

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 in this region began around 2200 BCE (Gregoricka, 2020), during the use of both tombs. This was a major factor in the decline of the Umm an-Nar period, leading to the abandonment of large Umm an-Nar centers, breakdown of trade networks with Mesopotamia and the Indus Valley, and the transition into the Wadi Suq period (Gregoricka, 2020).

Hypotheses

1. A larger proportion of active cribra orbitalia lesions would be present in Unar 1 as opposed to Unar 2, due to the changing subsistence strategies.
2. We expected to see higher rates severe cribra orbitalia in Unar 1 as opposed to Unar 2.



Figure 1: Tomb Unar 1, post-excavation.



Figure 2: Tomb Unar 2, post-excavation.

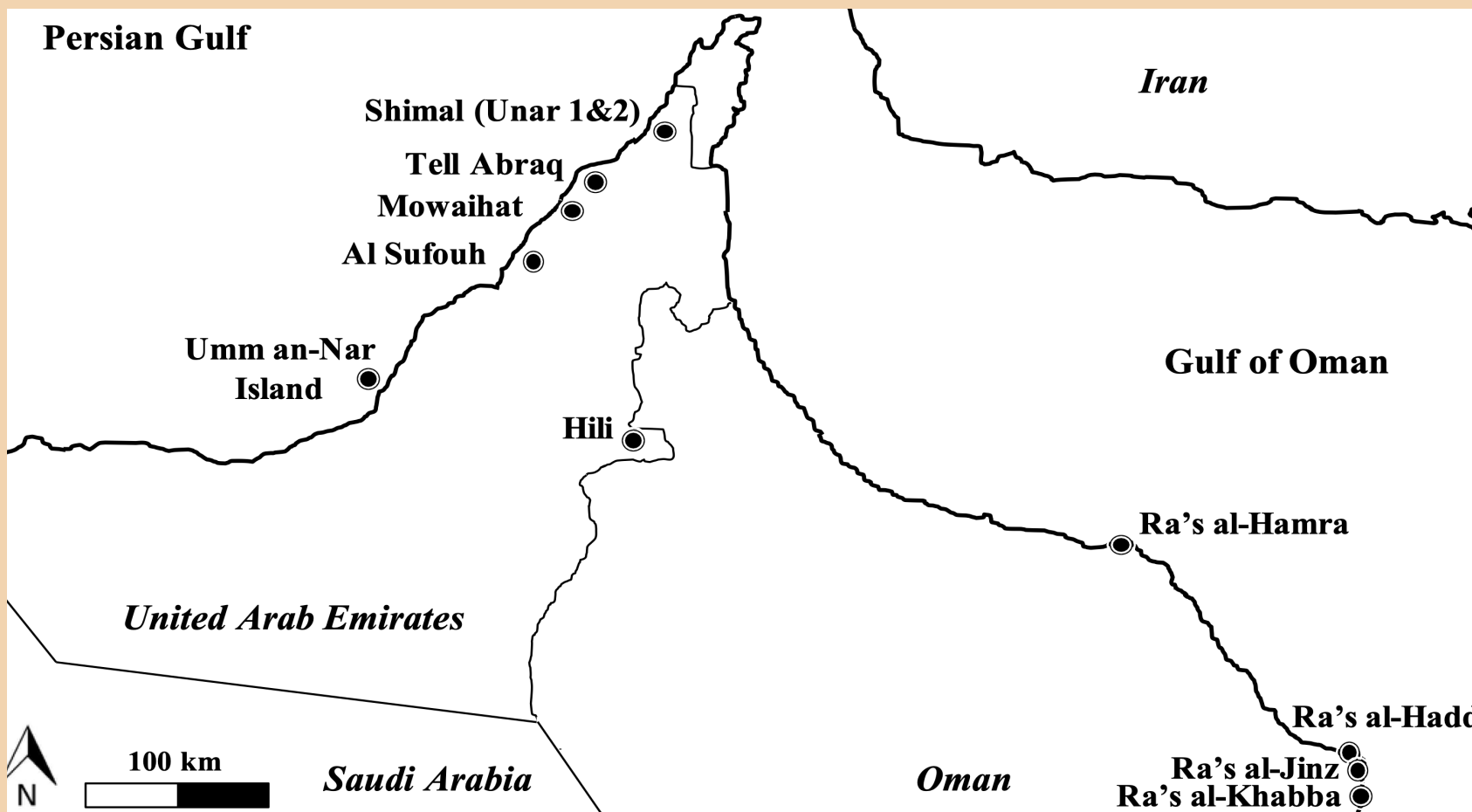


Figure 3: Map of southeastern Arabia (Gregoricka et al., Early view).

Materials & Methods

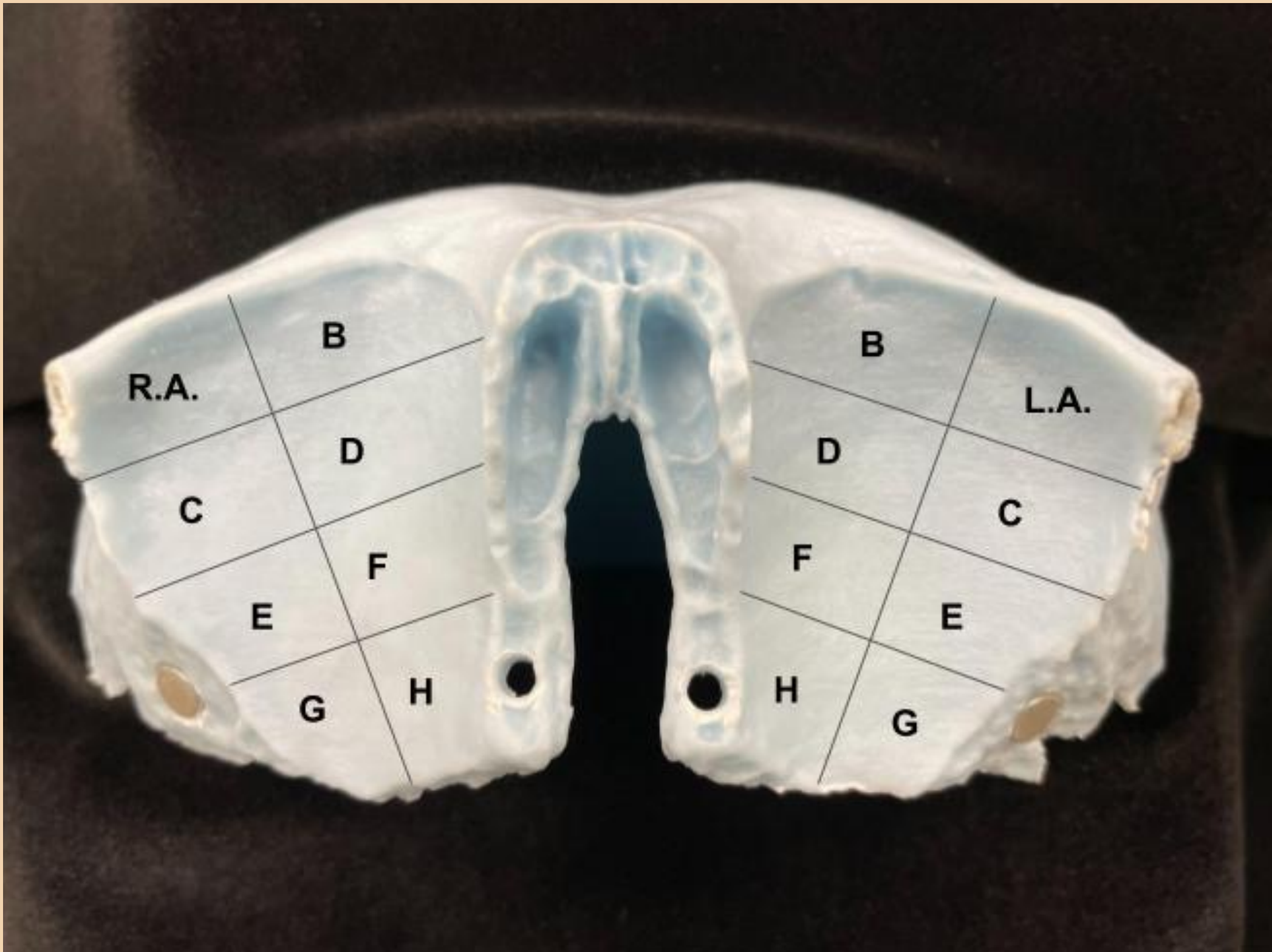


Figure 4: Due to fragmentation, a modification of Knüsel and Outram's (2004) zonation method was used to determine proportion of orbit present. Two zones represented 25% of the orbit.

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 $\geq 25\%$ 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.

Results and Discussion

Table 1: Unar 1 & 2 presence v. absence counts for all individuals with $\geq 25\%$ proportion of orbit present.

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

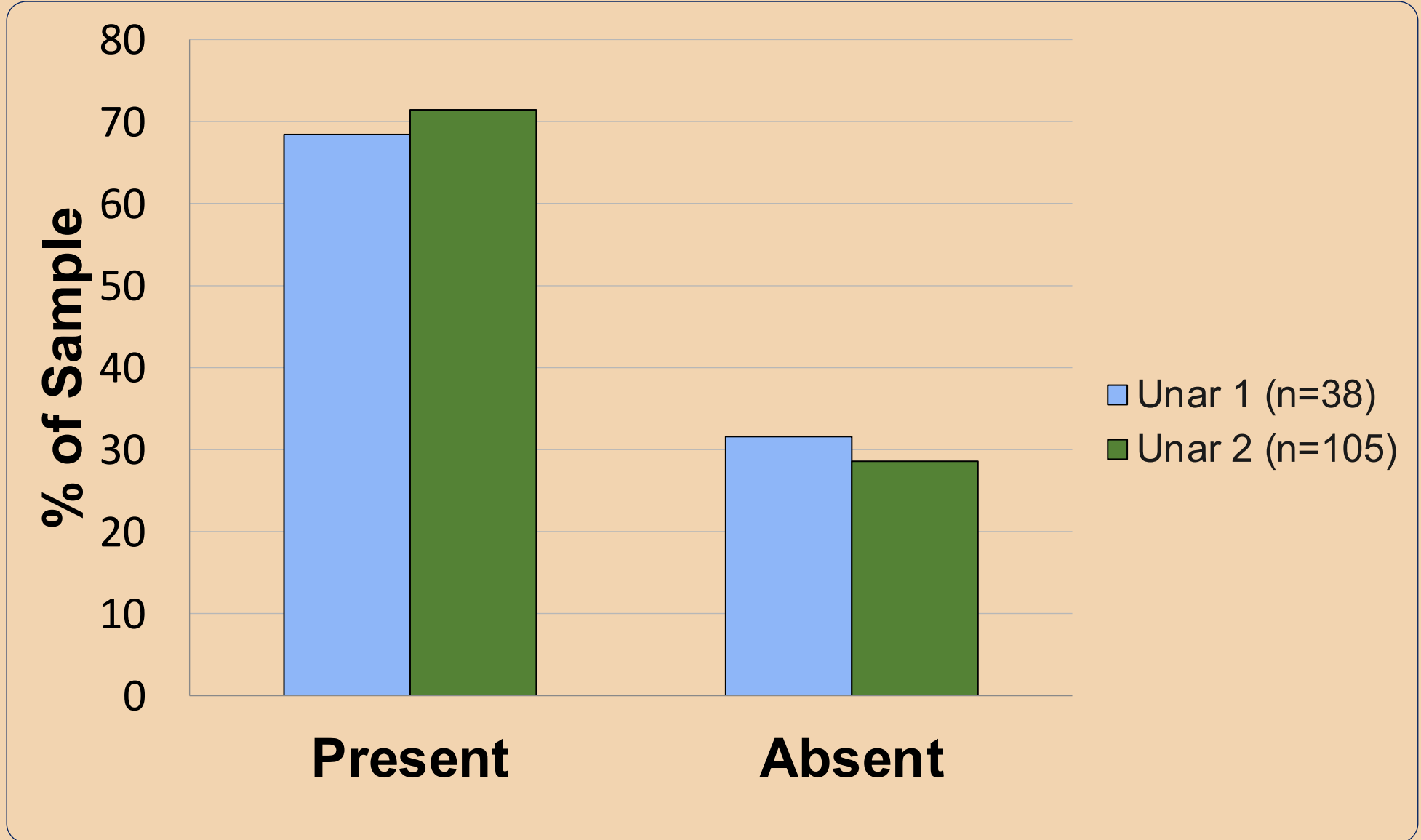


Figure 7: Presence v. absence of cribra orbitalia between tombs.

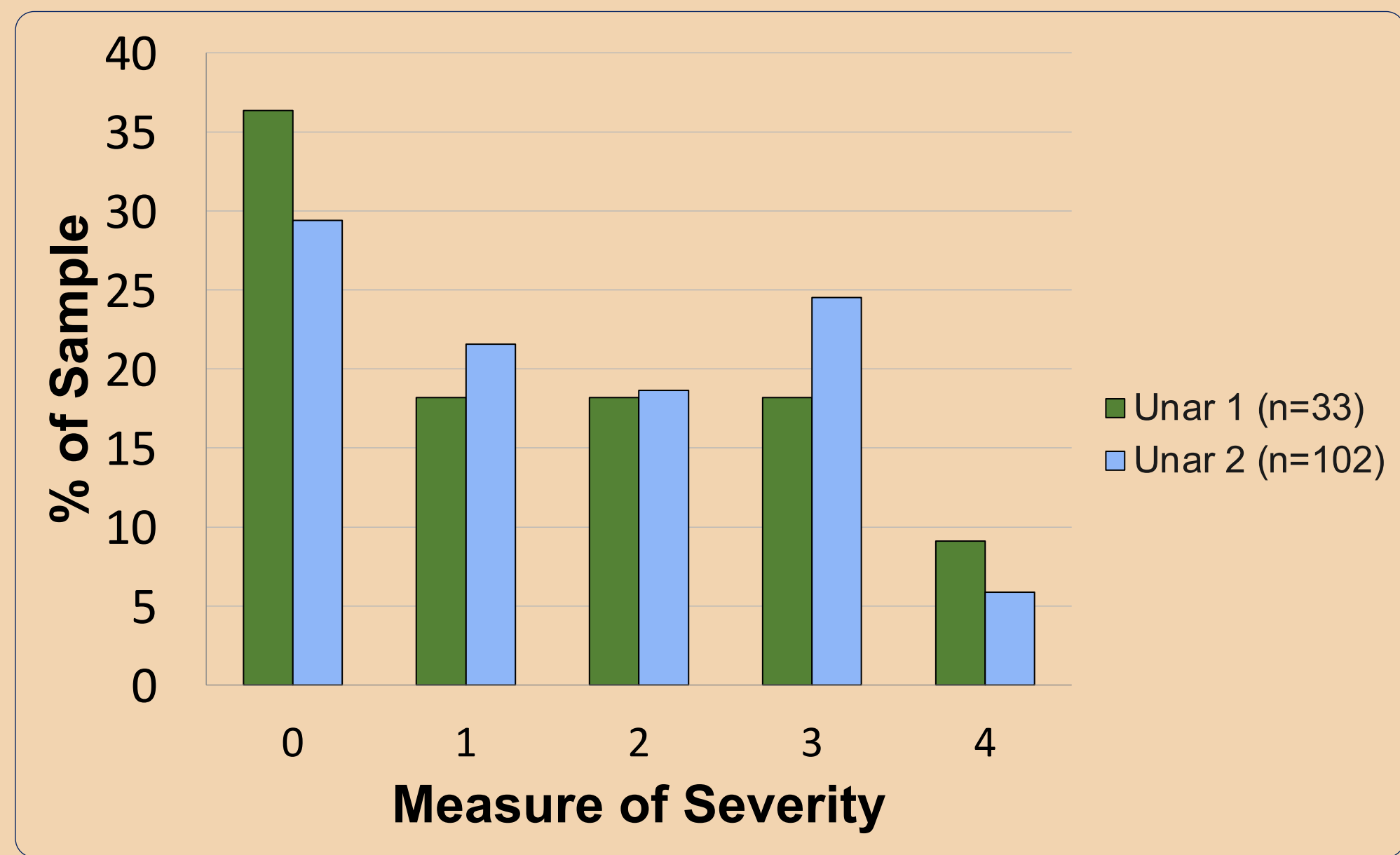


Figure 8: Measure of severity of cribra orbitalia between tombs.

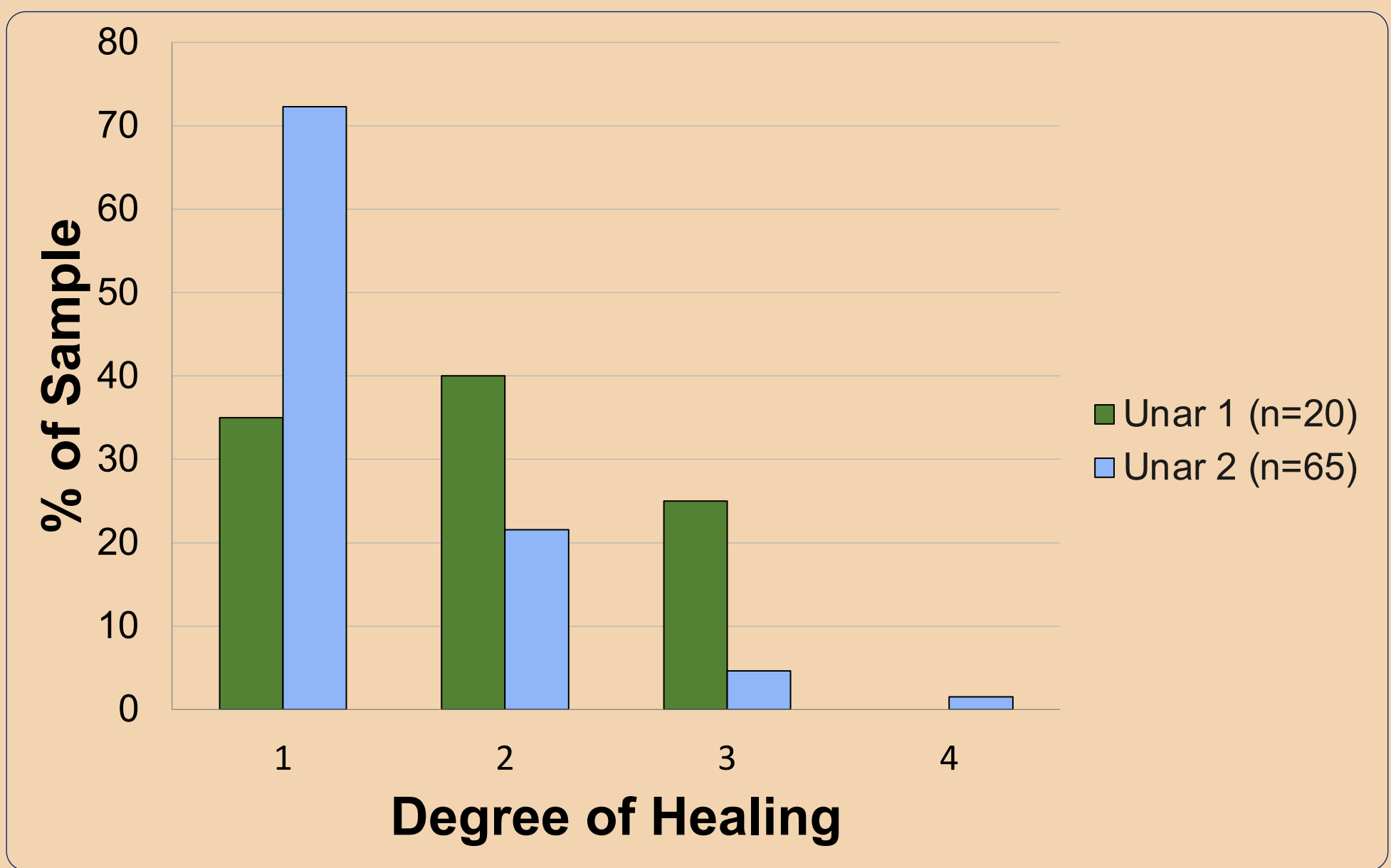


Figure 9: Degree of healing of cribra orbitalia between tombs.

No statistically significant difference was found in cribra orbitalia rates between tombs Unar 1 and 2 ($\chi^2=0.02$, $df=1$, $p=0.89$), nor for severity ($\chi^2=0.59$, $df=2$, $p=0.74$). 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 (69%) exhibiting higher rates of healing compared to Unar 2 (14%). Stable resource accumulation from oasis agriculture, continued pastoralism, and food resources acquired through interregional trade may explain this difference in healing.

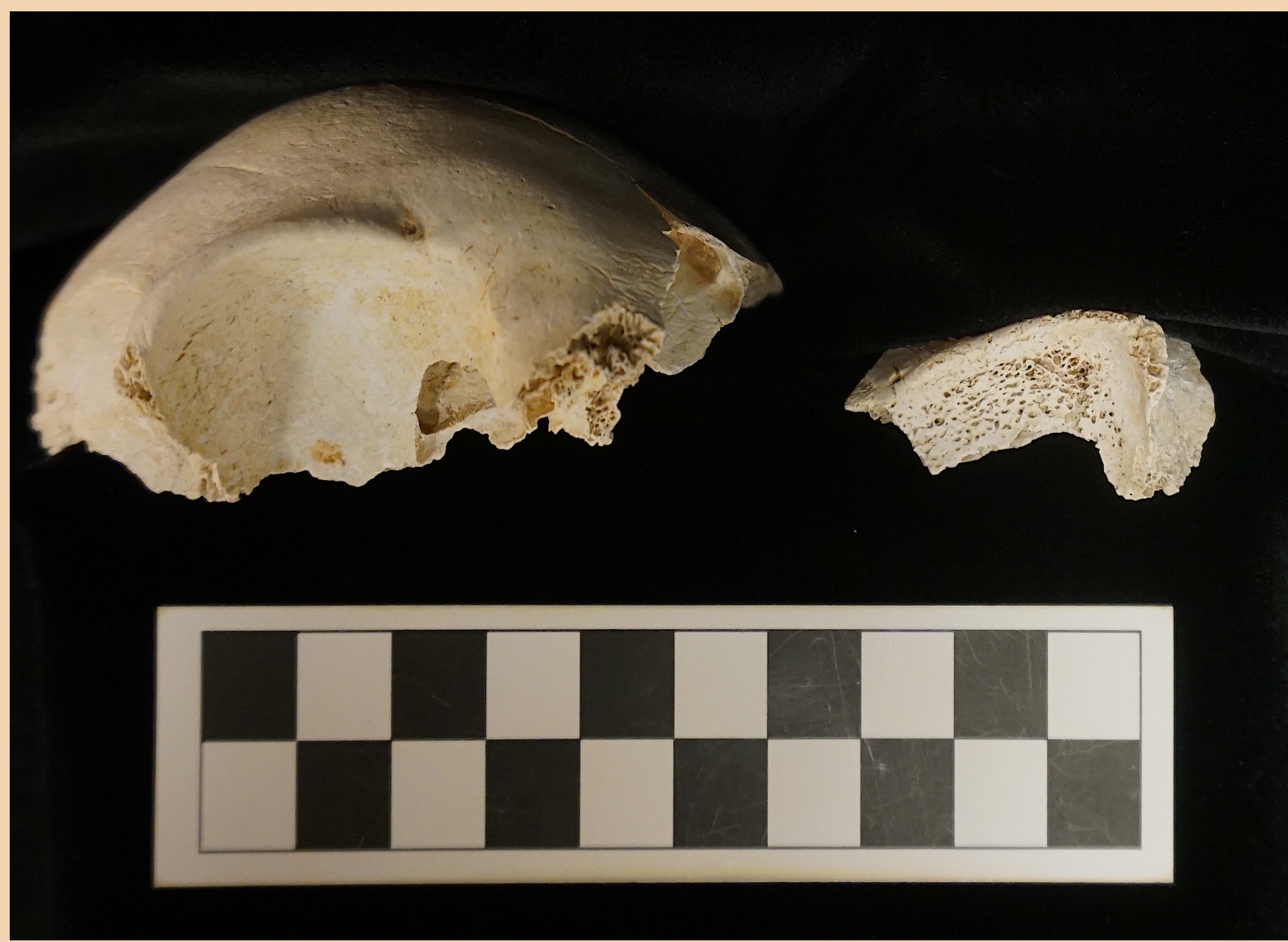


Figure 10: Examples of absence (left) and presence (right) of cribra orbitalia.

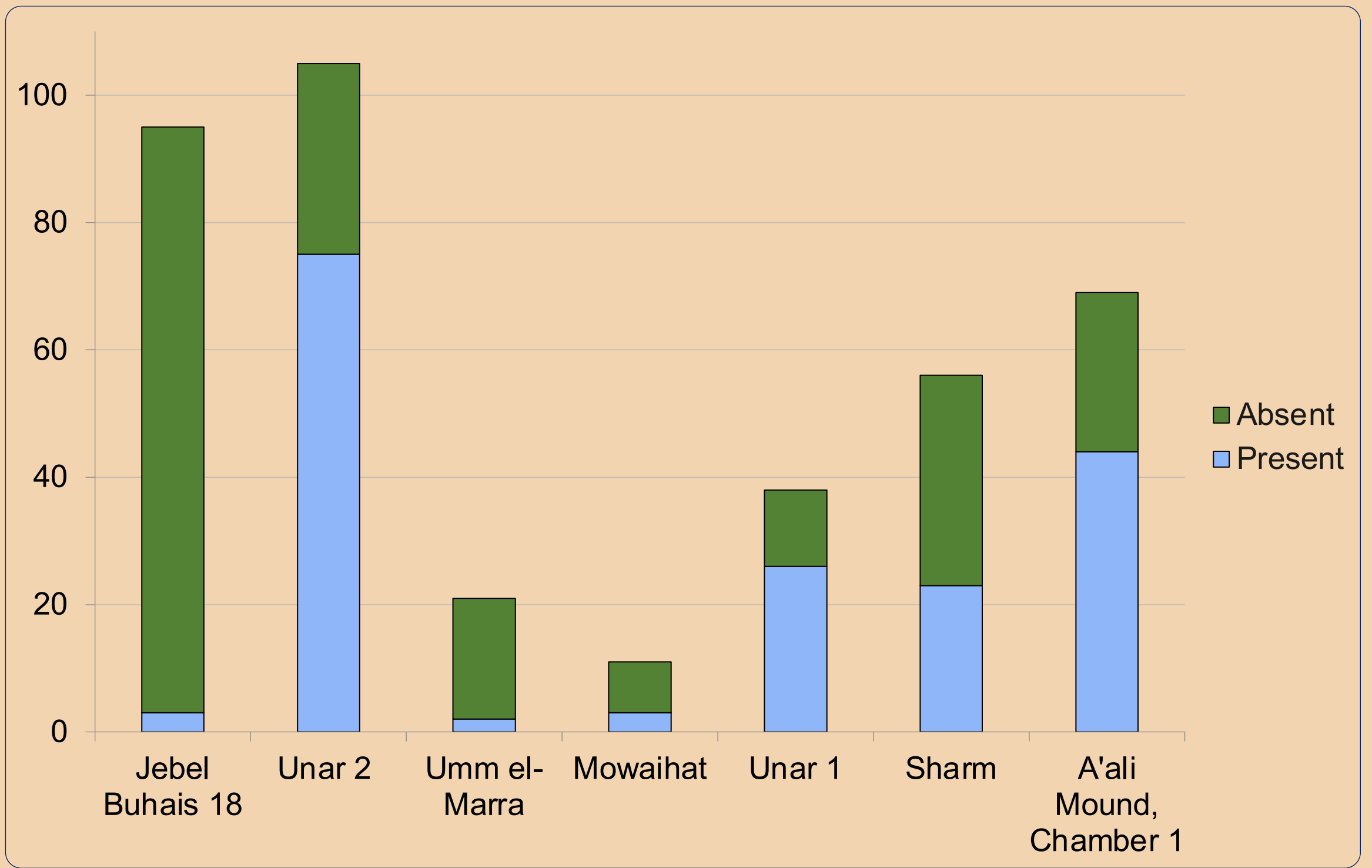


Figure 11: Presence and absence counts of cribra orbitalia at comparative Near Eastern sites v. Unar 1 and Unar 2.

Comparative analyses (**Figure 11**) revealed significant differences in rates of cribra orbitalia in tombs Unar 1 and Unar 2 compared to Neolithic Jebel Buhais and Bronze Age Umm el-Marra, Mowaihat, and Sharm. Jebel Buhais (UAE) had low rates of cribra orbitalia (3%) compared to Unar 1 and 2 (FE: $p<0.001$; $df=1$); this difference could be explained by disparate subsistence strategies. Similarities are seen with Chamber 1 of the A'ali Mound, Bahrain ($\chi^2=0.06$, $p=0.81$, $df=1$; present: 64%), possibly related to agricultural shifts seen in the subsequent Iron Age (Littleton, 2007). Significance differences observed with Bronze Age Mowaihat (UAE) and Umm el-Marra (Syria) may be due to small sample sizes from these assemblages.

Despite agricultural intensification and increasing aridification in southeastern Arabia towards the end of the Umm an-Nar period, similar rates and severity of cribra orbitalia at tombs Unar 1 and 2 suggest the local inhabitants of this area were able to adapt successfully in a way that did not negatively impact their health.

Acknowledgements

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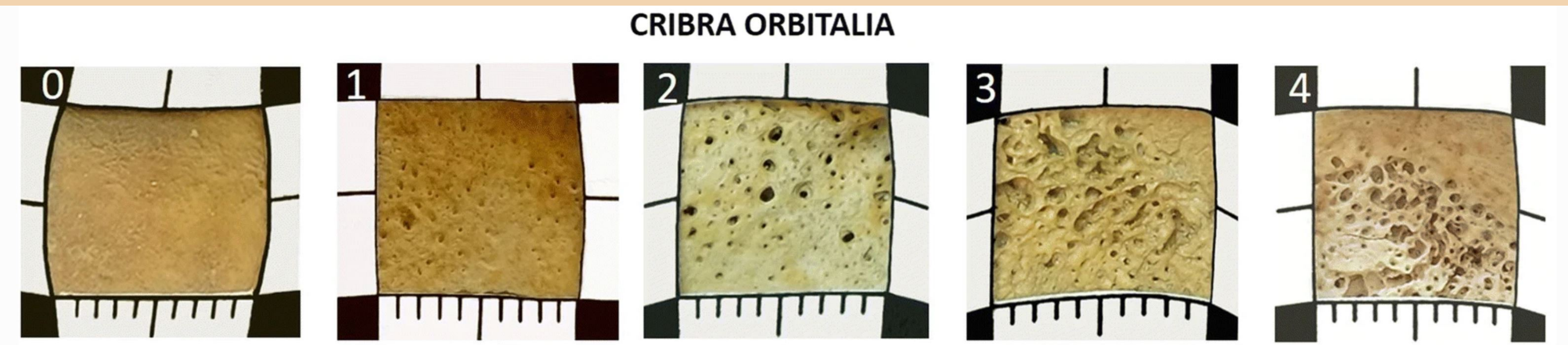


Figure 5: Measure of severity for cribra orbitalia (Rinaldo et al., 2019).

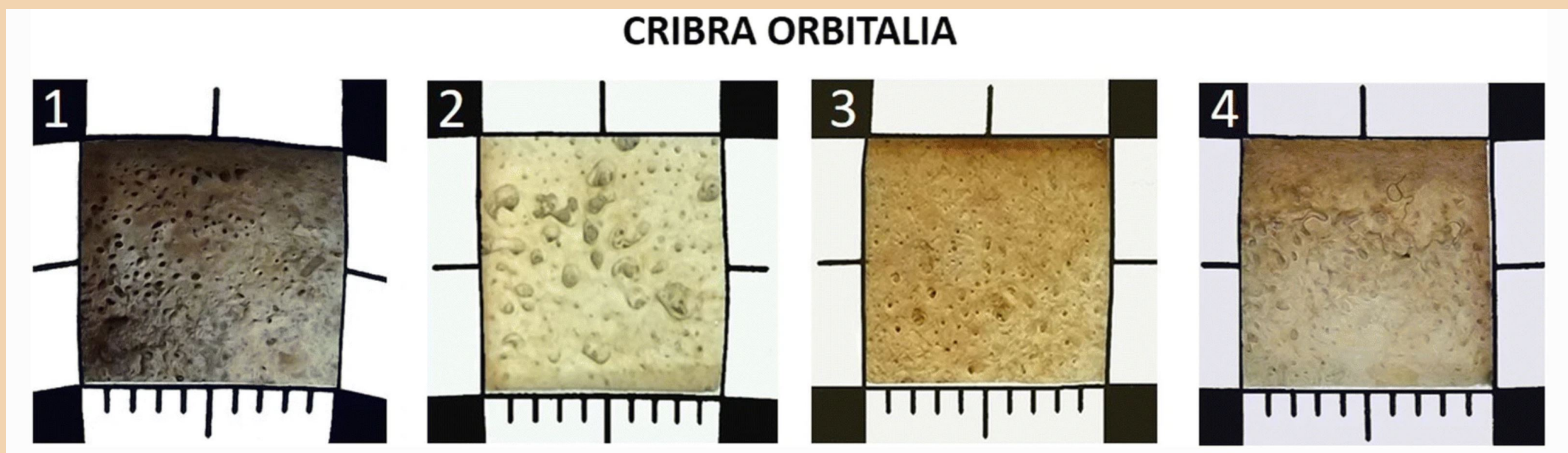


Figure 6: Degrees of healing for cribra orbitalia (Rinaldo et al., 2019).