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A minireview of high blood pressure prevalence in some contemporary hunter or fisher-gatherer communities

Una minirrevisión de la prevalencia de la presión arterial alta en algunas comunidades contemporáneas de cazadores o pescadores-recolectores

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ABSTRACT

Introduction: high blood pressure (HBP) is a risk factor for cardiovascular diseases, the leading cause of mortality worldwide. HBP intertwines hypertensive phenotypes and lifestyle traits. Systolic blood pressure rises with age, and HBP is frequent in older ages. This minireview describes the population mean blood pressure (BP) and the prevalence of HBP in communities of fishing-hunting and gathering individuals. **Material and methods:** the data on BP values or HBP prevalence were analyzed in different databases from contemporary studies on hunters-fishers and gatherers communities. **Results:** sixteen articles were selected from tribes of Central and South America, Africa, and Asia. Communities with little or no influence from modern civilization showed low BP values, regardless of gender or age. HBP prevalence was in most of them between 0 and 10%, with few exceptions. Acculturation changes this BP pattern. The concept that HBP, especially the isolated systolic HBP that affects the elderly, is an inevitable consequence of age seems unsustainable considering these data. **Conclusion:** high blood pressure (HBP) is not fatally linked to aging but results from the relationship between heredity and environment, a consequence of an unhealthy lifestyle related to civilization. This fact emphasizes the role of behavioral strategies in promoting better metabolic and cardiovascular health.

RESUMEN

Introducción: *la hipertensión arterial sistémica (HAS) es un factor de riesgo de enfermedades cardiovasculares, las primeras causas de mortalidad mundial. En la génesis de la HAS se entrelazan fenotipos hipertensivos y rasgos del estilo de vida. La presión arterial sistólica aumenta con la edad y la HAS es frecuente en edades avanzadas. Esta minirrevisión describe los valores promedio de la presión arterial (PA) poblacional y la prevalencia de la HAS en las comunidades de cazadores-pescadores y recolectores actuales.* ***Material y métodos:*** *se analizaron los datos de los valores de PA y la prevalencia de HAS de comunidades contemporáneas de cazadores-pescadores y recolectores en diferentes bases de datos.* ***Resultados:*** *dieciséis artículos fueron seleccionados de estudios de tribus de América del Sur y Central, África y Asia. Las comunidades con poca o nula influencia civilizatoria moderna tuvieron cifras de PA bajas, independientemente del género y la edad. La prevalencia de la HAS varió entre 0 y 10%, con pocas excepciones. La asimilación cultural modificó este patrón. El concepto de que la HAS, especialmente la de tipo sistólica aislada que afecta a los ancianos, es una consecuencia inevitable de la edad, parece insostenible de acuerdo con estos datos.* ***Conclusión:*** *la HAS no está fatalmente ligada a la edad, sino que es el resultado de la relación entre la herencia y el ambiente, consecuencia del estilo de vida poco saludable relacionado a la civilización. Este hecho refuerza la importancia de las estrategias conductuales que promueven una mejor salud cardiovascular y metabólica*

INTRODUCTION

The relationship between certain diseases and civilized society has long been a topic of interest for evolutionary biologists, ecologists, physiologists, physicians, nutritionists, anthropologists, sociologists, and historians.[1] The poorly defined concept of «civilization diseases»[2]

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refers to a set of maladies, unknown or with very low prevalence in the pre-agricultural and pre-historical ages (from the Paleolithic to Neolithic eras). The emergence and epidemiological spread of these ailments depended on nutritional and socio-cultural changes when human beings abandoned their nomadic lives and the hunting-fishing and gathering activities, settling first in villages and then in cities, obtaining their food supply from agriculture and livestock, and dialectically opposing their lifestyle traits with their genetic nature developed over millennia.[3] Remarkably, among these «civilization diseases», high blood pressure (HBP) is one of the best examples of these diseases resulting from the convergence of hereditary predisposition and certain lifestyle features, such as the type of nutrition, the consumption of salt and alcohol, obesity, sedentarism, and psychosocial stress, among other factors.[4]

HBP is currently the most prevalent cardiovascular disease and one of the most critical factors of death and disability worldwide, associated with dyslipidemia, tobacco consumption, obesity, and diabetes. HBP is one of the main promoter factors of coronary, cerebral, and peripheral atherosclerosis, heart failure, chronic renal disease, atrial fibrillation, vascular dementia, and vision loss, among other complications.[5]

Blood pressure (BP), especially systolic blood pressure (SBP), rises with age, and older adults have a higher prevalence of HBP. Even among those who were not hypertensive at younger ages, upon reaching old age, a considerable proportion of them showed elevation of BP, particularly SBP and pulse pressure, yielding to the modality known as isolated or predominant systolic arterial hypertension).[6-9] Is this fact consubstantial to human aging? Or, on the contrary, are these changes linked to age, another consequence of a civilized lifestyle?

This minireview is aimed to support the already established concept, but not shared by all that HBP is not an inevitable fact of advanced age. We analyzed data collected in the literature about BP values, or HBP prevalence, found in contemporary times in some communities that get their food from hunting (or fishing) and gathering activities, as our ancestors did in the Stone Age. The elucidation of this fact has undoubted practical value because it points the way forward for primary prevention.[10] The goal is not the impossible return to the primitive tribal style of life, but to learn from the culture of our ancient ancestors some customs and practices that made it unlikely the presence of diseases that today are the leading public health problems of human society.

MATERIAL AND METHODS

This review aims to describe the average population BP and the prevalence of HBP, estimated in observational studies on human communities that in current times still live by the norms of primitive hunting-fishing and gathering societies. We examined databases from the National Library of Medicine (NIH), the National Center for Biotechnology Information (NCBI), MEDLINE/PubMed, and Sciencedirect, with no publication date or sample size restriction. Medical Subjects Headings: blood pressure, high blood pressure (or hypertension), and hunter-gathering communities (and the Boolean terms «and» and «or» to make more precise the search) were selected to identify those articles focused on habitual BP and the prevalence of HBP in these societies. Inclusion criteria encompass studies written in English in which BP was quantitatively measured, and the prevalence of hypertension was estimated. Other types of communications were excluded, such as clinical cases, scientific or philosophical reflections, letters to the editor, brief notes, abstracts, and duplicate articles. We consider the cut-off values of BP signaling HBP (BP $\geq$ 140/90 mmHg), as it is recommended by the Task Force of the European Society of Cardiology (ESC), the European Society of Hypertension (EHS),[11] and the Mexican Official Norm on hypertension (DOF - Diario Oficial de la Federación, 2017).[12] Additionally, we considered other sources, like previous reviews of special ethnic groups.[13-16]

RESULTS

Of all databases consulted, sixteen articles were selected. Groups were divided by geographical areas in Central and South America *(Table 1)*,[17-23]

Table 1: Southern and Central America's hunter-fishers-gatherers' communities.

Ethnicity	Kuna	Kuna	Yanomami Yekwana	Tsimane	Yanomami	Xingu	Carajas
Geographic place	Ailigandi island, San Blas archipelago, off the Caribbean coast of Panama	Ailigandi and Ticantiki, islands, San Blas archipelago, off the Caribbean coast of Panama	Venezuela	Bolivian Amazonia	Brazilian Amazonia	Brazilian Amazonia	Amazon basin of tropical Northern Brazil, on the shores of two southern tributaries of the Amazon river
Number	133	142	155 Yanomami: 72 Yekwana: 83	2,248	400	198	89
Gender, %	M: 39 F: 61	–	Yanomami M: 54 F: 46 Yekwana M: 40 F: 60	F: 52.6 M: 47.4	F: 200 M: 200	–	M: 46 F: 43
Age [years]	35-42	18-82	Yanomami: 22.4 Yekwana: 22.2	F: Normotensives: 38 Hypertensives: 66.5 M: Normotensives: 39.3 Hypertensives: 65.8	25-59	–	16-61+
SBP*	98.2 ± 1.2	–	Yanomami: 95.4 ± 8.7 Yekwana: 104.0 ± 10.6	F: 108 M: 113	95.4	F: 96.2 M: 103.3	Age: 16-20 M: 109.5 F: 96.0 Age: 21-30 M: 109.8 F: 104.1 Age: 31-40 M: 107.3 F: 105.4 Age: 41-50 M: 100.9 F: 100 Age: 51-60 M: 109.0 F: 98.0 Age: > 61 M: 110.3 F: 108.0
DBP*	58.4 ± 0.7	–	Yanomami: 62.9 ± 8.5 Yekwana: 66.1 ±95	M: 70 F: 66	61.4	F: 61 M: 64.4	Age: 16-20 M: 72.5 F: 69 Age: 21-30 M: 72.9 F: 70.7 Age: 31-40 M: 70.5 F: 72.2 Age: 41-50 M: 69.1 F: 69.4 Age: 51-60 M: 70.3 F: 67.7 Age: > 61 M: 69.7 F: 64.7

Continue to Table 1: Southern and Central America's hunter-fishers-gatherers' communities.

Ethnicity	Kuna	Kuna	Yanomami Yekwana	Tsimane	Yanomami	Xingu	Carajas
MBP*	71.3	< 40 years: 81 ± 2 41-60 years: 77 ± 1 > 60 years: 80 ± 2	Yanomami: 73.7 Yekwana: 78.7	M: 84.3 F: 80	72.3	–	Age: 16-20 M: 84.3 F: 78 Age: 21-30 M: 85.3 F: 82 Age: 31-40 M: 82.3 F: 83 Age: 41-50 M: 79.7 F: 79.3 Age: 51-60 M: 83 F: 78 Age: > 61 M: 83.3 F: 79.3
HBP prevalence, %	–	2.2	–	M: 5.2 F: 3.9	0	1	–
Reference	17	18	19	20	21	22	23

SBP = systolic blood pressure. DBP = diastolic blood pressure. MBP = mean blood pressure, HBP = high blood pressure.
* Data expressed in millimeters of mercury [mmHg].

Africa *(Table 2)*[24-30] and Asia *(Table 3)*.[14,31] Data from those geographical places are shown in *Tables 1 to 3*.

Lowenstein, in 1961, described the population average arterial pressures of two Indian tribes (Mundurucus and Carajas) living in the tropical Amazon basin in northern Brazil, reporting that BP remains low throughout the adult life of these individuals.[23] BP tended to increase with age in Mundurucus Indigenous people but not in the Carajas group. The two tribes differ in their lifestyle, being the Carajas more attached to their primitive culture, while the Mundurucus had lost part of the lifestyle of their ancestors as westernized Brazilians had somehow partially acculturated them.

DISCUSSION

We are heirs to a long lineage that began when the great apes were evolutionarily separated from the first of our oldest direct ancestors, the «hominins», Like the archaic «Homos» that succeeded them, in the first millennia of the existence of «Homo sapiens», these beings lived under the norms of the tribal nomad society, dedicated to hunting or fishing, and gathering tasks. The term «civilization», whose etymology comes from the Latin word civitas (city), defines that stage of the development of human society that brought undoubted benefits but, at the same time, among many negatives, even catastrophic aspects, gave rise to numerous threatening risks to human health, which continue to weigh on contemporary human society. Civilization did not arise from one moment to another. The Neolithic age (the transition between the Stone Age and civilized eras) began 10,000 or 12,000 years ago and was characterized by slow and gradual changes in humans' food supply and social organization. Among the many facts that define civilization are the abandonment of nomadism and settlement in villages or cities, the invention of writing, pottery, agriculture and livestock, the origin of structured religions ruled by a priestly caste, the very birth of science, the end of the egalitarian society norms with the apparition of private property, and the differentiation of the human society in social classes (with the introduction of slavery), the development of the

Table 2: African hunter-gatherers' communities.

Ethnicity	Traditional pygmies	Hadza	Traditional pygmies	Pygmies	Luo	!Kung Bushmen	Bushmen
Geographic place	Southern Cameroon	Northern Tanzania	Cameroon	Cameroon	Nairobi, Kenya	Republic of Botswana	Souhern Ganzhi, Kalahari desert
N	94	46	20	150	310	152	78
Gender, %	M: 39 F: 61	M: 41 F: 59	M: 46 F: 54	M: 55 F: 45	–	M: 52 F: 48	M: 54 F: 46
Age [years]	23-46	18-60	33-35	38 ± 12	20-65	15-83	15-65
SBP*	119 (110-129)	Age: 18-39 115.90 ± 14.37 Age: 40-59 123.12 ± 19.73 Age: > 60 126.07 ± 17.48	122 ± 4	107 ± 12	M: 122.9 F: 129.2	Age: 30-39 M: 120 F: 113 Age: 50-59 M: 118 F: 123 Age: 70-83 M: 117 F: 123	Age: 12-17 M: 107.5 ± 14.9 F: 108.3 ± 9.1 Age: 18-35 M: 110.1 ± 11.7 F: 112 ± 15 Age: 40-55 M: 107.5 ± 11.2 F: 117.5 ± 12.9 Age: 60-65 M: 107.6 ± 9.9 F: 113.8 ± 19.2
DBP*	73 (66-78)	Age: 18-39 69.96 ± 11.49 Age:40-59 74.97 ± 29.26 Age: > 60 69.63 ± 11.28	83 ± 2	71 ± 11	M: 69.7 F: 72.5	Age: 30-39 M: 75 F: 73 Age: 50-59 M: 72 F: 76 Age: 70-83 M: 66 F: 68	Age: 12-17 M: 68 ± 13.4 F: 69.7 ± 8.9 Age: 18-35 M: 66.9 ± 5.3 F: 68.8 ± 8.7 Age: 40-55 M: 63.1 ± 6.7 F: 70.8 ± 5.7 Age: 60-65 M: 67.8 ± 5.5 F: 69.6 ± 9.0
MBP*	88 (81-93)	Age: 18-39 85.3 Age: 40-59 91 Age: > 60 88.7	97 ± 3	83 ± 10	M: 87.7 F: 93	Age: 30-39 88.2 Age: 50-59 89.5 Age: 70-83 84.7	Age: 12-17 M: 81.0 F: 82.7 Age: 18-35 M: 81.3 F: 83.3 Age: 40-55 M: 77.7 F: 86.3 Age: 60-65 M: 83.3 F: 84.7

Continue to Table 2: African hunter-gatherers' communities.

Ethnicity	Traditional pygmies	Hadza	Traditional pygmies	Pygmies	Luo	!Kung Bushmen	Bushmen
HBP prevalence‡	2.2	Age: 18-39 4.95 Age: 40-59 21.28 Age: > 60 25.93	–	3.3	–	–	–
Reference	24	25	26	27	28	29	30

SBP = systolic blood pressure. DBP = diastolic blood pressure. MBP = mean blood pressure, HBP = high blood pressure.

* Data expressed in millimeters of mercury [mmHg].

‡ Data expressed as a percentage.

institutions that together make up the State, the introduction of bronze crafting, the complete evolution and consolidation of the patriarchally family, and the creation of all kind of artistic expressions, including a pearl of extraordinary architectural wisdom and capabilities.[32,33]

Also took place a profound dietary revolution, characterized by the introduction of cereals as a nutritional fundament, as well as the consumption of meat of cattle modified by domestication, dairy and poultry products, the use of salt as a flavoring and food preservative agent, and the consumption of alcoholic beverages, among many others. In contrast with civilized people, our primitive nomad ancestors consumed the healthier meat of wild animals, fruits, nuts, roots, and abundant vegetables with a high dietary fiber, calcium, and potassium content. At the same time, cereals, milk, and dairy products were not components of their usual diet.[34] They did not ingest more salt than the natural constituent of their food, while the consumption of alcohol and tobacco was utterly unknown to them. Besides, women and men were generally lean and endowed with splendid physical fitness. Of course, they did not have an easy life. Many died young due to infections, parasite infestations, obstetric complications, injuries, and other accidents caused by the vicissitudes inherent to wildlife. Still, they were free of the chronic-degenerative epidemics that overwhelm civilized humans, particularly in modern times.[3]

One of the epidemiological traits in modern societies is the population age-dependent increment of SBP and a high prevalence of HBP, particularly in advanced ages. In the elderly, the mechanism responsible for the sustained increment of SBP is the altered aged-linked mechanic properties of the elastic arteries, which are due to senescent structural changes (extracellular matrix dystrophy, calcification, atheromatous and hypertensive arteriosclerosis, among others).[5]

At the present times, it is difficult to find «pure» hunter-fisher-gatherer societies because complete cultural isolation is now rather impossible. For that reason, it is noticeable that those contemporary primitive societies show a certain degree of acculturation (promoted by trade, religious, political, governmental, academic, or

Table 3: Asian hunter-fisher-gatherers communities.

Ethnicity	Negrito	Lau	Aita
Geographic place	Peninsular Malaysia	Northeast Malaita islets, Solomon Islands. Oceania	Bougainville island mountains, Solomon Islands, Oceania
Number	Deep forest communities: 197	178	169
Gender‡	M: 43.2 F: 56.8	M: 77 F: 101	M: 81 F: 88
Age (years)	18-80	15-65	18-64
Systolic blood pressure*	Deep forest communities: 130 ± 23	M: 122 ± 3.5 F: 128 ± 3.2	M: 111 ± 3.1 F: 106 ± 3.9
Diastolic blood pressure*	Deep forest communities: 84 ± 15	M: 81 ± 3.2 F: 83 ± 3.7	M: 72 ± 1.9 F: 67 ± 5.1
Mean blood pressure*	Deep forest communities: 99.3	–	–
High blood pressure prevalence‡	39.2 ± 7.0	M: 7.8 F: 9.9	M: 0 F: 0
Reference	14	31	31

* Data expressed in millimeters of mercury [mmHg].
‡ Data expressed as a percentage.

«charitable» intromissions, and migratory flows) and, because some hunter-gatherers, besides their hunting or fishing activities, practice pastoralism, and forest gardening-herbalism or swidden agriculture.

Some authors consider that three hundred groups worldwide that can be regarded as predominantly hunter (or fisher)-gatherers exist. They encompass ~10 million people,[35] an impressive number, considering that direct man-made destruction of many habitats and the environmental disasters due to climate change have limited the ecological possibilities of this form of life.

This review shows that HBP is unknown or rare in these societies living under the norms of the Stone Age. Population average BP pressures are less than 120/80 mm Hg, in all genders, in all age groups, and in tribe persons of different ecological regions. Except for Malaysian Negrito deep forest inhabitants, who have a high prevalence of HBP, which is unusual in other similar tribal groups,[14] and the Tanzanian Hadza ethnic group in whom an HBP prevalence of 21-26% was observed, in the rest of tribal communities, BP values were low, and the prevalence of HBP was less than 10% or completely absent. The isolation of the Malaysian Negrito community favors inbreeding and the more frequent occurrence of hypertensive phenotypes. The Hadza group has been somehow «contaminated» by their neighbor's more acculturated ethnic groups.

Concerning age, in most cases, older people had almost the same BP as the younger group members. *Table 4* shows that in the Amazonian Yanomami, average population blood pressure was similar in both genders and all age groups.[21] Why were our ancient ancestors not assailed by HBP? A low salt consumption played a role because its excess is one of the etiopathogenic mechanisms of hypertension, but by no means is it the only one. Among behavioral and nutritional protective factors against HBP, vascular damage, and early aging and frailty, are included the lifelong maintenance of physical activity, the absolute absence of tobacco smoking and ingestion of alcoholic beverages, and a healthy diet with high content of dietary fiber and rich in nutraceuticals, as polyphenols (epicatechin or quercetin) or carotenoids (as lycopene) and of course, with low salt content.

Although, in general, aging is associated with a natural decline of all organic functions, civilized life (particularly the western type of

modern civilization) has two antagonistic but simultaneous effects. On the one hand, it accelerates vascular aging, promoting chronic vascular diseases (atherosclerosis, hypertensive, and senescent calcinotic arteriosclerosis), yielding a pandemic outburst of acute and chronic vascular syndromes, principally from cardiac or cerebral origin. At the same time, high-tech medicine, and pharmacological advances, have decreased the mortality caused by these syndromes, at least in developed countries, though sometimes costly but effective therapeutic interventional or surgical procedures.[36] Those who survive the acute vascular syndromes, thanks to these interventions, are often affected later by disabling conditions such as heart failure, neurological or kidney deficiencies, and vascular dementia.

Aging is a natural, inevitable process but is not necessarily associated with frailty, disabling, or threatening diseases. The contemporary hunter-fisher and gatherers tribe persons' features signal that HBP and other «civilizations diseases» do not fatally accompany old age.

On the other hand, a large body of data suggests that acculturation (adopting a different cultural pattern) promotes the emergence of the typical chronic-degenerative diseases of civilization. Noticeably, the extraordinarily high consumption of polyphenols (epicatechin) from cacao beverages, for example, in the Panamanians Kuna Indigenous people, is associated with almost the absence of HBP and with a low incidence of cardiovascular diseases, diabetes, and cancer. This protection is not due to genetic influence because the people of this ethnic group, when acculturated, acquire the pathology of civilized human society.[18]

Table 4: Mean population values of blood pressure in both genders and different age groups in Yanomami Indians.

Gender and age group, years	Systolic blood pressure*	Diastolic blood pressure*
Men		
20-29	100	59
30-39	106	61
40-49	102	52
50-59	104	65
Women		
20-29	91	50
30-39	91	54
40-49	95	54
50-59	90	58

* Data expressed in millimeters of mercury [mmHg].
Taken from: Mancilha-Carvalho J et al.[21]

CONCLUSION

Data from this review strengthen the concept that HBP is not consubstantially linked to aging but instead to the unhealthy lifestyle that most of the modern, westernized world population has adopted. Although it is impossible to return to the past, it is always advisable to look back to learn about the healthier lifestyle of our primitive ancestors. We can introduce behavioral changes that promote better metabolic and vascular health, such as a moderate restriction of salt and alcohol, a greater consumption of vegetables and fruits, a lean weight, the habit of physical exercise, and total avoidance of tobacco smoking.

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