

# Analyzing the Prevalence and Severity of Cribra Orbitalia in Bronze Age Arabia

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## Background

The Umm an-Nar (ca. 2700-2000 BCE) is marked by the intensification of oasis agriculture leading to increased sedentism, as well as the emergence of complex trade networks (Potts, 2009). Tombs Unar 1 (Figure 1) and Unar 2 (Figure 2) are found in the Shimal Necropolis in the Emirate of Ras Al-Khaimah, UAE (Figure 3) and date to the latter third millennium BCE. The tombs associated with the Umm an-Nar period hold hundreds of commingled and fragmentary remains. Purposeful commingling in these tombs has been theorized to promote social cohesion and prevent a permanent social hierarchy from being implemented (Magee, 2014). Enhanced aridification began around 2200 BCE (Gregorick, 2020) and the use of both tombs. This was a decline of the Umm an-Nar period. The abandonment of large Umm an-Nar tombs and the emergence of trade networks with the Indus Valley, and the transition to the Iron Age (Gregorick, 2020).

Active cribra orbitalia present in Unar 1 as opposed to Unar 2 suggests a changing subsistence strategy. Higher rates of severe cribra orbitalia in Unar 2 suggest a more severe crisis.

## Methods

Of 955 frontal fragments assessed, 527 of them had scorable orbits. 407 fragments came from Unar 2, and 120 from Unar 1. For individuals with 25% of the orbit present, we scored presence and absence of cribra orbitalia. Additionally, we scored severity using a 0-4 scale (Stuart-Macadam, 1985; Figure 5) and degree of healing using Salvadei and colleagues' (2001) scale of 1-4 (Figure 6). A score of 1 represents no healing with a score of 4 representing almost complete healing.



Figure 1: Tomb Unar 1, post-reconstruction.



Figure 2: Tomb Unar 2, post-reconstruction.

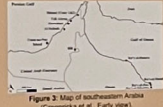


Figure 3: Map of southeastern Arabia (Gregorick et al., Early view).

## Results and Discussion

Table 1: Unar 1 & 2 prevalence & severity counts for all individuals with 25% proportion of orbit present.

	Orbits with CO	Orbits with No CO	Total
Unar 1	26 68.42%	12 31.58%	38
Unar 2	75 71.43%	30 28.57%	105



Figure 4: Measure of severity of cribra orbitalia between tombs.

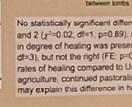


Figure 5: Degree of healing of cribra orbitalia between tombs.



Figure 6: Prevalence and absence counts of cribra orbitalia in comparative Near Eastern sites (Unar 1 and Unar 2).

No statistically significant difference was found in cribra orbitalia rates between tombs Unar 1 and 2 ( $p=0.02$ ;  $df=1$ ;  $p=0.85$ ) nor for severity ( $p=0.55$ ;  $df=2$ ;  $p=0.74$ ). A significant difference in degree of healing was present in the left orbit between tombs (Fisher's Exact:  $p=0.0004$ ,  $df=3$ ), but not the right (FE:  $p=0.52$ ,  $df=3$ ), with individuals from Unar 1 (68%) exhibiting higher rates of healing compared to Unar 2 (14%). Stable resource accumulation from class agriculture, continued pastoralism, and food resources acquired through interregional trade may explain this difference in healing.

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# Osteoimmunology and the reconstruction of host immunological status in treponemal infection: Effect of activated immune cells by oral pathogens and *Treponema pallidum* on osteoclastogenesis.

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## BACKGROUND AND RATIONALE

Long-term infection caused by *Treponema pallidum* (syphilis) can lead to severe bone disease. The effect of oral pathogens on osteoclastogenesis and bone resorption is not well understood. We hypothesize that oral pathogens can lead to bone disease by affecting osteoclastogenesis and bone resorption.



Figure 7: Effect of oral pathogens on osteoclastogenesis.



Figure 8: Effect of oral pathogens on bone resorption.



Figure 9: Effect of oral pathogens on osteoclastogenesis.



Figure 10: Effect of oral pathogens on bone resorption.



Figure 11: Effect of oral pathogens on osteoclastogenesis.



Figure 12: Effect of oral pathogens on bone resorption.



Figure 13: Effect of oral pathogens on osteoclastogenesis.



Figure 14: Effect of oral pathogens on bone resorption.