Prevalence and Determinants of Hypertension Among Adults in Urban Bonaberi District of Douala, Cameroon

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Abstract

Background: Familiarity with behaviors that cause and prevent hypertension (HTN) varies among different Cameroonian populations. Investigations that explore what Cameroonians believe lead to HTN, and how they feel HTN can be avoided, could shape health administrative efforts to refute fictitious understandings of HTN's development and management routines.

Objectives: The primary objective of this study was to assess perceptions of what causes and prevents HTN among Cameroonians. The secondary objective was to evaluate which demographic and lifestyle factors were associated with HTN within the study sample.

Methods: A 20-item, anonymous questionnaire was created to request Cameroonians' in-person feedback from April 2022 through July 2022, relative to their demographics and what they believed causes and prevents HTN; a pre-populated list of options was available in a select-all-that-apply format. Participants' blood pressures (BPs) were checked two times in their right arms, with the average BP utilized for analyses purposes, along with their height and weight recorded. Survey completion and measurements were performed at participants' residences throughout the Bonaberi district of Douala, Cameroon.

Results: A total of 485 participants had their BPs, weights, and heights measured and completed the questionnaire. Participants' average body mass index (BMI) was 28 kg/m^2, with average systolic BP (SBP) and diastolic BP (DBP) readings of 128 mm Hg and 76 mm Hg, respectively. Approximately 60% and 70% of participants revealed that they lack a sufficient number of fruits and vegetables, respectively, in their diets. Over 25% of the participants reported never having consumed alcohol before, whereas roughly 20% stated they currently smoke cigarettes or have in the past. The percentages (%) of participants selecting diet, weight gain, lack of exercise, stress, and witchcraft as causes of HTN were 84.9, 84.4, 84.2, 67.2, and 30.8, respectively. The percentages (%) of participants selecting exercise, regular BP checks, stress reduction, adequate rest, and diet monitoring as preventative HTN strategies were 94, 93.6, 92.8, 91.1,

and 91, respectively.

Conclusion: Individuals having a proper understanding of behaviors that cause and prevent HTN is critical to curbing the HTN epidemic. Cameroonians' cognizance in this study of actions that facilitate or fend off HTN was encouraging, with the exception of roughly one-third of participants attributing HTN's presence to witchcraft. Our observations align with existing research, but adds to it by revealing the necessity of future investigations to prompt participants to convey their feedback in an open-ended/ free text manner to identify and correct inaccurate assertions.

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Introduction

The Non communicable diseases (NCD) of today constitute a serious burden throughout the world and represent one of the main global developmental challenges.[1] Hypertension (HTN) is a NCD which is often referred to as the "silent killer disease." HTN is defined as a systolic blood pressure of 140 mmHg and above and/or a diastolic blood pressure of 90 mmHg and above, parameters that should be consistent for over three to six months for diagnosis.[2][3] The prevalence of HTN is rapidly escalating in developing countries and is a leading cause of death and disability.[4] Worldwide, 1.13 billion people have HTN according to the world health organization (WHO) and nearly one billion adults had HTN in 2000.[5] Dating back to 2005, the number of patients with HTN is projected to be 1.56 billion by 2025.[6] HTN is also a major risk factor of cardiovascular and cerebrovascular diseases and is associated with a high degree of morbidity and mortality.[5] HTN accounts for approximately 1 million deaths amongst the 1 billion adults living with it around the world.[5] Among people with HTN, two-thirds are living in low and middle income countries.[2][6]

Notably, the rates of HTN has been high in many African countries and continues to soar.[7] In Africa, HTN is the leading

cause of heart failure.[3] Furthermore, HTN-related complications are responsible for over 50% of the 17.4 million annual deaths caused by cardiovascular diseases worldwide.[8] The prevalence of hypertension in Sub-Saharan Africa (SSA) is estimated to be about 30% with disproportionately low awareness, treatment and control rates.[7] HTN in SSA has also been gradually increasing with reports indicating higher values in urban settings compared to rural settings.[9] The prevalence of HTN in SSA ranges from 14.5% in rural Eritrea, 32.9% in semi urban Ghana, and 40.1% in urban South Africa.[9] Likewise, adequate HTN control has been on the decline, equating to 1.7% in rural Ghana, 4% in urban slum dwellers in Nigeria, and 21.5% in urban Kenya.[7]

In Cameroon, about 29.7% of the general population are affected by HTN.[8][10] The prevalence of HTN is reported to vary from 31.1% in rural milieu, 32.2% in semi-urban to 47.5% in urban milieu with a national average of 31.0%.[11] The rising trends in NCDs have been documented for hypertension and diabetes, with a 2-5 and a 10-fold increase in their respective prevalence between 1994 and 2003.[12][9] Studies conducted in Cameroon in 1994 and 1998 showed that age, obesity and hypertension were significantly associated with hyperglycemia.[12][13][9] In 1994 the prevalence rates of hypertension in the adult population was 8.3%, compared to 1998 when these rates increased to 17.6% for urban men.[9]

Magnitudes are much higher in urban settings, where increasing prevalence of overweight/obesity (by 54-82%) was observed over the same period. These changes largely result from the increase of unfavorable eating habits, physical inactivity, and a probable increasing tobacco consumption.[13] These behavioral changes are driven by the economic growth and social movement, which are part of the epidemiologic transition.[12][9] These diseases are driven by forces that include rapid unplanned urbanization, globalization of unhealthy lifestyles and aging populations.[14][15] Unhealthy diets and a lack of physical activity may manifest in people as increases in blood pressure, blood glucose, and blood lipids, along with obesity, all comprising risk factors or determinants of hypertension.[1] Urbanization appears to be associated with extreme changes in dietary habits, psychological stress, subsistence means and physical activity.[13]

Nearly 30% of adults in the Douala, Cameroon fail to achieve HTN control, whereas among those diagnosed, 35% do not receive appropriate treatment.[1] Therefore, evidence is needed about the current distribution of associated risk factors or HTN determinants in urban Cameroonian dwellers to develop cost-effective strategies for successful prevention and HTN maintenance in developing countries like Cameroon.[6] The purpose of this study was to identify risk factors associated with HTN among urban dwellers in Bonaberi, Cameroon. The secondary objective was to assess Bonaberi residents' awareness of behaviors that cause and prevent HTN.

Methods

Study area

Douala is situated in the Littoral Region of Cameroon. It is a coastal city, the economic capital of Cameroon and the country's main business center. It is the capital of the Littoral region and the Wouri Department. Located at the edge of the Atlantic Ocean, at the mouth of the Wouri River, it is the largest port in the CEMAC sub-region. The city extends on both

banks of the Wouri River. Douala is a cosmopolitan city with approximately 2,500,000 inhabitants for a density of 9,523.8 inhabitants/km2 (according to figures from the last general census) over an area of more than 4000 hectares in perpetual growth at the same rate as its population with great cultural diversity of the ethnic groups in Cameroon.

Study design, population, and setting

This study included a community-based, descriptive, cross-sectional survey, accompanied by in-home blood pressure, weight, and height measurements, spanning from April 2022 through July 2022. Prospective enrollees were recruited through in-person appeals by three research assistants who presented to residences and invited participation. The three research assistants were at liberty to approach communities within the Bonaberi municipality of Douala, Cameroon at their discretion. Adults ages 18 to 65 years old residing in the predetermined Bonaberi locales were included in the study. Participants' ages were acknowledged on an honor system as no verifications were requested. Excluded persons were those making self-attestations of being younger than 18 years old or older than 65 years old; self-declarations of being visitors to Bonaberi; and self-disclosures of not feeling well enough to participate in the study.

The three research assistants, all of whom were nurses with a minimum of an associate degree in nursing, were trained by the primary author over two days on the proper way to measure participants' blood pressures and implications of the readings based upon international guidance.[5] The primary author selected an automated blood pressure device (OMRON ® M6) for use in this study based upon his review of available options for blood pressure monitors in different settings.[16] The blood pressure of each participant was measured form the right arm in a seated position after a 10-minute rest period. The averages of two BP measurements taken at two-minute intervals were recorded for subsequent analyses. HTN was defined as a SBP of 140 mm Hg and above and/or a DBP of 90 mm Hg and above.

The authors collectively decided on in-home blood pressure, weight, and height measurements for three reasons: 1. Blood pressure monitors, scales, stadiometers are not readily accessible to all Cameroonians 2. Mitigation of transportation barriers that limit individuals' abilities to have these measurements conducted at a healthcare institution 3. Participants would presumably feel more comfortable having their blood pressures checked at home, likely leading to more reliable readings. The documented prevalence of white coat HTN among Cameroonians and Africans overall supported this reasoning.[17][18] Weight was measured with participants fully clothed, without shoes, to the nearest 0.1 kilogram (kg) using the Active Era BS-05 Ultra Slim Smart Digital scale. Height was measured without shoes to the nearest 0.1 centimeter (cm) using a portable stadiometer. Body mass index (BMI) was calculated using the respective weights and heights through dividing the weight, in kg, by height in meters (m) squared (m^2).[14] Configurations in Microsoft Excel assisted with conversions from cm to m^2.

The sample size was calculated in terms of an approximate population size of 2,500,000 residents using the Lorenz formula that reflected a 5% margin of error, 95% confidence interval, and 20.8% expected distribution.[9] These tabulations provided a minimal sample size of 253 respondents. Ten percent of 253 was added to the sample size estimation, equating to 278 participants as the minimum sample size based upon a previously established design.[9] However, a larger sample size of 500 participants was targeted to account for disinterest of some prospective participants and to help with

the generalizability of the results.

Survey development

A 20-item questionnaire administered after the blood pressure, weight, and height assessments comprised our data collection tool. The first item contained an informed consent statement that explained the study details and assured participants that their privacy would be protected. The next eight items requested demographic data, including gender, age (in years), highest education level completed, marital status, occupation, religion, monthly income (in Francs), and area of residence. The following three items assessed family history of HTN (yes or no), causes of HTN (5 options available as "yes" or "no"); and prevention of HTN (5 options available as "yes" or "no"). The options available for causes and prevention of HTN were formulated in a select-all-that-apply format. For causes of HTN, diet/food intake, lack of exercise, weight gain, stress, and witchcraft were listed. For prevention of HTN, exercise, diet monitoring, regular BP checks, adequate rest, and stress reduction were listed. The options available for participants to choose from were devised by the authors after reviews of worldwide statistics of HTN's incidence and prevalence, with the exception witchcraft's inclusion; this addition resulted from multiple study authors' anecdotal experiences of informal dialogue with community members about suspected health detriments related to witchcraft.[5] The remaining eight items queried if participants consumed alcohol (yes or no); frequency of alcohol consumption (not a consumer, once a month, once a week, more often than listed); smoking status (non-smoker, current, past); number of meal consumptions per day (once, twice, three, more than three); daily hours of sleep (< 7, 7 to 8, > 8); exercise intensity (light, moderate, high); frequency of fruits and vegetables consumption (everyday, once a week, once in a while).

The demographic variable "age" was queried as a free text response, in years, as opposed to captured by age groups; the former consideration permitted the authors to obtain mean, median, maximum, and minimum age ranges for the sample. For the "occupation" demographic variable, participants were asked to select only one; the authors were aware that some participants may have been employed in more than one capacity from the listed options. Each of the four areas of residence were included due to the authors' familiarity with their urban natures. Bonassama, Sodiko, Mabanda, and Bojongo are listed in descending order of population density. The authors relied on literature reviews, their multidisciplinary backgrounds, and feedback from pilot testers to develop the survey. Furthermore, two epidemiology professors from an affiliated university reviewed the survey to validate its contents. The survey was available in English only. Study participation extended from April 2022 through July 2022. Aside from gaining awareness of their levels of blood pressure control, individuals were not incentivized to participate in this study.

We performed multiple logistic regression analyses, examining the dichotomous dependent variable of "yes" or "no," in the setting of participant demographics that served as the categorical independent variables. All data analyses occurred through the Statistical Package for Social Scientists (SPSS), Version 28, with statistical significance set a priori as $p < 0.05$. The Ethical Review Committee of St. Louis University Institute and the Littoral Regional Delegation for Public Health approved the study protocol.

Results

Out of 500 Bonaberi, Cameroon residents approached to participate in this study, 485 of them submitted questionnaires (97%). All questionnaire items did not receive a response, as the number of respondents varied from 462 to 477 for certain components. Table 1 highlights community residents' responses about various activities of daily living, with almost three-fourths of them admitting to alcohol use, of which close to 30% reported drinking alcohol on a weekly basis. Approximately one-half of the sample attested to consuming food three times a day, leaving less than 10% eating once a day or more than three times a day. Over one-half of the sample disclosed sleeping seven to eight hours daily, as fewer than 15% claimed to get more than eight hours of sleep each day. Under 10% of participants reported a "high" level of exercise intensity, with the majority participating in "low" levels of exercise intensity. Roughly 80% of participants identified as non-smokers, as the remaining percentage was split between current and former cigarette smokers.

Table 1. Bonaberi, Cameroonian community residents' self-reported daily lifestyle activities (N = 485)

Survey item		n (%)	Survey item		n (%)
Alcohol consumption	Yes	356 (73)	**Daily hours of sleep±**	< 7	155 (32)
	No	129 (27)		7 – 8	252 (52)
				>8	70 (14)
Frequency of alcohol consumption	More often	56 (12)	**Level of exercise intensity**	Low	255 (52)
	Once a week	141(29)		Moderate	188 (39)
	Once a month	159 (33)		High	42 (9)
	Not a consumer	129 (26)			
Frequency of food consumption±	Once daily	27 (5)	**Smoking status (Cigarettes)**	Current	51 (11)
	Twice daily	183 (38)		Past	54 (11)
	Three times daily	236 (49)		Non- smoker	380 (78)
	More than three times daily	38 (8)			

± *Some participants did not respond to these survey items.*

Table 2 presents community residents' beliefs about lifestyle factors leading to hypertension and strategies that mitigate its onset. Table 2 also provides demographical information about the study participants. Each category of demographics (independent variables) statistically significantly predicted one or more factors (dependent variables) that could prompt or prohibit hypertension's onset ($p < 0.05$). Causes of hypertension's development for respondents to choose from included diet, weight gain, lack of exercise, stress, and witchcraft. Preventative actions that could be taken to ward off hypertension for respondents to choose from included exercise, regular BP checks, stress reduction, adequate rest, and diet monitoring. The percentages (%) of participants selecting diet, weight gain, lack of exercise, stress, and witchcraft as causes of HTN were 84.9, 84.4, 84.2, 67.2, and 30.8, respectively. The percentages (%) of participants selecting exercise, regular BP checks, stress reduction, adequate rest, and diet monitoring as preventative HTN strategies were 94, 93.6, 92.8, 91.1, and 91, respectively. In terms of demographics, most of the participants revealed their monthly income, in

Francs, as being less than 5,000 (# of Francs = XX dollars); were between 31 and 45 years old; and declared Christianity as their religion. Furthermore, the majority of participants indicated that they were married; employed as salaried workers; achieved a tertiary education; and resided in the Bojongo locale.

Table 2. Bonaberi, Cameroon community residents' views toward causes and prevention of hypertension (N = 485)

Independent variables (Demographics)		# of Participants	Significantly predicted dependent variables(HTN causes)	Significantly predicted dependent variables(HTN prevention)
Monthly Income (In Francs)	<5,000	216	Stress	BP checks Adequate rest Stress reduction
	5,000 — 20,000	188		
	>20,000	81		
Age group (years)	31 – 45	271	Lack of exercise Stress	Stress reduction
	46 – 55	166		
	56 – 65	48		
Religion	Christian	407	Diet	**None**
	Muslim	35		
	Atheism	43		
Relationship status	Single	199	**None**	Stress reduction
	Married	217		
	Divorce	29		
	Widowed	40		
Occupation	Student	91	**None**	Exercise
	Salaried worker	181		
	Farmer	34		
	Business	179		

Statistical significance: p < 0.05; HTN: Hypertension; BP: Blood pressure; None: No significantly predicted variable(s) identified

Causes of HTN listed in the questionnaire: Diet, lack of exercise, weight gain, stress, witchcraft

HTN prevention strategies listed in the questionnaire: Exercise, diet monitoring, BP checks, adequate rest, stress reduction

Religion significantly predicted beliefs about diet contributing to HTN, with Atheists, Muslims, and Christians, in descending order, expressing their agreement (p =0.037). Age groups significantly predicted lack of exercise's impact on HTN, with the percentage of people in agreement increasing as age groups (in years) decreased from 56 – 65, 46- 55, and 31 – 45, respectively (p =0.016). Age groups (p=0.049), level of participants' education (p<0.001), and monthly income (p<0.001) all significantly predicted stress as a cause of high blood pressure, with percent of agreement increasing with age groups and income levels, but not participants' education levels. Participants' education levels also significantly predicted beliefs that witchcraft can cause high blood pressure, with the more educated participants having

decreased reliance on this notion than the less educated participants (p=0.010).

Participants' occupations (p=0.016) significantly predicted exercise to prevent HTN; students outnumbered their occupational counterparts. Areas of residence significantly predicted exercise (p=0.019), diet monitoring (p=0.018), adequate rest (p=0.003), and stress reduction (p=0.013) to prevent HTN; the percent of Bonassama and Sodiko residents had consistently higher agreement than Mambanda and Bojongo residents. Monthly income of participants significantly predicted regular blood pressure checks (p=0.033), adequate rest (p=0.003), and stress reduction (p=0.034) as being HTN prevention methods, demonstrating a direct correlation between higher income levels and higher percentages of agreement with each of these approaches. Lastly, gender significantly predicted blood pressure checks (p=0.07) and age of participants significantly predicted stress reduction (p<0.001) as HTN prevention methods. The percentage of males slightly agreed more with blood pressure checks to prevent HTN than females; the younger the participants, the more likely they were to agree with stress reduction as a HTN preventative modality.

Participants had an average body mass index (BMI) of 28; lowest and highest were reported as 16.2 and 48.3, respectively. The mean reported systolic blood pressure (SBP) was 128 mm Hg, ranging from 40 to 183 mm Hg. The mean reported diastolic blood pressure was 76 mm Hg, with the values extending from 33 to 105 mm Hg. Roughly 40% and 30% of participants admitted to consuming a sufficient number of fruits and vegetables, respectively. The questionnaire did not query the types of fruits and vegetables consumed nor did it account for participants' preparations of their fruits and vegetables.

Of the five predictor variables assessed for having HTN – age dichotomized to < 45 years old or > 45 years old; marital status dichotomized to married or not married; monthly income dichotomized to < 5,000 Francs or > 5,000 Francs; family history of HTN dichotomized to "Yes" or "No"; and gender dichotomized to "male" or "female" – three were statistically significant: age (p = 0.027, Odds Ratio (OR) 1.623, 95% CI (1.056, 2.495), marital status (p = 0.037, OR 1.572, 95% CI (1.027, 2.409), and monthly income (p = 0.025, OR 1.645, 95% CI (1.064, 2.545). Participants older than 45 years old, married, and earned greater than or equal to 5,000 Francs/month had almost 2 times higher odds of having HTN than their counterparts.

Discussion

This study utilized a questionnaire-based approach to assess Bonaberi, Cameroonians' awareness of HTN causes and prevention strategies. Participants selected "Yes" or "No" to whether they believed the listed options caused or prevented HTN. They also provided demographical information and responded to questions about their lifestyle behaviors. Overall, respondents were familiar with actions that may result in HTN or those that could reduce HTN acquisition. Larger scale evaluations have surmised that HTN in Africa is on the rise and that numerous people do not realize that they are living with it[7]. Furthermore, researchers have shown that economic and literacy rates, weight, marital statuses, and age, are factors commonly linked to HTN diagnoses and corresponding management capabilities among Cameroonians.[10] Similarly, the findings here revealed that increasing age and income, along with being married,

predicted participants' hypertensive readings.

Approximately three-fourths of study participants admitted to having consumed alcohol, of which one-third or almost one-third of them reported alcohol use on a monthly or weekly basis, respectively. Slightly under 80% of the sample identified as non-smokers, but over half of the participants categorized their exercise intensity as "low," accompanied by an overall average BMI of 28 mg/k^2 (overweight) for study participants. Outside of Cameroon, researchers in Bangladesh, Ethiopia, and Kenya have described associations between obesity/overweight, diet, and lack of physical activity with HTN occurrences.[3][6][14] Indonesian researchers uncovered low adherence to HTN medications despite participant attestations of being intrinsically and extrinsically (by the healthcare team) motivated to take their medications as prescribed.[4] While adherence to anti-hypertensives was not directly assessed here, participants' SBPs and DBPs spiking up to 183 mm Hg and 105 mm Hg, respectively, suggest that challenges to adherence were present within this study sample.

An underlying contributor to metabolic factors linked to HTN in this study and elsewhere could be stress. Participants in this study consistently regarded stress as a notable cause of HTN and its minimization as a promising HTN prevention strategy. The frequency and intensity of participants' stressors were not analyzed in this study. Future research is warranted to investigate self-reported stressful triggers and their regularity in the context of hypertensive episodes. Incorporation of in-depth stress assessments into HTN evaluations would likely inform ongoing efforts to standardize approaches to chronic diseases like HTN at a policy level throughout Cameroon.[12]

Several studies based in rural and urban Cameroon, including this one, have articulated relationships between health indicators, e.g., obesity, alcohol consumption, tobacco use, physical activity/exercise, and hypertension.[1][8][11][13] Each group of researchers conveyed that such health indicators' association with hypertension could be confounded by environmental and socioeconomic factors. However, this study differentiated itself from the existing literature by querying participants' own beliefs about causes and prevention of HTN. By taking this additional step, we learned that participants' levels of education were indirectly proportional to their perceptions that witchcraft causes HTN (p = 0.010). We concede that each study participant's understanding of the term "witchcraft" could have varied. Nevertheless, recognition of the fact that some participants attributed HTN's onset to a mystical force is distinctive. This finding compels future research to look closer into other notions that people with chronic conditions like HTN may have that ostensibly serve as barriers to appropriate disease prevention and maintenance interventions.

In light of unconventional views revealed in this study towards HTN considerations, it is incumbent upon Cameroonian governmental and non-governmental entities to intensify their efforts to elevate HTN literacy. Inaccurate information about the causes of HTN and reliable ways to prevent it poses a two-fold harm: direct impact on the individual with HTN or at risk of developing it and indirect danger by way of misinformation abiding in perpetuity among peer exchanges such as on social media outlets. Given that HTN's prevalence is a world-wide concern, taking a look around at global initiatives that seek to address HTN in a concerted manner may be helpful. The World HTN League has created an international stage devoted to highlighting society's role in curbing the HTN epidemic.[2] As Cameroon is listed among the organization's membership, perhaps revisiting how contemporary HTN literature is disseminated to Cameroonians marginalized

educationally or geographically could be advantageous.

Limitations

Although study participants were encouraged to exercise honesty, social desirability likely factored into their submissions. This could have led some participants to give what they viewed to be acceptable as opposed to authentic perceptions. Furthermore, the dichotomy of a majority of the survey item responses, i.e., yes/no, may have compromised some participants' truthfulness who were unsure of how to respond. Consequently, some survey items did not receive 100% participation, likely owing in part to respondents being unable to make a definitive choice. Logistically, inhabitants have inconsistent internet access throughout Cameroon. In turn, participants capable enough to secure internet access for longer periods of time were better positioned to learn more about the causes and prevention of HTN through online resources, possibly skewing the survey data.

The study design did not query co-morbidities such as diabetes and dyslipidemia. Management capabilities of such conditions has been shown to affect HTN states, possibly impacting blood pressure readings of participants in this study. Additionally, our methodological approach did not account for the number nor type(s) of HTN medications participants may have been taking during the study period. Participants' use of more or less HTN medications was inclined to impact their degree of HTN control and subsequently could have affected associations shown between participant demographics and HTN statuses. The survey did not inquire about the duration of time participants may have been diagnosed with HTN prior to study implementation. Ostensibly, participants diagnosed with HTN over a longer period of time may have been more knowledgeable about the disease state than those who were recently diagnosed. From a safety perspective, the blood pressure assessment component of our methodology did not include a contingency plan relative to HTN emergency/urgency presentations. Fortunately, no participants' blood pressure readings nor signs/symptoms prompted additional attention by medical personnel.

Conclusion

Worldwide, HTN remains a concern that people living with it, knowingly and unknowingly, and those who are at risk of contracting it, have varying insights into how it develops and what can be done to prevent it. Cameroonian study participants residing in Bonaberi, Douala were mostly cognizant of behaviors that could lead to HTN and actions that could be taken to combat it. Nevertheless, a surprising sentiment among some study participants was that witchcraft causes HTN. Therefore, additional research is needed to unpack prevailing belief systems about HTN and to explore strategies to intervene with accurate and customizable information.

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