Is high blood pressure something you have occasionally, sometimes, or all the time?	<ul style="list-style-type: none"> Occasionally Sometimes All the time
What benefits are associated with treatment of high blood pressure?	<ul style="list-style-type: none"> Longer life Decreased cardiovascular complications (specific examples or generalization) Decreased healthcare costs (patient indicated saving money, less cost for medications, less insurance-related costs) Increased quality of life (return to previous state of health, improved exercise tolerance, decreased social impact of illness) Symptom relief (aforementioned symptoms decreased)
What will happen to you if your blood pressure stays high?	<ul style="list-style-type: none"> Cardiovascular complications Stroke Decreased quality of life Do not know
Do you think high blood pressure is curable or something you will have all your life?	<ul style="list-style-type: none"> Curable/Incurable

Table 2: Baseline data

	All n = 197	DRH n = 97	TTCIH n = 50	UHWI n = 50	p-value
Age in years (SD)	50.8 (11.5)	50.5 (13.1)	51.6 (9.1)	50.8 (10.4)	0.856
Male gender, n (%)	90 (45.7)	48 (49.5)	22 (44)	20 (40)	0.529
BMI in kg/m ² (SD)	29.7 (6.5)	30.9 (6.7)	26.3 (4.7)	31.3 (6.6)	< 0.0001
Mean SBP in mmHg (SD)	158.6 (26.2)	166.8 (28.0)	153.0 (18.1)	152.7 (27.9)	0.0025
< High school education, n (%)	89 (45.2)	23 (23.7)	44(88)	22 (44)	< 0.001
Smoker, n (%)	54 (27.4)	50 (51.5)	2 (4)	2 (4)	< 0.0001
Cocaine use, n (%)	16 (8.1)	16 (16.5)	0 (0)	0 (0)	0.001
Duration of HTN in years (SD)	9.5 (9.6)	12.1 (11.0)	4.6 (5.8)	9.1 (7.6)	< 0.0001
No medications, n (%)	19 (9.6)	15 (15.5)	4 (8)	0 (0)	0.001
Exercise, n (%)	126 (64)	64 (66)	35 (70)	27 (54)	0.2107
Low salt diet, n (%)	105 (53.8)	34 (35)	44 (88)	27 (54)	< 0.0001

DRH = Detroit Receiving Hospital, Detroit, Michigan, United States of America; TTCIH = Tanzanian Training Center for International Health, Ifakara, Tanzania; UHWI = University Hospital of the West Indies, Kingston, Jamaica; BMI = body mass index, SBP = systolic blood pressure, HTN = hypertension

Explanatory Models of Hypertension

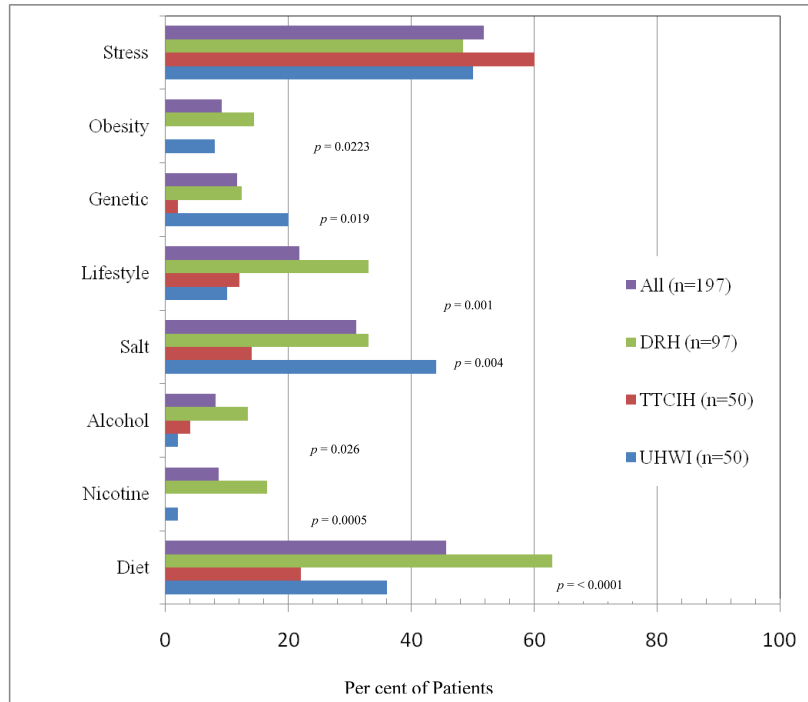


Fig. 1: Perceived causes of chronic hypertension*.

DRH = Detroit Receiving Hospital, Detroit, Michigan, United States of America; TTCIH = Tanzanian Training Center for International Health, Ifakara, Tanzania; UHWI = University Hospital of the West Indies, Kingston, Jamaica; *Only statistically significant *p*-values (< 0.05) are displayed.

linked to elevated BP (Fig. 2). More than a third of the patients in each arm of our cohort (44.3% vs 36% vs 42%; *p* = 0.62) held the belief that cHTN is curable (Table 3). Less

than 50% of the overall cohort identified individual benefits of treating cHTN (Fig. 3), such as living a longer life (17.3%), prevention of cardiovascular complications (16.7%)

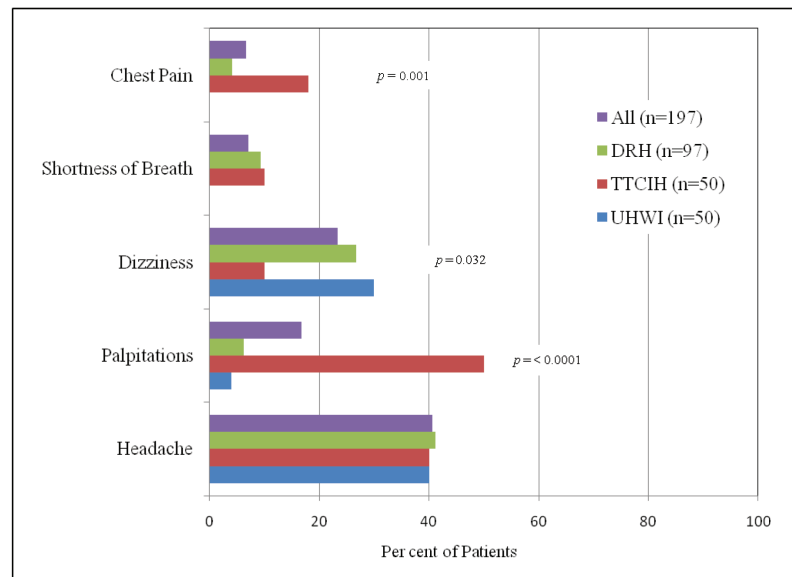


Fig. 2: Perceived symptoms experienced with elevated blood pressure*.

DRH = Detroit Receiving Hospital, Detroit, Michigan, United States of America; TTCIH = Tanzanian Training Center for International Health, Ifakara, Tanzania; UHWI = University Hospital of the West Indies, Kingston, Jamaica; *Only statistically significant *p*-values (< 0.05) are displayed.

Table 3: Explanatory model responses

Quantitative domains	All n = 197	DRH n = 97	TTCIH n = 50	UHWI n = 50	p-value
cHTN is a disease, n (%)	41 (20.8)	19 (19.6)	14 (28)	8 (16)	0.307
Know when BP is elevated, n (%)	166 (84.2)	81 (83.5)	46 (92)	39 (78)	0.151
BP can be elevated without symptoms, n (%)	112 (56.8)	63 (65)	18 (36)	31 (62)	0.002
Have high BP all the time, n (%)	68 (34.5)	39 (40.2)	10 (20)	19 (38)	0.042
cHTN is curable, n (%)	82 (41.6)	43 (44.3)	18 (36)	21 (42)	0.623

DRH = Detroit Receiving Hospital, Detroit, Michigan, United States of America; TTCIH = Tanzanian Training Center for International Health, Ifakara, Tanzania; UHWI = University Hospital of the West Indies, Kingston, Jamaica; BP = blood pressure; cHTN = chronic hypertension

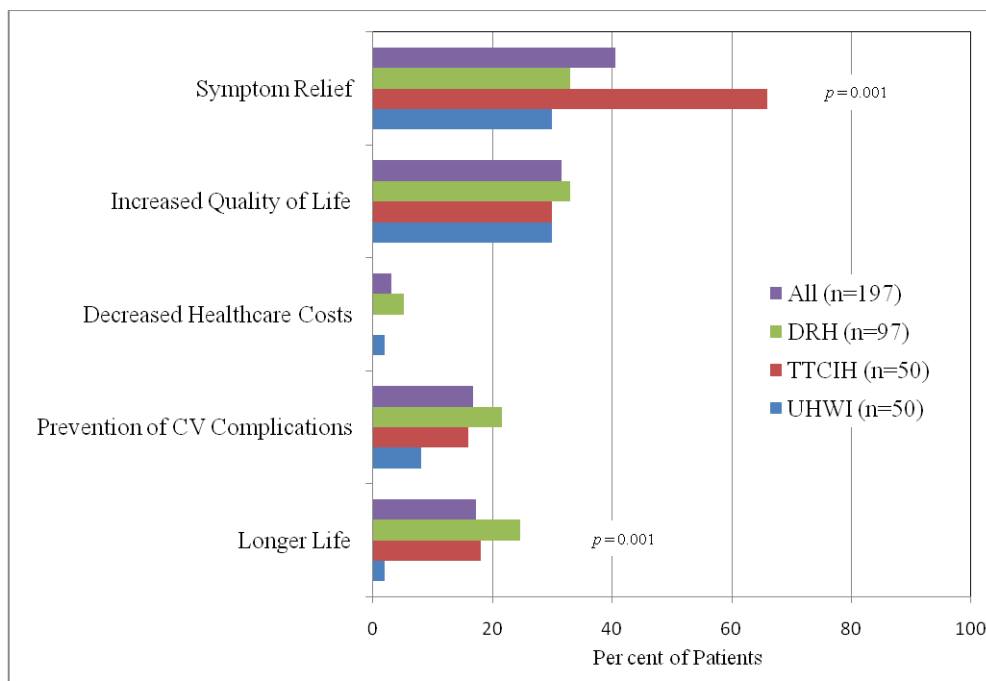


Fig. 3: Perceived benefits of treating chronic hypertension*.

DRH = Detroit Receiving Hospital, Detroit, Michigan, United States of America; TTCIH = Tanzanian Training Center for International Health, Ifakara, Tanzania; UHWI = University Hospital of the West Indies, Kingston, Jamaica; CV = cardiovascular; *Only statistically significant *p*-values (< 0.05) are displayed.

or increased quality of life (31.5%). The most commonly perceived benefit was symptom relief (40.6%), while the least cited benefit was decreased future healthcare costs

(3%). Further, fewer than 50% identified cardiovascular complications, stroke, or decreased quality of life as possible consequences of uncontrolled cHTN (Fig. 4).

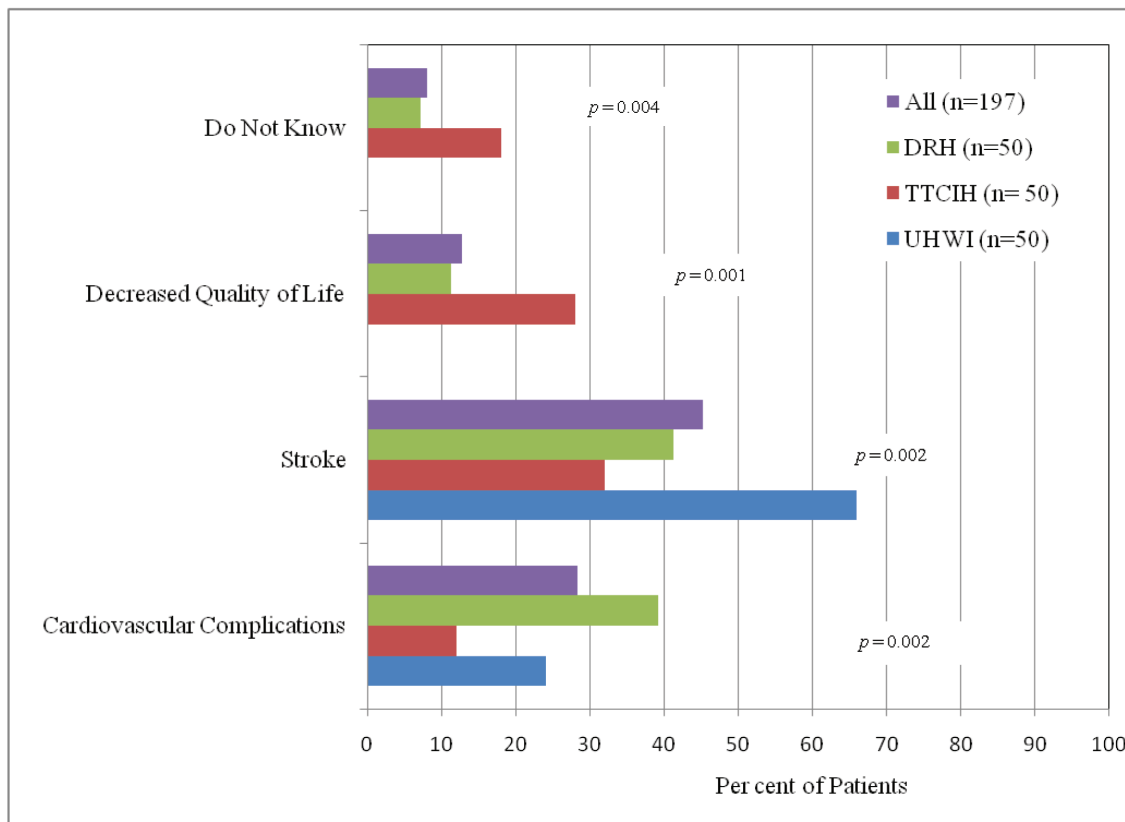


Fig. 4: Perceived consequences of untreated chronic hypertension*.

DRH = Detroit Receiving Hospital, Detroit, Michigan, United States of America; TTCIH = Tanzanian Training Center for International Health, Ifakara, Tanzania; UHWI = University Hospital of the West Indies, Kingston, Jamaica; *Only statistically significant p -values (< 0.05) are displayed.

DISCUSSION

In this study of “black” patients who presented to the ED of our three study sites with elevated BP, an under-appreciation of cHTN as a dire and fixed disease state was consistently observed. While other studies have evaluated baseline understanding of cHTN in patients in the USA (14, 18, 26, 27), this study is the first to be compiled across three international sites using individuals recruited exclusively from the ED. Improved understanding of cHTN, its aetiologies and consequences has been identified as a major public health objective because of the potential impact on the morbidity and mortality associated with cardiovascular disease and stroke (28–30).

Our data offer several important insights into cHTN and the patients who live with it. First, despite a relatively prolonged median duration of cHTN in the overall cohort (9.5 years), general comprehension of the disease process was quite poor with clear disconnect regarding comprehension of chronicity and the benefits of treatment. In particular, there was a broad misconception that cHTN is a transient or curable condition and limited appreciation that treatment could prolong life or reduce healthcare costs; findings which have clear implications for disease self-management

facilities. That respondents from Detroit had the longest duration of cHTN, yet were most likely to be without antihypertensive medications is especially concerning and is likely to represent some combination of inertia on the part of patients and their healthcare providers. Second, nearly 80% at each site associated elevated BP with symptoms (especially headache) and more than one-third did not believe BP could be elevated without symptoms, suggesting that patients simply do not believe the “silent killer” narrative that has been promoted by the medical community for decades. This may be especially problematic for emergency physicians who commonly encounter poorly controlled BP in asymptomatic patients with cHTN (30, 31). In spite of this, only 40% of all respondents mentioned symptom-relief as a potential benefit of treating their cHTN, indicating some lack of cognitive congruence. Third, there is substantial variance across geographic regions with regard to perceived causes of cHTN, suggesting the need for at least some degree of targeted education. Cigarette smoking, alcohol and salt were variably under-appreciated as contributors to cHTN and respondents’ attitudes may be the result of geographical and cultural differences amongst groups. For instance, perception that diet and salt intake were related to cHTN was far

lower in the Tanzanian cohort while stress was over-emphasized.

A key point of our study was to contrast beliefs related to cHTN across individuals who, based on the colour of their skin, may be lumped into a single “racial” category (*ie* “black”) when in fact they originate from widely divergent cultural and ethnic backgrounds. Control of cHTN requires an inter-disciplinary approach taking into account the patient’s understanding of the disease, lifestyle, diet and medication compliance (6, 32–36). The findings of the present study indicate that variations in ethnicity and geographical location must be considered when developing intervention strategies for at-risk populations and that cultural competence will be needed to formulate area-specific approaches to control cHTN.

Educational interventions geared toward addressing deficits in cHTN knowledge have improved patients’ attitudes toward antihypertensive medication (34). Based on our data, there is a clear need for consistent messaging that cHTN is indeed a chronic disease with serious long-term consequences. Delivery of this from the ED is achievable and could help improve self-efficacy and medication compliance in divergent geographic regions. Augmenting this with tailored information would help address differences in perceived causes of cHTN, benefits of treatment and consequences of poor control.

There are several limitations of this study that warrant mention. The results were the product of a convenience sample of ED patients in only three centres and the findings are probably not applicable to the general population. Further, including only known hypertensive patients may have led to selection bias, as their EMs may differ significantly from the patients who are unaware of their HTN status. Those included in the study suffered from poor BP control with low levels of disease comprehension and our data may not apply to populations with better cHTN management in each respective geographical region. The analysis of the data consisted of converting qualitative responses to quantitative, coded domains. As there is no systematic framework for such conversion, and there is great variability in the interpretation of qualitative responses, the results may not be entirely congruent across sites. That there was near universal agreement in the categorization of qualitative responses on independent review is reassuring and supports the internal validity of interpretation, at least within the context of this study. Lastly, we did not include a control population of normotensive individuals, making it difficult to determine how much race or geographical area may factor into development of EMs, independent of a specific chronic disease state.

In conclusion, this study demonstrates overall poor understanding of cHTN as a controllable yet largely incurable disease process in a high-risk subset of ED patients. The results of this study could help inform future efforts to control BP at the patient level as well as research designed to

implement more effective, population-specific approaches to management of cHTN, providing a facile mechanism for widespread reduction in the burden of cardiovascular disease.

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