Journal of Archaeological Science: Reports 17 (2018) 58–67

Contents lists available at ScienceDirect

Journal of Archaeological Science: Reports

journal homepage: www.elsevier.com/locate/jasrep

Stature and the Neolithic transition– Skeletal evidence from southern Sweden

Anna Tornberg

Department of Archaeology and Ancient History, Lund University, PO. Box. 192, SE-221 00 Lund, Sweden

ARTICLE INFO

Keywords:
Stature
Maximum femur length
Kruskal-Wallis
Early Bronze Age
Iterative discriminant analysis
Neolithic

ABSTRACT

Human stature is a variable often used to study health changes in present and past populations. In this study possible differences in stature from the late Mesolithic-Early Bronze Age, based on skeletal data from southern Sweden, are investigated. The sample comprises $n = 203$ femora where maximum lengths were evaluated using non-parametric testing. Sex was assessed primarily using criteria on the pelvis and secondarily through statistical testing of sexual dimorphism. Measurements of the vertical diameter of the femoral head, femoral anterior-posterior and medial-lateral were evaluated using an *iterative discriminant analysis*. Results confirm a significant difference in femoral length between archaeological culture groups for both sexes. Male femoral lengths evidence a significant increase in the Battle Axe Culture that remained high throughout the Late Neolithic and Early Bronze Age. Only a minor increase in male stature associated with the transition to agriculture could be noticed; stature then remained constant until the Pitted Ware Culture. There was no change in female stature following the Neolithic transition. Female stature then increased gradually throughout the Neolithic, but decreased somewhat in the later part of the Late Neolithic-Early Bronze Age. These findings suggest that the transition to agriculture did not affect health in any profound way, and that the high stature in the BAC-Early Bronze Age are dependent on a mix of genetic influx, population increase and good nutrition and health, possibly linked to an intensification and consolidation of the agro-pastoral economy.

1. Introduction

The transition to agriculture is probably the most intensely investigated area within archaeology. The term Neolithic Revolution, first expressed by V. Gordon Childe, is largely abandoned among scholars today, but it emphasizes the importance of this transition to human society. The transition to agriculture must be understood on a regional basis, since both when the Neolithic transition occurred and how the custom of agriculture was adopted differ between areas. A short introduction of the Neolithic transition and Neolithic cultures in southern Sweden is therefore required. The introduction does not seek to be comprehensive, but to give an overview of current understandings of these cultures.

The Late Mesolithic in southern Scandinavia is associated with the Ertebølle Culture (c. 5200–4000 BCE). The site of Skateholm in southernmost Sweden contains a large variety of species, dominated by mammals; especially wild boar, red deer, roe deer and grey seal; and fishes, especially pike and perch (Jonsson, 1988), reflecting a wide dietary source. Findings of large refuse deposits of mollusk shells, i.e. *kitchenmiddens* (kökkenmödding) also evidence that mollusks were part of the diet. The archaeological findings are also supported by stable isotope studies (Eriksson and Lidén, 2003; Eriksson and Lidén, 2013). For more details of the Skateholm burial and settlement site as well as the Ertebølle Culture the reader is recommended the work of Larsson (1984, 1988).

Sørensen and Karg (2014) set the Neolithic transition in Southern Scandinavia to 4000–3700 BCE, using ^{14}C-dates. The debate among scholars has been whether agriculture was spread through migrations (Sørensen, 2014; Skoglund et al., 2012) or local adoption (Zvelebil, 1996; Price, 2000; Melchior et al., 2010) and is still somewhat inconclusive. The Early Neolithic is characterized by the material culture associated with the Funnel Beaker Culture (Trichtenbecher Kultur, TRB), which lasted until the Middle Neolithic A (Fig. 1). The subsistence was agriculture with remaining dependence on foraging strategies, at least in the beginning (Sørensen, 2014). Burial practice transformed from flat grave burials and burials in long barrows and dolmens in the Early Neolithic, to passage graves in the Middle Neolithic. The skeletal material is sparse from the Early Neolithic; the majority of TRB skeletons are retrieved from Middle Neolithic passage graves containing multiple inhumations.

The Pitted Ware Culture (PWC) (c. 3200–2300 BCE) was partly contemporary to the TRB. The people of the Swedish Pitted Ware

E-mail address: Anna.Tornberg@ark.lu.se.

http://dx.doi.org/10.1016/j.jasrep.2017.10.031
Received 9 February 2017; Received in revised form 9 October 2017; Accepted 22 October 2017

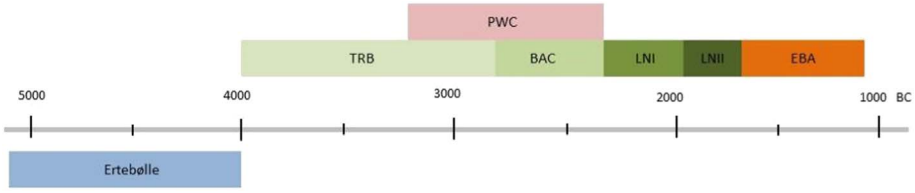

Fig. 1. Timeline over the late Mesolithic and the Neolithic-Early Bronze Age cultures in relation to chronology. Mesolithic: Ertebølle, Neolithic: TRB = Funnelbeaker Culture; PWC = Pitted Ware Culture; BAC = Battle Axe Culture; LNI = Late Neolithic I; LNII = Late Neolithic II; EBA = Early Bronze Age.

Culture lived in coastal areas, mainly on the east coast. These people were buried I flat graves and express an isotopic signal consistent with a marine diet dominated by seals (Eriksson, 2004; Fornander et al., 2008; Eriksson and Lidén, 2013). This is also consistent with the zooarchaeological record, where however pigs also are frequent (Storå, 2001). It is not definitely concluded if the pig bone assemblages common on several sites are from wild or domestic animals. However, Rowley-Conwy and Storå (1997) argue that they are wild which is also supported by stable isotopes (Fornander et al., 2008).

The Swedish-Norwegian Battle Axe Culture (c. 2800–2300 BCE) is part of the Corded Ware complex that was present in large parts of continental Europe. The BAC differs significantly from the preceeding TRB and the partly contemporary PWC in cultural expression. People of the BAC were most commonly buried in flexed positions in single or double graves, with more or less strict schemes regarding body orientation and grave goods associated with the sex of the buried (Malmer, 1962; Olausson, 2015). There has been a scholarly debate considering whether the Corded Ware complex is due to migration from the Yamnaya in the east or due to local change in identity (Malmer, 1962; Malmer et al., 1986; Kristiansen, 1989; Damm, 1991; Fokkens, 1998). Recent studies of ancient DNA support the migration theory (Haak et al., 2015; Allentoft et al., 2015), even though it is uncertain to what extent.

The beginning of the Late Neolithic is set around 2300 BCE. Helle Vandkilde defined two phases of the Late Neolithic; The Late Neolithic I (c. 2350–1950 BCE) and the Late Neolithic II (c. 1950–1750 BCE), which she based on investigations of early metalwork in Denmark (Vandkilde, 1996). Much of the archaeological expressions of the early part of the Late Neolithic (LNI) resemble that of the late part of the BAC with settlements with one or a few long houses and flat grave burials in crouched or outstretched position. Radiocarbon dates suggest that inhumations in collective gallery graves got in use around 2000 BCE in Scania, southernmost Sweden, and Västergötland, southwestern Sweden, corresponding to the LNII. Inhumations in flat graves and reuse of Middle Neolithic passage graves were however still practiced (Blank, 2016). There is no evident difference in burial customs between the Late Neolithic and Early Bronze Age (EBA) until EBA period II (c. 1500–1300 BCE), when numerous burial mounds were erected. There was an increase in societal complexity during the Late Neolithic (Apel, 2001; Brink, 2013), leading to the onset of the Bronze Age around 1700 BCE. This can also be detected through an increased diversity in burial practice, culminating in the EBA period II (Tornberg, 2017). Some scholars argue that a hierarchical society is present in southern Scandinavia already in the Late Neolithic (Apel, 2001; Artursson, 2005; Brink, 2013) while others relate a hierarchical society to metal trade and thus put it in the EBA period Ib or EBA period II (Vandkilde, 1996; Kristiansen, 1999; Earle, 2002; Kristiansen and Earle, 2015). What is to be considered unanimously agreed among scholars is that there is a transition from an egalitarian society in the earlier parts of the Neolithic to a socially stratified, and more complex, society in the Late Neolithic or Early Bronze Age.

Ever since the contributors to the almost classic anthology “Paleopathology at the Origins of Agriculture”, edited by Cohen and Armelagos (1984), reported trends of decreasing health following the Neolithic transition in many parts of the world, discussions about the consequences of early agro-pastoralism on health have been heavily researched. This publication was followed up by the volume “Ancient Health” about twenty years later (Cohen and Crane-Kramer, 2007). In this book, researchers of Neolithic health worldwide contributed to a more detailed and a somewhat more heterogenic picture of health following the agricultural transition. For the Old World, a decline in health, based on a number of different types of health data, is mainly reported from South and Central Europe (Eshed et al., 2010; Larsen, 2006; Meiklejohn and Babb, 2011; Meiklejohn et al., 1984; Mummert et al., 2011; Wittwer-Backofen and Tomo, 2008). In the more peripheral regions of Scandinavia and the British Isles data supports an increase in stature, rather indicating an improvement in health in the Neolithic (Bennike, 1985; Bennike et al., 2007; Roberts and Cox, 2007). This is probably due to a more gradual adoption of farming in northern Europe than in the central and southern parts (Zvelebil, 1996).

Data from continental Europe suggests an increase in stature within the Neolithic, culminating in the Late Neolithic or Bronze Age (Meiklejohn et al., 1984; Bruchhaus, 2001; Gerhards, 2005; Gerhards, 2006). The trend is however not conclusive with Wittwer-Backofen and Tomo (2008) suggesting a further decrease of male stature in the Late Neolithic, although with an increase in stature in the female sample. Considerations have to be made to the relatively small sample size of nine individuals respectively in the male and female Late Neolithic sample. Earlier research of Late Neolithic health in southern Scandinavia reports an increase in stature compared to earlier periods of the Neolithic, with mean stature of 176–178 cm for males and 162–163 cm for females in Denmark (Arcini and Hyll, 2003; Bennike, 1985; Gejvall, 1963; Sjøvold, 1974; Tornberg, 2013; Tornberg, 2015). The studies are based on Danish skeletons (n = 66) (Bennike, 1985) as well as a gallery grave from Dragby (n = 21) (Gejvall, 1963) in central Sweden, a few individuals from Scania (n = 18) (Tornberg, 2013; Tornberg, 2015), as well as a study of Middle Neolithic Hunter-Gatherers from the island of Gotland (n = 64) (Sjøvold, 1974). There is however a lack of further research of Neolithic stature in southern Sweden as well as a synthesis related to stature and society. Previous research of Neolithic stature only comprises a low number of data, especially from the earlier periods. The data is also gathered from contexts that only have been dated in a relative sense, and as a consequence more detailed analyses of increasing stature during the Neolithic and Early Bronze Age cannot be made. A large number of ^{14}C-datings from Scania, southernmost Sweden, suggest that it is problematic to date buried skeletons only from burial typology since Bronze Age reburials in Late Neolithic gallery graves have been practiced in very large extent (Bergerbrant et al., 2017; Tornberg, 2017). Considering earlier reports of high stature in the Late Neolithic in Denmark and parts of southern Sweden, this is also expected in this study. However, since previous studies of Late Neolithic stature in southern Sweden only comprise small samples, further analyses are needed. There is also little understanding of the development of stature within the Neolithic in southern Sweden as well as the effect on stature following the transition to agriculture. By including new stature data from all of the Neolithic, and a large amount of radiocarbon dates on Late Neolithic-Early Bronze Age skeletons, the development of stature throughout the Neolithic can be investigated.

In this study south Swedish Late Mesolithic, Neolithic, and Early Bronze Age stature has been recorded and analysed. I explore stature change following the transition to agriculture and throughout the Neolithic. Is there a change in stature following the transition to agriculture, and does Late Neolithic stature in southern Sweden equal as high as those reported from Denmark? In what way have male and