

A biological distance analysis of Cyprus population from Chalcolithic to Late Bronze Age

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Introduction:

The subject of my doctoral study was designed to explore the biological affinities of Cypriot populations from the Chalcolithic period until the Late Bronze Age. It has tested the relationships between different regional and temporal settlements based on the evaluation and analysis of the frequencies of non-metric dental traits, by identifying similarities and potential discrepancies in dental morphology. The latter serving as a proxy for genetic data might indicate a change of the composition of the inhabitants reflecting a potential migration event.

The primary aim of the study was to examine and record the presence or absence of non-metric dental traits in selected samples and through the statistical analysis to provide an indication of the biological distance between these populations. The objective was to establish the biological proximity of Cypriot populations and to interpret the results within the cultural context of Cyprus and the observed changes in material culture. In addition, the biological distance results from Cyprus were compared and discussed against similar research data from the East Mediterranean region, in order to view them within a dynamic environment of cultural interactions and advances not solely in the island but in the broad area.

Background:

The island has been relatively isolated with any migration event not attested and culturally homogenous with some regionalism present from its initial colonisation until the Late Chalcolithic period. Another feature observed is the lack of sites with continuous sequence from the Neolithic until the end of the Bronze Age. During the transitional periods the abandonment of existing settlements and the establishment of new ones are combined with the introduction of novel elements or a mix of cultural elements between the preceding and the subsequent phases. Especially, throughout the Bronze Age the island gradually reflected changes and went through a process that lead to major social, economic, and cultural transformations. The question that emerges is whether these events could be attributed to demic diffusion from neighbour areas or are part exclusively of an internal process of acculturation of the Cypriot indigenous population.

The first hypothesis for a migration event with significant number of people moving to the island is set chronologically during the transitional period that marks the end of Chalcolithic period and the introduction of Early Bronze period. The emergence of a new cultural model with differences in material world and the development of innovative technological advances may suggest Anatolian people moving to the island. The next significant stage that questions a movement of population is the transition phase between the end years of Late Bronze Age and

the Geometric period. The introduction of Greek elements in Cypriot culture is often associated with a migration event: A movement of population from the sub-Mycenaean Greece.

Biological distance analysis (or Biodistance):

The term refers to the measurement and interpretation of relatedness or divergence between populations based on polygenic skeletal and dental traits. The approaches used in biodistance include the assessment of skeletal and dental traits by recording the variation in metric attributes and the variation in degrees of expression of morphological traits. The examination of these variations in skeletal and dental data is commonly used to define patterns that are assumed to reflect genetic affinities within or between past populations. The latter suggests the basic assumption for all biodistance studies that the populations sharing similar metric or non-metric attributes are more closely related than those populations showing differences in the same attributes.

Dental morphology is the study of the shape and form of teeth. The utility of studying the tooth morphology and its variation in past and modern populations has been applied in research questions in anthropology and archaeology. Dental non-metric traits are commonly used in biodistance studies as they exhibit certain advantages: preservability, observability, variability and heritability. They are easy and quick to record and a dental non-metric research is a simple, low cost, effective and non-destructive method.

Samples

The samples selected in the present study are representative for the selected historical time frame to include populations before and after the potential migration events. In addition, the samples were selected to cover certain geographic parts of the island. Permissions were granted from the excavators (where necessary) and the Department of Antiquities of the Republic of Cyprus. The human remains studied in this research were from the excavations at *Souskiou Vathyrkakas*, *Kissonerga Mosphilia*, *Lemba Lakkous*, *Erimi Pamboula*, *Ypsonas Vounaros*, *Deneia*, *Episkopi Phaneromeni*, *Sotira Kaminoudhia*, *Alassa Paliotaverna* and *Pano Mantilaris*, *Limassol Tombs* and *Palaepaphos Skales*. The human remains from the latter mainly belong to the Geometric period, but it was included for comparison with the Bronze Age samples. The study of the archaeological remains took place in Cyprus where the samples are currently stored in the local museums.

Methodology

The dental remains were examined and the presence/absence of the dental traits was recorded to produce each trait frequency appearance in the population. The research employed the individual count method, where the antimere with the highest degree of expression is scored. This method maximizes sample size, avoids the problem of antimeric symmetry, and holds that the side exhibiting the greatest trait expression best reflects the underlying genotype. The score of dental traits was based on the industry gold standard: The Arizona State University Dental Anthropology System, allowing the results to be comparable with other projects.

The statistical analysis to test biological affinities employed the Mean Measure of Divergence, which is considered the standard test and the appropriate method to examine biological proximity based on non-metric traits in relative smaller samples and also the Bray Curtis similarity index.

Results

There were certain limitations associated with the study of Cypriot dental remains. First, Late Bronze Age and the Palaepaphos samples provided only a small number of observations. Secondly, the preservation of some dental morphological elements was poor reducing the ability to score traits in some cases. However, despite these difficulties the results provided a framework to discuss the relationships between the samples and the potential migration events.

The results of the biodistance analysis, bearing in mind the limitations of the methodology and the caution of a small number of observations for some of the samples, showed a remarkable similarity of the overall dental traits frequencies in the Cypriot populations from the Chalcolithic period until the beginning of the Geometric phase. However, the similarities observed in the dental phenotypes could be read in two different ways.

Firstly, these results might indicate the exclusion of demic diffusions episodes and arrival of waves of new settlers from the neighbourhood areas. Therefore, it supports the continuity of the Cypriot population and proposes its isolation during this period. However, it is not unlikely that a new group of settlers might have arrived in the island as Cyprus raises its role as a central point in the international networks and the observation of increased trade and cultural interactions.

A second approach is that the reason for the similarities in dental phenotype in Cypriot population could be not to the isolation of the indigenous people but the similarities of people belonging to the same dental anthropology group. Within a group of people sharing close genetic data, dental phenotypes are quite similar. In order to observe difference between these groups, it is necessary to study large samples. Unfortunately, archaeological samples and this was the case with the Cypriot samples in my research, do not include a large number of observations and therefore may not reveal small differences that may indicate a slight/significant alteration of the population. However, recent genetic studies showed the common Neolithic Anatolian background for most of the East Mediterranean populations. In this context, even if they were migration events in Cypriot prehistory, the common ancestry may obscure the identification of such movements. New settlers from the Anatolia during the Early Bronze Age or from a fragmented Mycenaean world during the end of the Bronze Age would not be able to identify due to the common genetic background and the subsequent dental phenotype similarities. It is exactly this point that would prevent to make any comments or hypotheses on the scale of any new settlers as it is difficult to trace the extent of their mark in the biological identity of the population.

My research included also a regional comparison of the Cypriot samples with settlements from the Anatolia, Levant and Aegean areas which showed the dental morphology similarities between the populations pointing statistically non-significant differences with only a slight divergence observed. The latter could be attributed to genetic drift and slow dental evolution changes, confirming the common ancestry background of these groups as previously described.

Conclusion

The present study could not draw a secure answer about the events of possible population movements. The increased trade/cultural contacts might provide the conditions that allowed a number of people from the Anatolia, Levant and Aegean areas to move to the island during the Early-Late Bronze Age period. It would not be possible to comment whether the new settlers might have moved in large scale or in a single event or multiple waves. Any number of new settlers along with the material goods (brought by them or via the trade routes) and the exchange of cultural traits contributed to the uniqueness of the Cypriot culture.

It would be interesting the extension of the current study to include samples from the Neolithic and after the Geometric period. It would also be worth to try to access samples that were not possible to study due to COVID 19 restrictions or because the material was still unpublished.

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