

Blood Pressure of Foreigners in China

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BLOOD PRESSURE OF FOREIGNERS IN CHINA *

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Hypertension, unassociated with cardiac or renal disease, so common in other countries, is uncommon in China. Attention has been called to this by Cadbury,¹ Cruickshank,² Kilborn³ and others, who have also shown that the average blood pressure of the Chinese is lower than the average for persons in other countries. In the Hunan-Yale Hospital, of more than 4,000 cases in the medical service department during the past four years, there has been only one diagnosed as essential hypertension, and, including the cases of nephritis and cardiac disease, not more than twenty with blood pressures over 160. During two years, 1918 and 1919, of 4,940 patients in the medical service of the Peter Bent Brigham Hospital,⁴ Boston, there were 236 cases of essential hypertension and 146 cases of chronic nephritis with hypertension.

It has been my impression and that of others on our staff that less hypertension is seen among the Occidentals living in China, and that the average blood pressure of foreigners is lower than the average usually accepted as normal. Little information on this point has been found in the journals and textbooks on tropical medicine.

Studies on the blood pressure in India⁵ seem to show that the average systolic blood pressure of the Hindus is about 100 millimeters of mercury, while that of the Europeans in Bengal is from 115 to 130 mm. There are conflicting reports from the Philippines. Musgrave and Sison,⁶ in 1910, and Concepcion and Bulatao,⁷ in 1916, found that the blood pressure of the Filipinos was lower than the average given for Americans and Europeans, and that the blood pressure of Americans living in the Philippines was about the same as that of the Filipinos.

* From the Department of Medicine, Hunan-Yale Hospital, Changsha, China.

* Read before the Section of Medicine at the Conference of the China Medical Association, Peking, China, Sept. 1-8, 1926.

1. Cadbury, W. W.: The Blood Pressure of Cantonese Students, China M. J. **37**:823 (Oct.) 1923.

2. Cruickshank, E. W. H.: Physiological Standards in North China, China M. J. **37**:1 (Dec.) 1923.

3. Kilborn, L. G.: The Blood Pressure of Szechuenese Students, China M. J. **40**:1 (Jan.) 1926.

4. Hospital Rep. Peter Bent Brigham Hospital, 1918 and 1919.

5. McCay, D., quoted by Cadbury (footnote 1).

6. Musgrave, W. E., and Sison, A. G.: Blood Pressure in the Tropics, Philippine J. Sc. **5**:325 (Aug.) 1910.

7. Concepcion, I., and Bulatao, E.: Blood Pressure of the Filipinos, Philippine J. Sc. **11**:135 (May) 1916.

Chamberlain,⁸ however, in 1912, at the head of an army board appointed to investigate tropical diseases in the Philippines, during a careful study of more than 6,000 observations on the blood pressure of 1,042 American soldiers and of more than 500 observations on 386 Filipino soldiers, concluded that, "The blood pressure of Americans residing in the Philippines differs but little if any from the average at home" (average 115 mm. for from 18 to 30 years of age and 118 for over 30), and that there was not a tendency for the blood pressure to rise or fall with increasing length of residence, up to three years, the limit of their study. He found that the average pressure for the Filipinos was "practically identical with that for the group of white men" (116 mm. for from 15 to 40 years of age). The textbooks⁹ refer only to Chamberlain's work in their brief references to blood pressure in discussing the effects of the tropics on the white race.

In 1923 the Health Committee of the Yale Mission introduced a uniform system of medical examinations for candidates before coming to China and annual examinations thereafter. In the four years' records now available, there are two points that have impressed the members of this committee: first, that the average systolic blood pressure for the whole group is lower than the usual average for Americans, and second, that many show a definite drop in blood pressure in China as compared with the pressure recorded in America.

From the hospital and health records my co-workers and I obtained the blood pressure of 120 men and women, all foreigners—a few Europeans, but mostly Americans. Persons with diseases which were likely to affect the blood pressure were not included. The foreign community of Changsha is small, which has made it difficult to get a larger series. The blood pressure of the men and women was almost identical, an average of 112 mm. for sixty-three women and 113 mm. for fifty-seven men. The distribution was approximately the same; so the results for both men and women are included in the same table.

The blood pressure of 278 apparently healthy local Chinese was obtained from the Hunan-Yale Hospital and Dispensary records for comparison.

In 1923, Alvarez¹⁰ reported the blood pressures in nearly 15,000 American men and women. His results are included with ours in table 1.

8. Chamberlain, W. P.: A Study of the Systolic Blood Pressure and the Pulse Rate of Healthy Adult Males in the Philippines, *Philippine J. Sc.* 6:467 (Dec.) 1911.

9. Castellani and Chalmers: *Manual of Tropical Medicine*, 1919. Byam and Archibald: *The Practice of Medicine in the Tropics*, 1921.

10. Alvarez, W. C.: Blood Pressures in Fifteen Thousand University Freshmen, *Arch. Int. Med.* 32:17 (July) 1923.

In table 2 are shown the results for a slightly different group including Americans and Filipinos in the Philippine Islands, as reported by Musgrave and Sison and by Chamberlain. Cadbury's figures for Cantonese students are also given in this table.

TABLE 1.—Percentage Distribution of a Series of Systolic Blood Pressures of Groups of Foreigners and Chinese in Changsha Compared with Averages for Americans

	Blood Pressures									Number Examined
	80 to 89	90 to 99	100 to 109	110 to 119	120 to 129	130 to 139	140 to 149	150 to 159	160 to 169+	
Foreigners (Changsha) men and women.....	2%	19%	30%	23%	15%	5%	3%	1%	2%	120
Chinese (Changsha).....	3%	18%	32%	29%	10%	3%	3%	2%	1%	278
Women, U. S. A. (Alvarez) ¹⁰	(0.3%)	3%	18%	36%	29%	10%	2%	1%	1%	9,000—
Men, U. S. A. (Alvarez)...	—	1%	3%	18%	31%	26%	13%	5%	3%	6,000
Americans, men and women (Alvarez).....	—	2%	12%	29%	30%	16%	6%	3%	2%	15,000—

TABLE 2.—Percentage Distribution of Blood Pressures of Groups in the Philippines and of Some Cantonese Students

	Blood Pressure									Number Exam- ined
	71 to 80	81 to 90	91 to 100	101 to 110	111 to 120	121 to 130	131 to 140	141 to 150	151 to Over	
U. S. soldiers (Philip- pines) ⁸	—	—	5%	29%	37%	21%	5%	2%	1%	992
Filipinos ⁸ (soldiers).....	—	1%	7%	26%	34%	19%	7%	2%	4%	366
Foreigners ⁶ (Philippines)	—	—	1%	17%	34%	23%	13%	7%	2%	97
Cantonese students ¹ (over 20 years).....	4%	12%	38%	22%	16%	7%	—	—	—	?

TABLE 3.—The Average Systolic Blood Pressures for Different Racial Groups as Given by Different Observers

Groups	Reported by	Number Examined	Average Systolic Pressure
Philippines			
Filipino soldiers.....	Chamberlain	366	115 - 116
Filipino civilians.....	Concepcion	697	115.6
American soldiers.....	Chamberlain	1,042	115 - 118
India			
Hindus.....	McCay	500 ?	90 - 105
Europeans.....	McCay	?	115 - 130
America			
Women.....	Alvarez	9,000	117.3 ±10.8
Men.....	Alvarez	6,000	128.9 ±13.5
Men.....	Woley (J.A.M.A. 55: 121 [July 9] 1910)...	1,000	127.5
China			
Cantonese students....	Cadbury	700	101
Szechuan students....	Kilborn	700	111
Hunan students.....	Kao (Nat.M.J.China 8: 101 [June] 1922)...	261	114.5
Hunan, adults.....	Foster	278	111
Foreigners, Hunan....	Foster	120	112 ±14.7

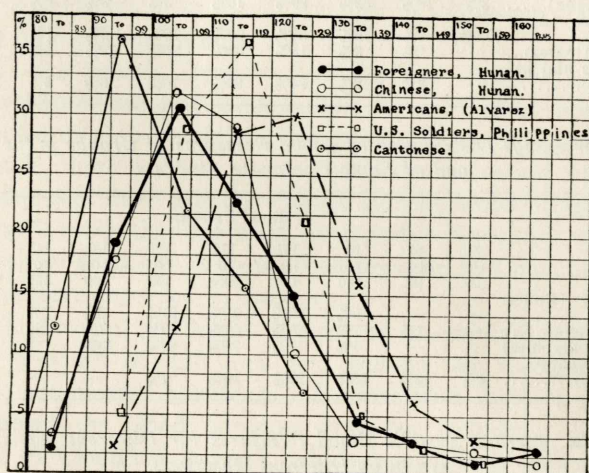
The average blood pressures as given by different observers for different racial groups of all ages are given in table 3.

A comparison of the various reported series, chart 1, seems to show that for this small number, at least, the average blood pressure of the foreigners in Changsha, as in the Philippines, is definitely lower than

the figures set by Alvarez as normal for Americans, and that the average for the foreigners in Changsha is almost identical with that of the local Chinese.

Data of thirty-four men and women, with blood pressures recorded in America and again a year or more later in China are shown in table 4. Eight do not show any change, two show an increase in pressure, but the remainder show a drop of from 10 to 40 mm. of mercury after living a year or more in China.

There are several persons with rather striking changes: R. A. had a blood pressure of from 140 to 145 for several years in America; it dropped to 128 and 120 during four years in China. W. H. had been



Comparative curves of some blood pressures given in tables 2 and 3

refused life insurance several years before because of high blood pressure, although it was usually from about 135 to 140. This dropped to 125 and 108 in two years in China. L. F., whose pressure was always around from 118 to 120, dropped each year in China—112, 102, 95 and 88—without subjective symptoms of any weakness or any physical signs of hypotension. A Chinese woman physician (S. C., the report not included in the foregoing tables), who was born in Hawaii but who had always lived in the United States, had a blood pressure of 120 in 1923 before coming to China. It dropped to 115 and to 88 this year. I have the reports of only two taken before, during and after furlough. The blood pressure of E. H. was 116 in 1923 in China, 140 in November in America and 128 the following year in China; that of F. H. was 120 in China, 130 in America and 108 for the following two years in Changsha.

A similar series of records of the blood pressure of forty members of the Peking Union Medical College staff was obtained¹¹ (table 5). In this series, twelve do not show any definite change, or less than 5 mm. up or down, only three show an increase, while twenty-five show a decrease. The average for the group taken in Peking is 9 mm. less than in America (118 in the United States, 109 in Peking). In the Changsha series there was a difference of from 8 to 14 mm. (121 in the United States, and 113 or 107 in Changsha, depending on whether the maximum or minimum China record was taken).

TABLE 4.—Blood Pressures of Thirty-Three Adult Americans Taken in Routine Physical Examinations in America and Again After a Year or More in Central China; Two-Thirds Show a Definite Drop in Blood Pressure

Name	Age	Sex	Years in China	Height		Weight	Blood Pressure in U. S. A.	Blood Pressure in China	Change in Blood Pressure
				Ft.	In.				
R. A.	34	M	4	6		167	140	128, 120, 120	-20
H. B.	25	M	1	5	5	145	135	118	-17
S. B.	24	F	1	5	3	115	114	100	-14
N. B.	28	F	2	5	3	120	130	110, 90	-40
W. B.	24	M	1	6		140	116	80	-36
J. B.	43	M	10	5	11	140	104	94, 98	-6
S. C.	22	M	1	5	6	147	118	116	0
L. F.	34	F	4	5	4	120	118	110, 102, 95, 88	-30
J. F.	34	M	6	5	9	160	110-118	118, 110	0
M. F.	21	M	1	5	10	170	122	115	-7
L. G.	26	F	1	5		126	120	108	-12
C. G.	25	F	2	5	5	125	125	108, 105	-20
P. G.	30	M	3	5	9	160	120	120, 102, 100	-20
R. G.	30	F	3	5	3	104	102	112, 118	+16
E. H.	40	M	16	5	11	205	140	116, 128	-12
F. H.	40	F	16	5	6	134	130	108, 108	-22
W. H.	50	M	3	6		204	135	125, 108	-27
O. K.	25	M	3	5	9	200	130	140, 130, 125	0
E. K.	22	F	2	5	2	120	120	105, 105	-15
J. L.	25	F	1	5	1	112	114	122, 112	0
S. M.	22	M	1	5	10	147	120	100	-20
M. M.	28	F	2	5	3	120	116	116, 100	-16
J. N.	28	F	2	5	8	160	132	136, 122	-10
P. P.	24	M	2	6		156	112	120, 120	+8
R. P.	36	M	10	5	7	126	120	116, 108, 95	-25
M. P.	35	F	10	5	4	122	120	100, 96, 92	-28
H. R.	30	M	3	5	10	200	120	124, 124	0
K. R.	22	M	1	5	9	128	106	104	0
D. S.	24	M	2	6		165	122	124	0
T. V.	23	M	1	5	7	128	110	110	0
C. W.	25	M	2	5	10	140	112	92, 100	-12
O. W.	30	F	5	5	4	135	118	105, 95	-23
A. W.	22	M	1	5	10	146	132	112	-20

The figures are presented for what they are worth. Most were single observations, but were taken in routine medical work, and when possible they have been verified. The records were made with Tycos, aneroid and Baumanometer mercury instruments, using a 12.5 cm. band. The auscultatory method was used as a routine. Some slight variations were noted in checking up the different instruments and observers. The

11. Dr. Otto Willner, in charge of the Department of Staff Health of the Peking Union Medical College, through whose courtesy the figures in table 5 were obtained, asserts that the blood pressure of foreigners seen in practice in Peking tends to average around 110 or lower, rather than around 120, which is considered normal in the West.

records were taken when the subject was sitting; some were taken in the afternoon; others in the forenoon; most were taken during the months of April and May. There did not seem to be any seasonal variation.

COMMENT

One does not know how to comment on the significance of such a small series, which would have a large probable error. How different would a larger series be? Do these same changes in blood pressure occur in all parts of China?

TABLE 5.—Blood Pressure Records of Forty Foreigners Taken Before and After Coming to China*

Name	Age	Sex	Blood Pressure in U. S. A.	Blood Pressure in China	Change in Blood Pressure
A.....	25	M	122	108	-14
B.....	31	F	110	106	0
C.....	35	F	132	110	-22
C.....	33	M	120	118	0
C.....	36	F	120	100	-20
D.....	32	M	112	114	0
D.....	36	F	120	120	-10
E.....	39	M	120	108	-12
F.....	35	M	128	110	-18
F.....	33	F	120	110	-10
F.....	?	F	120	110	-10
F.....	31	M	118	125	+ 7
G.....	36	F	106	102	0
G.....	39	F	118	120	0
G.....	33	F	115	110	- 5
G.....	30	F	105	100	- 5
G.....	33	F	115	105	0
H.....	28	F	118	110	- 8
H.....	30	F	130	110	-20
H.....	44	M	122	118	0
J.....	?	F	108	112	0
K.....	34	M	120	114	- 6
K.....	29	M	120	110	-10
K.....	29	F	125	114	-11
K.....	28	F	100	84	-16
K.....	24	M	100	106	+ 6
K.....	39	M	135	108	-27
L.....	?	M	115	120	+ 5
L.....	26	F	118	90	-28
M.....	32	F	115	112	0
P.....	32	F	124	102	-22
S.....	32	M	112	105	- 7
S.....	42	F	121	130-114	0
T.....	35	M	130	115	-15
T.....	28	F	130	110	-20
T.....	?	F	118	118	0
V.....	36	M	110	92	-18
V.....	42	M	125	108	-17
W.....	44	M	106	106	0
W.....	45	F	120	98	-22

* Over 60 per cent have a lower blood pressure in China. Only three show an increase.

The comparative hypotension itself does not seem important, for even those with blood pressures in the eighties and nineties do not complain of symptoms. It apparently does not have any relation to ill health, change of diet, shorter hours of work or exercise, amount of sleep or lack of nervous tension or strain; but it may have some relation to the feeling some have expressed of lack of energy and capacity for work in China as compared with their feeling when in the "States."

The significance of this variation seems to be that an answer to this question might give some clue to the etiology and possible treatment of

the other and more important side of this same problem, that is, hypertension. An explanation of essential hypertension which will withstand rigid criticism has not yet been offered. Many cases of hypotension are equally unexplained. A solution of these problems might be found if the factors of difference in the lives of persons living in China and those living in Western countries could be analyzed.

Many factors have been suggested from time to time to explain the low blood pressure of the Chinese: (1) smaller stature and lighter weight; (2) decreased capacity for muscular effort with resulting decrease in muscular tone; (3) some racial endocrine differences; (4) diet, largely vegetable, low in protein and salt; (5) climate, which lowers vasomotor tone, especially of the splanchnic and peripheral vessels, or which, by the increased secretions from the skin, causes lowered surface tension or possibly causes some variations in the volume and viscosity of the blood, and (6) the simplicity of life in China and the absence of nervous strain.

None of these theories has been proved. Cadbury feels that possibly (1) and probably (4) and (5) are real factors. Musgrave and Sison lay most emphasis on (5). If it is true that the blood pressure of Chinese and foreigners is influenced alike, it would seem to rule out the question of physical stature or development and of the endocrines. So far as protein intake is concerned, there does not seem to be a great difference in the diet of foreigners living in China and at home. As to climate, Changsha is not in the tropics. The mean temperature is about that of Alabama and Mississippi, and any unusual absence of hypertension in those states has not been reported. Peking is in about the same latitude as New York City. Could it be that there is some subconscious adjustment to the unhurried life of the East that lowers the general tone?

One case of essential hypertension in a Chinese is of interest in connection with the question of etiology. Miss T., a supervisor in the Nursing School, aged 38, had completed her education in America and had returned to China in 1922. In November, 1925, after three years in north China, she came to us complaining of persistent headaches and insomnia. The results of the examination of the heart, eyes, sinuses and other organs, as well as urinalysis, were normal. Her blood pressure was 180 systolic, and 110 diastolic. Roentgenograms of the teeth, sinuses and heart were normal, and there was normal renal function. She had an intensely nervous temperament and seemed more like a Westerner than a Chinese in her habits and attitudes. On enforced rest and limitation of duties, her blood pressure dropped later to 130 and 135. Was it that the nervous tension was responsible for her hypertension, or was the high blood pressure the cause of her highstrung temperament?

The foregoing figures and observations are presented to call attention to some facts which should receive further investigation. At present there does not seem to be any real answer as to why there is such an absence of hypertension in China, or any adequate explanation for the lower-blood pressure that seems to exist.¹²

SUMMARY

1. The blood pressure of the Chinese has been shown to be lower than the usual averages, and hypertension is rare.
2. The blood pressure of a series of Occidentals living in China shows that the average for foreigners is about the same as that of the local Chinese, and that the blood pressure of the majority of persons studied was lower in China than in America.
3. An analysis of unknown factors responsible for this comparative hypotension may give some clue as to the cause of hypertension in other countries.

12. In a recent communication, Mr. E. F. Harris, manager of the North China Division of the Sun Life Insurance Company, Shanghai, has sent the results of the blood pressures of about 1,000 policy holders, Chinese and foreigners, for analysis. He makes the following comment: "In my opinion our experience does not bear out the deductions which you mention. In our experience the blood pressure of the Chinese is considerably lower than the blood pressure of the Caucasian races. The blood pressure of the white races, i. e., European and Americans, in China, is, however, in our experience just the same as the blood pressure of such races in Europe and America. We also are of the opinion that hypertension in foreigners is just as common in China as in Western countries, but that hypertension is rare in the Chinese."

