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A REVIEW ON THE SPREAD OF THE ANAEMIA IN THE INDUS VALLEY

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ABSTRACT: ***The Harappan, or Indus Valley, civilization, with characteristics such as a highly specialized and functionally integrated economy, centralized hierarchical institutions and a large population base, is considered by many to be among the earliest and most evolved of ancient civilizations. During the most recent cemetery excavations at Harappa, two of the 29 cranias recovered revealed cranial lesions of porotic hyperostosis, indicative of chronic anaemia. However, any of the 92 individuals for whom postcranial remains were preserved showed no lesions associated with the symptoms of inherited anaemias, indicating that the most likely diagnosis is an acquired iron de science. In a diverse ecological environment, this low prevalence of anaemia can be associated with a good nutritional base and few gastrointestinal and other infections due to high personal and community hygiene standards. Genetic anaemia may be responsible for an apparently higher incidence of porotic hyperostosis in Mohenjo-Daro, a Harappan site located in a different environmental region, but these results are tentative due to the limited samples available for these and other South Asian sites.***

KEYWORDS:Cribraorbitalia,Harappan civilization; Harappa; Mohenjo-Daro; Porotic hyperostosis.

INTRODUCTION

Conventional wisdom holds that growth is hampered by anaemia, sexual maturation is delayed and work efficiency and exercise ability are affected. Moreover, there is some evidence to show that in anaemic children, such as attention span and conceptual learning, may incur permanent developmental deficits in mental faculties. Consequently, anaemia, especially in the developing world and among the poor in more prosperous communities, has long been considered a major health issue.The bone marrow is activated to improve red blood cell production as the body's iron reserves have been drained and the circulating haemoglobin has been decreased. Macroscopically evident resorptive lesions of the external surfaces of the cranial vault and orbital roofs, which are attributable to hyperplasia of the underlying marrow, are the most widely cited skeletal manifestations of this process[1]. Due to their porous appearance, these lesions, also referred to as 'porotic hyperostosis,' are thought to be while they may continue, incompletely cured, they result from chronic iron deficiency in infancy into adulthood, even though the iron deficiency has been resolved[2].In intensity and patterning, lesions can range from scattered fine

Foramina to related cribrotic characteristics, the latter most often found in the roofs of the orbits and called 'orbitaliacrybra'. In babies and children, orbital lesions are most severe and widespread and develop as early as 6 months of age and as late as 12 years. Vault lesions can also develop as early as 6 months and are most likely to be observed after 5 years of age, appearing to become more prominent within the first decade of life.Although clinical radiographs of patients with different forms of anaemia may display bone changes, macroscopic lesions give a more precise image of the occurrence of the disorder in a skeletal population, as at most 50 ± 75 per cent of clinical patients with anaemia have observed

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changes in X-rays[3].In this article, data has been reviewed on the skeletal markers of anaemia at Harappa and Mohenjo-Daro in relation to the particular environmental and cultural conditions of the two locations, in order to determine the relative effect of various influences on the pathogenesis of anaemia in the sense of anaemia in the valley of the Ancient Indus. Harappa is the sort of Harappan, or Indus Valley, civilization that nourished what is now Pakistan in the Indus River valley some 4000±5000 years ago[4].Apparently, society had a highly specialized and functionally organized economy, centralized bureaucratic institutions and a broad population base, as well as its own writing system, a standardized weight and measurement system and consistent types and iconography of vessels. The subsistence economy was primarily based on cultivation of wheat and barley, but also included husbandry of cattle, sheep and goats.

Figure 1: Map of South Asia showing the locations of sites mentioned in the paper

An analysis of the relative probabilities of acquired and genetic anaemia and, thus, of the physical, sociocultural and environmental evidence for these pathological conditions is needed to classify the probable cause(s) of anaemia in the Indus Valley. Skeletal symptoms of anaemia are uncommon in early stages outside the cultural and geographic sphere of the Indus Valley, but tend to rise in incidence in the Harappan era and later, but this pattern may be an artifact of limited samples and should be viewed cautiously.Possible porotic hyperostosis was found at the Sri Lankan site of BelilenaKitulgala on the frontal bone of a boy from Upper Pleistocene stages (12 260+870 years BP), but the aetiology of this disease is unclear.The single skeleton from the Mesolithic BaghaiKhorrockshelter that was studied had porotic hyperostosis on the frontal and parietal bones, but no lesions were found in skeletal samples of 10 and 30 individuals from the SaraiNaharRai and MahadahaGangetic Mesolithic sites, respectively. In four of the 22 crania from the Chalcolithic (pre-Harappan) site of

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Inamgaon, porotic hyperostosis was found[5]. Three out of five Iron Age (post-Harappan) Raigircranias exhibit vault lesions[6].

The lesions found in the Harappa and Mohenjo-Daro skeletal remains are consistent with the diagnosis of acquired iron deficiency anaemia, as they are typically mild and localized when this disorder results in skeletal changes, such as porous lesions and diploic thickening of the cranial vault and orbital roofs.Coarse trabeculation has also been found at the ends of long bones, metacarpals and phalanges in children, and some facial activity in adults, although these characteristics have not been observed in the remains of Harappan.Anaemia also results from iron deficiency acquired due to chronic illness or prolonged gastrointestinal parasite-induced blood loss. The pathogen load impacting a population relies on a number of variables in the physical and social environments in any situation. With sedentism and denser load, the load increases with people that both the transmission of infectious agents between people in close proximity and the accumulation of human waste and other refuse in and around the settlement are encouraged by these communities. However, proper sanitation and personal hygiene can moderate these effects.For instance, the inter-individual transmission of intestinal parasites typically happens via the faecal±oral pathway and is thus linked to the existence of the settlement, the availability of water and the disposal of waste. There is evidence in both Mohenjo-Daro and Harappa that the societies have stressed high sanitation requirements, with impressive water supply and waste disposal features. Wells provided fresh water, and within private houses were built bathing platforms and latrines where sloping floors, gutters and ceramic drainpipes channelled sewage into cesspits and filled street drains.Increased sedentism and population growth are often generally linked with recurrent respiratory infections, but do not seem to have been widespread in Harappa. In the Harappan samples, no skeletal evidence of tuberculosis or any related infection has been found and the incidence of non-specific infectious diseases is poor.Just 5 percent of the overall Harappa study showed periosteal lesions, all of which were on long bones. Porotic hyperostosis and periostitis are also strongly associated and a relatively low pathogen load is thus demonstrated by the low frequencies of both conditions at Harappa[7].Therefore, in the Harappan civilization, the high degree of personal, household and community hygiene seems to have restricted the spread of infectious diseases in areas of urban expansion and high population densities.While iron deficiency in Harappa does not appear to be the product of infectious diseases, nutritional deficiency, most commonly iron deficiency, can also be the cause of this form of anaemia. Maize-dependent diets, commonly cited as the primary causes and anaemia of iron deficiency, because they are subject to babies and children

Deficiencies of iron and protein/calorie can be omitted as causative factors of anaemia in Harappa, where wheat and barley and later millets were the main agricultural foodstuffs; maize was unknown until the sixteenth century AD in the Old World.However, scarcity of iron consumption can also be associated with low levels of meat in the diet, as meat supplies haem iron that is readily absorbed by the body, while plants supply non-haem iron that is absorbed at just 10±25 percent of the rate of absorption of haem iron. In addition to this iron deficiency, diets that depend heavily on agricultural produce are often often marked by insufficient protein intake, which is necessary for the production of red blood cells.Deficient iron consumption can also occur when breast milk or cow and goat milk is stored for too long by children, both of which are low sources of iron relative to red meat, legumes, shellfish and dark green leafy vegetables. While it is not currently possible to classify the relative amounts

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of animal and plant foods in the Harappan diet or to determine the components of the diet for infants, it is not possible to rule out a dietary deficit in iron.

CONCLUSION

Skeletal lesions suggest that, comparison to Mohenjo-Daro, anaemia was comparatively rare in the population at Harappa. Highly urbanized centers such as these also experience elevated frequencies of iron deficiency acquired due to the proliferation of infectious diseases induced by the availability of polluted water and close interaction with people. However, commitment to personal and environmental hygiene, In the Harappan civilization, the risk of anaemia from blood loss attributable to gastrointestinal parasitic infection was presumably reduced.Systemic markers of stress, including enamel hypoplasia and Harris'Episodic morbidity is shown by lines in Harappan skeletons, but since these are not associated with high frequencies of porotic hyperostosis or periostitis, they seem to represent acute rather than chronic stress[8]. Furthermore, in South Asian skeletal studies, there is actually no evidence for chronic infectious diseases.During the Harappan (urban phase) period, a few major urban centers and many villages, primarily linked to the river systems that stored alluvium for the cultivation of cereal crops, appeared along the drainage of the Indus River and peripheral areas (Figure 1). The twin capitals of this ethnic movement have long been considered the locations of Harappa in the north and Mohenjo-Daro in the south.

Of note, the causative agent(s) of anaemia need not be the same in both areas, and environmental variations associated with Indus floods and endemic malaria may have resulted in a comparatively higher prevalence of genetic anaemia reflecting porotic hyperostosis in Mohenjo-Daro. A important reason for this diagnosis is the geographical spread of hereditary pathological haemoglobins and epidemic and endemic malaria in South Asia today, while the lack of preserved postcranial remains in South Asian skeletal sequence, and hence the absence of evidence for the pathognomonic postcranial lesions indicate that it is not actually possible to validate this view.

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