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Preliminary study on the state of health of prehistoric population distributed in the Yellow River Valley

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Abstract

An integrated study of the prehistoric population in the Yellow River valley suggests that, as time went on, their average age and body height tended to reduce and the prevalence to increase. It evidences that their physical condition was gradually worsened from the Peiligang Period to the Erlitou Period. This phenomenon was directly concerned with the change of prehistoric environments and the process of social complexity.

Keywords: health; prehistoric population–demography; processes of social complexity; the Yellow River Valley.

Introduction of the issue

The expanding scope of archaeology since 1960s has gradually directed the attention of scholars towards questions concerning the state of nutrition and health of prehistoric population. The theme of these studies is to assess the nutrition and health statuses of past human groups through studying the skeletal remains with methods of physical anthropology. In addition, they lay the ground for monitoring the intertwining relationship between social development, environmental change and the state of nutrition and health of past population. Studies of past nutrition and health comprise of three areas of study in physical anthropology, namely, age composition, pathology and diet. This paper is a preliminary effort to evaluate the state of health of the prehistoric population distributed in the Yellow River Valley. It is based on systematic analysis of the average age, average height and prevalence extrapolated from the extant dataset of physical anthropology.

Average age of the prehistoric population distributed in the Yellow River Valley

Average age is one of the important indicators of the health of a population. The longitudinal fluctuation of average age reveals the effects of social development and environmental change to the general health of human population. We subscribe the static population model for the following study. To fulfill statistical requirements, we use only the burial assemblages yielding at least 20 human specimens whose ages are identified. For longitudinal analysis, we partition the archaeological data into four broadly-defined consecutive phases of Peiligang, Yangshao, Longshan, and Erlitou. In addition, the dataset of Dawenkou Culture is exceptionally rich; therefore, it is treated separately in the following discussion.

To date, 49 burial assemblages recovered from the Yellow River Valley meet our self-imposed data requirement. Based on the age estimates of the 49 human groups, we have derived the average age for each of the groups and the general average age by archaeological phases (see Table 1). For Peiligang Phase (3 sites), the male average age is 39.69, the female average age is 33.07, and the general average age is 33.10 (see footnote of the table for derivation of general average age). For Yangshao Phase (20 sites), the male average age is 38.64, the female average age is 34.45, and the general average age is 33.63. For Dawenkou Phase (13 sites), the male average age is 33.91, the female average age is 32.33, and the general average age is 27.45. For Longshan Phase (9 sites), the male average age is 36.18, the female average age is 32.49, and the general average age is 35.39. Finally, for Erlitou Phase (4 sites), the male average age is 35.25, the female average age is 30.96, and the general average age is 29.11. Two intriguing trends can be summarized from the above summary. First, male average age in general is higher than female average age across archaeological phases. Second, the general average age of archaeological phases decreased through time.

The longitudinal fluctuation of average age among the prehistoric human groups of the Yellow River Valley was correlated to the processes of social complexity. The degree of social complexity during Longshan and Erlitou Phases indicates that social stratification had emerged. One of the consequences of the appearance of social stratification coupled with the strengthening of private property was the intensification of predatory warfare. The most direct result of warfare was mass fatality, particularly that of young and mature adults who participated in combat. The mass fatality of younger age groups had detrimental effect on the average age of the population, leading to the decrease of general average age of the population.

In addition, the dynamics of average age of the prehistoric population in the Yellow River Valley are consistent with the results of archaeological study of environmental oscillations. Past environmental studies indicate that the Yellow River Valley experienced several major climatic and environmental oscillations. Overall, the climatic conditions of Yangshao Phase were the most favorable. As a result, the average age of this phase was the highest among the archaeological phases under study. After

Table 1 Average ages of the prehistoric groups distributed in the Yellow River Valley.

	Sites \ Sexes	Male Average	Female Average	General Average Age*
General average age, Peiligang Phase	Jiahu	40.66	35.84	34.50
	Jiahu	40.66	35.84	34.50
	Shigu	34.02	28.94	31.94
	Baijiacun	44.38	34.44	32.87
		39.69	33.07	33.10
General average age, Yangshao Phase	Yuanjunmiao	34.97	30.54	29.00
	Beishouling	41.03	35.35	39.11
	Jiangzhai I	35.66	30.60	30.12
	Jiangzhai II	41.27	38.73	38.47
	Hengzhen	37.42	30.91	29.70
	Fulianbao	42.13	35.90	34.70
	Shijia	42.61	40.94	39.51
	Longgangsi	37.36	32.77	32.50
	Hejiawan	37.65	36.38	33.19
	Lüjiaya	36.67	40.00	36.55
	Xiawanggang I	43.68	39.91	36.57
	Xiawanggang II	42.07	36.66	36.79
	Wangwan I	30.30	21.90	27.50
	Dahecun	35.86	36.89	35.45
	Hongshanmiao	41.60	24.86	32.03
	Liuwan	37.86	37.89	36.58
	Yinwa	35.75	26.67	27.93
	Yuanyangchi	47.16	47.38	38.19
	Dadiwan	38.46	28.29	29.40
	Yangshan	33.37	36.50	29.33
		38.64	34.45	33.63
General average age, Dawenkou Phase	Dawenkou	34.88	34.53	32.17
	Wangyin	35.78	33.96	33.49
	Dadunzi	37.28	37.02	35.66
	Liulin	36.32	34.89	33.79
	Jianxin	31.34	26.11	25.70
	Wucun	29.83	29.93	16.83
	Fujia	25.84	28.11	24.56
	Chengzi	33.33	31.95	32.61
	Yuchisi	31.03	30.58	14.08
	Yedian	38.53	34.21	26.66
	Sanlihe	40.08	37.84	33.17
	Xixiahou	39.86	35.35	26.88
	Huating	26.72	25.75	21.21
		33.91	32.33	27.45
General average age, Longshan Phase	Sanlihe	37.19	42.06	38.09
	Yinjiacheng	34.98	36.25	31.38
	Chengzi	34.72	30.83	28.36
	Dahecun	38.97	23.80	34.79
	Wangwan II	31.35	28.50	29.50
	Xinhua	42.12	34.88	37.28
	Liuwan	36.76	35.71	35.14
	Qinweijia	38.25	29.87	30.32
	Caiyuan	31.27	30.50	26.61
		36.18	32.49	32.39
General average age, Erlitou Phase	Youyao	33.74	25.89	28.46
	Donghuishan	31.34	27.79	26.92
	Huoshougou	32.95	32.00	29.56
	Ganguya	42.97	38.17	31.51
		35.25	30.96	29.11

*General average age is derived from all the human interments that have been estimated to age, including those have not been identified to sex.

Yangshao Phase, the climatic conditions started to deteriorate. In particular, the several events of significant fall in temperature levied considerable effect on the longevity of the population. By the Erlitou Phase, average age was the lowest. To illustrate the effect of climatic oscillation to the longevity of human population, we take the cold event of 5000 BP as an example. By that time the average ages of the varying human groups of the Yellow River Valley were, in general, low. In particular, the general average age of Yuchisi was only 14.08. Environmental change has a series of significant effects on daily life, including health and food resources. It directly or indirectly affect-

ed the longevity of the prehistoric populations distributed in the Yellow River Valley at different times.

To sum, the processes of social complexity and environmental change effected the average age of the prehistoric populations distributed in the Yellow River Valley. Within the time span under study, human longevity decreased through time. To a certain extent, this change indicates the continuous deterioration of the state of health of prehistoric population distributed in the Yellow River Valley.

Male average height of the prehistory population distributed in the Yellow River Valley

Height is one of the basic phenotypes of human kind. It has broad attention from physical anthropologists and is deemed to be one of the most important areas in the study of human health. Change in body height of a population not only reflects the dynamics of phenotypic characteristics of human kind, but also contains information pertaining to functional stress, paleo-pathology and diet pattern that directly reflect the evolutions of human health.

To date, physical anthropologists have provided height information of male specimens of 13 prehistoric burial assemblages of the Yellow River Valley. Two Peiligang Phase sites have been studied. The male average height of the Jiahu group is 171.2cm, and that of the Shigu group is 167.0cm. The height information of seven Yangshao assemblages is available. The average height of Jiangzhai I group is 170.29cm, that of the Jiangzhai II group is 168.81, that of the Beishouling group is 168.82, that of the Hengzhen group is 167.70, that of the Yuanjunmiao group is 168.40, that of the Banpo group is 169.50, and that of the Xiawanggang group is 161.00cm. The heights of two burial assemblages of the Dawenkou Phase have been studied. The male average height of Xixiahou group is 169.63cm, and that of the Dawenkou group is 171.68cm. Similarly, the heights of two burial assemblages of the Longshan Phase have been studied. The male average height of Miaodigou II group is 166.00cm, and that of the Mengzhuang group is 165.5cm. When the 13 groups are collapsed into cultural phases, the male average height of Peiligang Phase is 169.10cm, that of the Yangshao Phase is 167.79cm, that of the Dawenkou Phase is 170.66cm, and finally that of the Longshan Phase is 165.75cm. These numbers suggest a graduate reduction of the average height of male specimens among the prehistoric population distributed in the Yellow River Valley. This trend is related to the continuous increase in the intensity of manual labor and functional pressure due to the emergence and development of agriculture. During the period between 8000 BP to 4000 BP, the fluctuation of the distributions of millet and rice cultivation zones in the Yellow River Valley, to a certain extent, indicated the development, intensification and change of prehistoric agriculture in China. Although there were variations in the regional distribution and subsistence pattern of the Yellow River Valley prehistoric sites under study, the increasing intensification of agriculture was a general trend. There exists a relationship between the increase of intensity of manual labor and functional pressure and the graduate decrease in male average height. Therefore, the decrease in body height suggests the deterioration of human health through time.

Prevalence of the prehistoric population distributed in the Yellow River Valley

The paleo-pathology data of prehistoric the Yellow River Valley mainly comprise of random studies of individual sites. Some scholars have discussed the implications of these data. The present paper focuses on dental caries. Fourteen the Yellow River Valley prehistoric sites yield relatively systematic information of dental caries. The rate of dental caries is 2.45% for the Jiahu group, 6.60% for the Beishouling group, 3.40% for the Yuanjunmiao group, 12.12% for the Xiawanggang group, 42.86% for the Dahecun group, 17.60% for the Hongshanmiao group, 47.06% for the Qingtai group, 2.80% for the Liuwan group, 6.40% for the Dadunzi group, 3.30% for the Dawenkou group, 19.50% for the Guangwu group, 5.50% for the Miaodigou II group, 54.24% for the Zhouli Longshan group, and finally 1.00% for the Taosi group. When these groups collapse into cultural phases, the rate of dental caries is 2.45% for the Peiligang phase, 18.99% for the Yangshao Phase, 4.85% for the Dawenkou Phase, and 20.06% for the Longshan Phase. The above analysis suggests that the rate of dental caries among the prehistoric population distributed in the Yellow River Valley gradually increased through time. The information on dental caries bears the shortcomings of non-systematic and not particularly rich, and there exists difference in study method among physical anthropologists. Yet, studies from the same scientist yield results consistent with the above observed patterns. For instance, Du Bailian's study of Jiahu, Xiawanggang, Dahecun, Qingtai, and Zhouli of Henan (1999) shows a similar pattern of gradual increase in dental caries rate through time. In addition, random data suggest that the rate of chronic diseases increased through time among the Yellow River prehistoric groups. The Mengzhuang group shows a rate of chronic disease at 29.63%, and some specimens have indications of multiple diseases. This trend is not seen in the earlier phases. Furthermore, it is worth to note that the rate of dental caries significantly vary among human groups of the same cultural phases. For instance, the Zhouli group of Longshan Phase has a high rate of dental caries at 54.24%; conversely, that of Taosi is only 1.00%. Whether this is attributable to the difference of the status and nature of the cemeteries under comparison, or to the subsistence pattern has to be determined by future dietary, faunal and floral analyses.

There exists an inter-relationship between the increasing rates of dental caries and overall prevalence with the intensification of agriculture and changes of social environment. Recent studies indicate that the proportion of agriculture in the economy of the society increased through time. The increasing reliance on agriculture and the increase in the variety of crops contributed to an increase in the ratio of carbohydrate-rich grain food to the protein-rich animal

food in human diet. Although the increase in grain food alleviated the crisis of population growth, it affected human health in negative ways. Sugar- and carbohydrate-rich food encourages the proliferation of oral bacteria that erode human tooth enamel and to a certain extent contribute to the continuous increase in dental caries. Intensification of agriculture provides the premise for the developing size of human population. However, the increase in population size and density accelerated the dispersal of epidemic diseases. The changes in pathological rate of the prehistoric population distributed in the Yellow River Valley suggest the continuous deterioration of human health.

Conclusions

Investigations on the longevity, male average height and pathological rate lead to the conclusion that human health deteriorated through time during the prehistory of the Yellow River Valley. This trend intertwines with the emergence and the subsequent intensification of agriculture, and the continuous increase of population size. This observation points to a number of questions needed to be answered but we are constrained by the extant information. Intriguing questions include the effects of environment and subsistence patterns to human health, and horizontal regional variation of human health. The conclusion of this paper is tentative; but it suggests new lines of investigation. The current study of prehistoric health in China is a pathfinding one. It is imperative to obtain fine-grained data, and analyze them with innovative approaches.

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Postscript

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