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Citation

Schats, R. (2021). *The spatial distribution of cribra orbitalia in the medieval Netherlands: a relationship with malaria?*. Retrieved from <https://hdl.handle.net/1887/3618534>

Version: Publisher's Version

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Note: To cite this publication please use the final published version (if applicable).

THE SPATIAL DISTRIBUTION OF CRIBRA ORBITALIA IN THE MEDIEVAL NETHERLANDS

A RELATIONSHIP WITH MALARIA?

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Introduction

Cribra orbitalia (CO), porosity in the eye orbit, is generally associated with childhood anaemia. In certain areas of the world, the occurrence of CO is linked to malaria, as anaemia is one of the key symptoms of this disease.^{1,2} To study if malaria is an important cause for the orbital lesion, this research investigates the spatial distribution of CO in the medieval Netherlands. If malaria is contributing to the prevalence here, it is likely to be common in the marshy and brackish, low-lying areas based on known vector preferences.

Materials & Methods

1629 individuals from 19 different medieval sites across the Netherlands have been studied for the presence and severity (light, medium, severe³) of CO (table 1) and analysed using chi-square tests.

Table 1: Archaeological sites with cribra orbitalia prevalence.

Site	n	N	%	Malarial
Aduard	15	60	25.0	Yes
Alkmaar	31	93	33.3	Yes
Blokhuizen	10	51	19.6	Yes
Breda	19	109	17.4	No
Delft	27	120	22.5	Yes
Diever	9	86	10.5	No
Dokkum	27	193	14.0	Yes
Elst	1	36	2.8	No
Hellevoetsluis	19	75	25.3	Yes
Kampen	11	50	22.0	Yes
Klaaskinderkerke	37	109	33.9	Yes
Lent	10	61	16.4	No
Maastricht	16	180	8.9	No
Nieuwerkerke	32	144	22.2	Yes
Reusel	5	34	14.7	No
Smalle Ee	2	28	7.1	Yes
Vlaardingen	9	29	31.0	Yes
Wijk bij Duurstede	10	109	9.2	No
Zelhem	4	62	6.5	No

Spatial Distribution

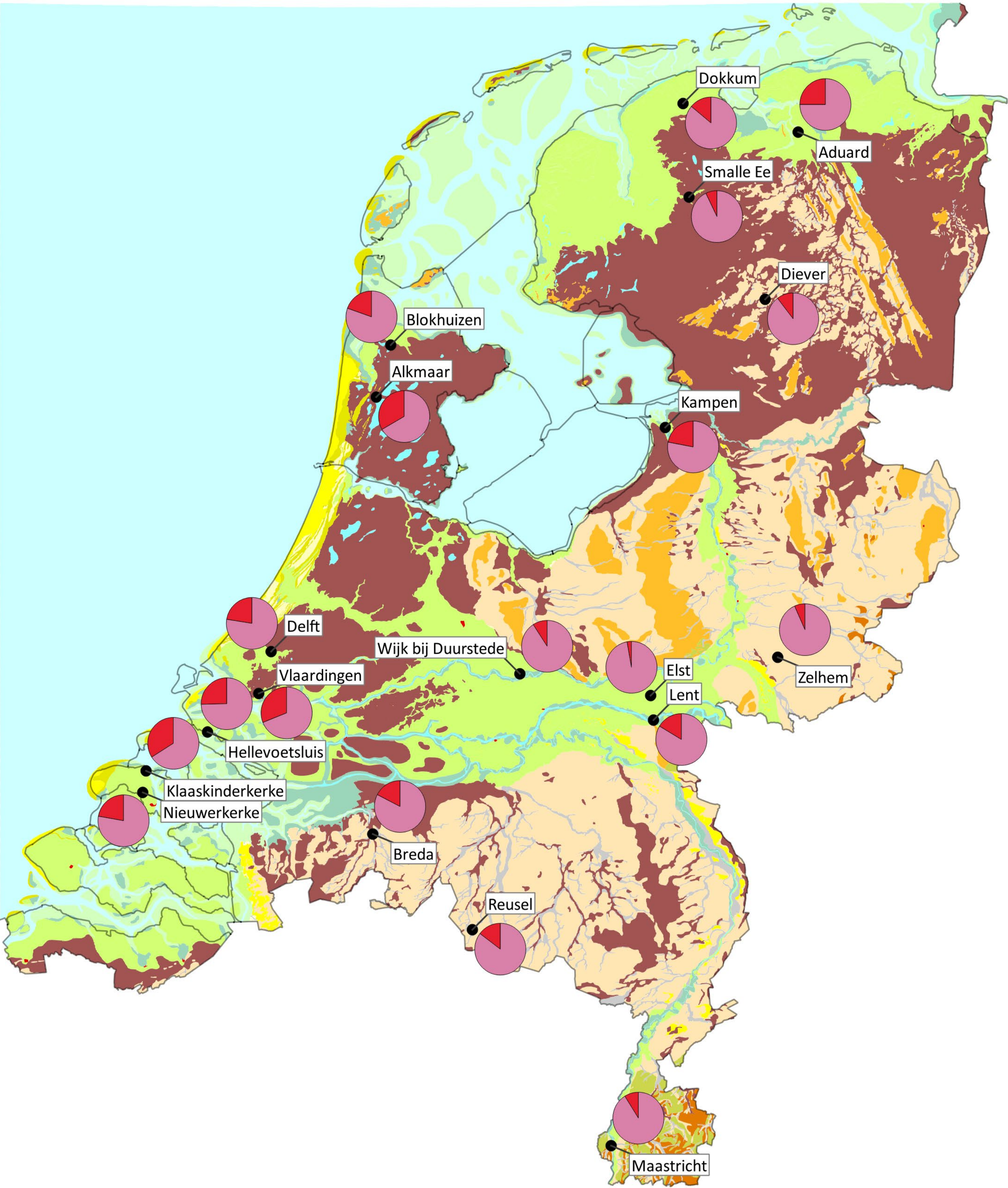


Fig. 1: Spatial distribution cribra orbitalia (red = present, pink = absent)

Results

CO is statistically significantly more common in the regions of the Netherlands with low-lying, marshy areas of the coast, with the presence of brackish water (10.9% vs. 23.1%) (fig. 1, table 1). There is however no significant difference in the severity scores between the regions ($p = 0.496$).



Fig. 2: Severity of cribra orbitalia. a + b = medium, c = severe, d = light

Discussion & Conclusion

The results of this study show that geographic location influences the prevalence of CO. Areas known to have been historically malarial have a higher frequency, indicating that malaria may have been an important causative agent of anaemia in these regions in the medieval period. The severity of CO is however not correlated with site location suggesting that if malaria can be considered the cause of CO in certain regions, it is not responsible for more severe lesions.

References: 1. Gowland, R.L. & Western, A.G. 2012. Morbidity in the marshes: using spatial epidemiology to investigate skeletal evidence for malaria in Anglo-Saxon England (AD 410–1050). *Am. J. Phys. Anthropol.* **147**, 301–311. 2. Smith-Guzmán, N.E. 2015. The skeletal manifestation of malaria: An epidemiological approach using documented skeletal collections. *Am. J. Phys. Anthropol.* **158**, 624–635 (2015). 3. Stuart-Macadam, P. 1985. Porotic hyperostosis: Representative of a childhood condition. *Am. J. Phys. Anthropol.* **66**, 391–398.