TEMPORAL TRENDS IN OLD WORLD PATTERNS OF MORBIDITY

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Extensive research by many investigators with archeologically recovered human remains in the Americas indicates pre-Columbian temporal patterns of increased morbidity in many areas. Although dietary factors may also be involved, much of this pattern can be explained by temporal shifts in population density and settlement pattern. This paper explores the existing published evidence for comparable patterns in the Old Word. Analysis includes newly acquired data from northeastern Hungary, spanning several thousand years.

Key words: Morbidity, Old World, temporal patterns, human skeletons.

Los amplios estudios desarrollados por muchos investigadores con restos humanos arqueológicamente rescatados en las Américas, indican un incremento en los patrones temporales precolombinos de morbidez. Aunque los factores dietéticos puedan tener un rol, muchos de estos patrones pueden ser explicados por cambios temporales en la densidad de poblaciones y los patrones de población. Este trabajo explora críticamente la evidencia existente para esta interpretación y compara los datos del Nuevo Mundo con el patrón sugerido para el Viejo Mundo. El análisis incluye datos recientemente adquiridos del noreste de Hungría, los que abarcan miles de años.

Palabras claves: *Morbidez, Viejo Mundo, patrones temporales,*

Within the last two decades, research in the Americas in human skeletal biology has attempted to elucidate long term patterns of morbidity and mortality and to correlate them with aspects of culture and environment. Analysis of many samples originating from well-documented archeological contexts has established that prior to European contact in the Americas significant morbidity was present. Furthermore, it appears that in many regions of the Americas, morbidity was increasing through time in association with shifts in subsistence and settlement pattern (Cohen and Armelagos 1984; Verano and Ubelaker 1992). Increasingly, anthropo-logists and paleopathologists turn to increasing sedentism and population density with associated problems of sanitation as key factors in the rise in morbidity.

Populations of the Old World also increased in size and density, changed their diet and became more sedentary in many areas. Did these people suffer similar health problems for similar reasons? Do archeologically-recovered samples from the Old World reveal similar patterns of lesions as those from the Americas? This essay explores information in the published literature that bears on these questions. The published work discussed here is not a complete inventory of what has been done. Rather it represents a thoughtful sampling of many of the key publications and what they reveal about the issues of concern.

As in paleopathology and skeletal biology in general, publications in these areas focusing on Old World problems advance understanding at a variety of levels. The literature demonstrates a more sophisticated ability to diagnose individual diseases (Campillo 1993; Roberts and Manchester 1995) and to document them in individual ancient samples (e.g., Brothwell 1973; Manchester and Roberts 1989). Recently, diagnostic abilities have been augmented by molecular approaches in which genetic material of the specific disease organism can be identified in ancient material (Rafi et al. 1994). The literature also contains discussion of theoretical issues in the evolution of disease (Capasso 1996; Cockburn 1959), including interpretation of the relationship of disease, environment and culture (Angel 1967; 1968; Armelagos 1990). Evidence of disease and physiological stress clearly has deep roots in the Old World (Ogilvie et al. 1989). To what extent do the available data reveal temporal patterns that can be explained by environmental or cultural factors? This essay examines aspects of these issues using a regional perspective.

Australia

Webb (1995) provides an overview of health conditions in Australian samples. His survey of Australian skeletal remains reveals low levels of

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stress indicators in Upper Pleistocene samples, accompanied by evidence of increased cranial thickening. His data from more recent population samples lack clear temporal control and may contain some remains that overlap in date with the historic period, but offer information on regional variability. Samples from arid desert areas reveal the least evidence of overall morbidity, but display relatively high levels of evidence of infectious disease, thought largely to be treponemal in origin. The other two regions (coastal and central) represented in Webb's samples show the highest evidence of overall morbidity with the coastal samples displaying less evidence of anemia than those from the central area. Precontact morbidity appears to be lower than in contact times. Collectively, this study suggests a very general temporal increase in morbidity with significant regional variation reflecting varying environmental influences on the disease process.

Japan

Temporal data on one stress indicator, enamel hypoplasia is provided by Yamamoto (1992) on four Japanese samples. The samples are grouped into Jomon (10,000 B.C. to 300 B.C.), Kofun (A.D. 300-700), early modern Edo and modern. Frequencies were slightly higher in the early Jomon sample than in Kofun. Highest frequency was found in the early modern Edo sample with a low frequency in the modern sample.

Nubia

Martin et al. (1984) provide one of the most comprehensive summaries of health change in the Old World in their summation of extensive research on Sudanese Nubian remains. Samples in this study have been grouped in Mesolithic (12,000 B.C.), Neolithic (5000-3600 B.C.), A-Group (3400-2400 B.C.), C-Group (2400-100 B.C.), Meroitic (350 B.C.-A.D. 350), X-Group (A.D. 350-550), and Christian (A.D. 550-1350). Their analysis reveals a general decline in stature, although no data were available for the Mesolithic. Porotic hyperostosis was high in the relatively early A-group with males and females showing different patterns. Evidence for infectious disease is relatively low throughout which the authors suggest might be due to the ingestion of tetracycline in grain. Life expectancy at age 25 generally declined through time while caries frequencies generally increased. Collectively, their study suggests little evidence of health changes with the introduction of agriculture but noticeable changes during agricultural intensification in more recent times.

Beckett and Lovell (1994) add detail on aspects of dental disease within the Nubian samples, specifically between Classic/Terminal A-Group and the succeeding C-Group. Their data suggest that both groups had a mixed diet but the later C-Group consumed more cultivated cereals. The later group showed more severe dental attrition and greater frequencies of antemortem tooth loss, periapical abscesses and dental caries than the earlier group. The authors attribute the increased dental occlusal attrition to increased amounts of grit in the diet resulting from food preparation practices.

South Asia

As early as 1969, Kennedy reported synthetic data on health in India and Ceylon. Kennedy appropriately cautioned that the data base was quite limited but some preliminary possible trends were suggested. In particular, Kennedy noted that material from the Late Stone Age site of Langhuag in Gujarat had little dental disease but extreme attrition. Evidence of violence was apparent in the Harappan material. Kennedy's general survey on samples from the late Stone Age, Neolithic, Chalcolithic, Harappan, Iron Age and Early Historic suggested a temporal trend of less attrition and increased levels of caries, dental abscesses and malocclusion. Murty's (1974) summary of research on samples from India revealed additional information relevant to health evaluation.

In 1983, Lukacs reported low caries frequencies in Early Neolithic remains from Mehrgarh, Baluchistan in Pakistan. Additional work in dental anthropology by Lukacs in South Asia (1984; 1992a) included his 1992(b) study of the Bronze Age Harappa material. He noted that males had lower frequencies of dental disease than females and that in general, dental disease increased in the Indus Valley with agriculture. The transition in South Asia from the Late Stone Age to the agricultural periods witnessed a reduction in tooth loss and resorption but little evidence of change in caries and abscess frequencies, data likely influenced by demographic factors (Lukacs 1978). The transition from Neolithic to Chalcolithic involved reduction of dental pathology (Lukacs 1978).

Kennedy (1984) provides a comprehensive summary of health changes in South Asia samples. He grouped his samples into Paleolithic, hunter-gatherer, early farming, Harappan, Gandharan, and Iron Age. Although hampered by limited samples, Kennedy found evidence for reduction of stature in the hunter-gatherer to early farming transition, with an associated reduction in sexual dimorphism. Evidence of hypoplasia was more common in farming samples than in hunter-gatherers. Hunter-gatherers presented low rates of dental caries but greater occlusal attrition and higher frequencies of alveolar resorption and antemortem tooth loss. The agricultural samples showed an increase in dental caries. Kennedy also felt his samples suggested that in South Asia the transition to agriculture was associated with increased porotic hyperostosis, caries, abscesses, dental hypoplasia, lines of increased density (Harris lines) and a "broad spectrum of diseases".

Iran-Iraq

Rathbun (1984) provides a synthesis of research done in Iran and Iraq noting the tentative nature of his discussion due to sample limitations. In general, he characterized the early Paleolithic samples as displaying comparatively high frequencies of trauma, degenerative joint disease, dental attrition, antemortem tooth loss and low frequencies of dental caries. His preagricultural samples presented high levels of degenerative joint disease and dental abscesses.

Neolithic samples displayed continued problems of degenerative joint disease, trauma, attrition and dental caries with evidence of infection "relatively common". Samples that could be dated to the metal ages generally displayed a greater range of pathology. Rathbun found that evidence for infection generally reduced from a high in the Neolithic to a low in the more recent metal ages.

Greece and Turkey

Largely through the career work of J. Lawrence Angel (Grmek 1989), knowledge of temporal changes in health of ancient eastern Mediterranean populations and the environmental and cultural factors involved is among the most comprehensive for the Old World. As Angel systematically studied archeologically-recovered samples, he gradually pieced together the pattern of change. In 1947 he suggested that longevity increased slightly between 650 B.C. and 150 B.C. in ancient Greece. In 1948 he suggested that populations in Greece in the fifth century BC were healthier than their ancestors and that the transition from prehistoric to historic times brought an increase in body size and length of life.

Angel's (1971a) analysis of the largely Middle Bronze Age Lerna sample from Greece included comparative studies suggesting that porotic hyperostosis was high in the early Neolithic and then decreased steadily to Classical times and then increased again in Turkish period samples. The Middle Bronze Age material displayed severe dental disease, higher frequencies than documented for either Neolithic or Classical samples. Subsequent synthetic articles by Angel (1971b, 1972, 1974) stressed the importance of cultural factors, malaria, population density, fertility and female longevity in the overall interpretation of disease-population dynamics in the Eastern Mediterranean. He noted that fractures were generally more common in males and increased in frequency in modern times.

In 1984, Angel offered a synthesis of the data he had accumulated on eastern Mediterranean samples. His long term study had included samples from the following temporal sequence: paleolithic, mesolithic, early neolithic, late neolithic, early bronze age, Middle Bronze Age, Late Bronze age, Early Iron Age, Classic, Hellenistic, Roman, Medieval, Byzantine, Baroque, Romantic and Modern. Samples from the Paleolithic showed excellent health in general but included examples of trauma. The Mesolithic samples show some decline in health with new disease. The Neolithic revealed low general health. The Bronze age displayed regional variation with the Anatolia sample revealing better health than samples from Greece. Class distinctions were also apparent in the Bronze Age samples. Health showed improvement through the Bronze age with a slight decline in the Iron Age. The general trend was presented by Angel as a decline in growth and nutrition during the transition from hunting to farming, partial recovery and advance during the Bronze Age with substantial advance in Hellenistic - Roman culture. A general decline is seen from A.D. 1300 to about A.D. 1700.

Near East

Overviews of past health conditions in populations from the Near East have been offered by Patricia Smith and others (1984a,b). Study has suggested that longevity increased in the Neolithic and then again in the late Hellenistic and Roman period. Little information is available about cribra orbitalia in early samples but high frequencies are reported for later periods. Enamel hypoplasia shows an increase after the Natufian period. Dental caries frequencies increase from Natufian through Neolithic to Chalcolithic and then decrease in Bronze and Roman samples. The later groups show more evidence of periodontal disease and antemortem loss than early ones. The data suggest to Smith and colleagues marked decline in health after the Neolithic in association with fully established agriculture and animal husbandry. A temporal trend of decreasing cortical thickness is also suggested (Smith et al. 1984b), reflecting activity related functional demands. Arensburg (1996) suggested that differences in oral pathology were relatively minimal between Israel Natufian and Neolithic samples, despite differing subsistence.

Eastern Europe

In Hungary, Acsàdi and Neméskeri (1970) offer comprehensive comparative demographic data on ancient samples. Values of life expectancy at birth range from 25 in the Neolithic to 44 in the Mesolithic and Iron Age. Life expectancy at age 20 ranged from 25 in the Roman Period to 32 in the Iron Age. Life expectancy values seem to be highest in the Mesolithic and Iron Age samples and fluctuate in the others. Edynak's (1976) survey of longevity in southeast Europe revealed no strong temporal trends but considerable regional variability. In Hungary, low frequencies have been reported of enamel hypoplasia (Marcsik and Kocsis 1992), as well as other dental disease (Molnar and Molnar 1985).

Ubelaker and Pap (1996) offer a view of health conditions within a large Bronze Age sample from northeastern Hungary. Literature comparison suggested relatively high mortality, but low frequencies of most other stress/morbidity indicators. A subsequent study of Iron Age remains from the same area reveals slight increases in most stress indicators (Ubelaker and Pap 1998).

Denmark

Pia Bennike's work (1985) reveals a reduction of immature mortality in the Viking Period and more recent samples. Stature shows an increase from the middle to the late Neolithic. Dental pathology, including caries, tooth loss, and alveolar bone loss is lowest in the Early Neolithic through the Bronze Age and higher in the Iron Age, Viking Period and Middle Ages.

Italy

Skeletal biology research with Italian samples has documented porotic hyperostosis in Bronze Age samples (Germanà and Ascenzi 1980), cribra orbitalia associated with iron deficiency in a third century B.C. sample from Carthage (Fornaciari et al. 1981), a high frequency of dental caries with examples of enamel hypoplasia in a Neolithic sample from Western Liguria, and activity related problems in an Iron Age sample from the site of Pontecagnano. Comparing Etruscan (sixth to seventh century B.C.) with Oscan (fourth to fifth century B.C.), Fornaciari et al. (1985-1986) found greater dental attrition, periodontal disease, and enamel hypoplasia in the older group.

In another comparative study, Formicola (1987) found a temporal trend of reduction of crown size, increase in dental caries, increase in enamel hypoplasia, slower attrition rate, and less use of anterior dentition. Two samples were examined, a Late Epigravettian (X-IX millennium B.C.) sample of hunter-gatherers and a Middle Neolithic (IV millennium B.C.) sample of early farmers from the same site.

Portugal

In their 1988 article on dental caries in western European samples, Meiklejohn et al. note that in Portugese mesolithic samples, dental caries are more marked in adults than in subadults, suggesting to them age-related dietary differences that add complexity to interpretation.

Also in 1988, Jackes reported on material from six Portugese sites, two of Mesolithic origin and four Neolithic. Factors of fertility are stressed in interpreting an increase in mortality between Mesolithic and Neolithic. An increase in deaths below the age of 25 was found. The Mesolithic - Neolithic transition in Portugal apparently involved a reduction in dental pathology, average age at death and dental size. Research by Lubell et al. (1990, 1994) suggest a dietary shift from Mesolithic to Neolithic and that the Mesolithic caries rate may have been higher than suspected previously.

Spain

Research on Spanish samples has documented enamel hypoplasia on Middle Pleistocene Hominids (Bermudez de Castro and Perez 1995) and an early possible trend toward decreasing attrition and increased dental pathology (Arias and Garralda 1996).

In a comparative study of dental pathology in eastern Andalucia, Sylvia et al. (1991) documented a temporal increase in dental caries (although a decrease in the Copper Age), and increase in antemortem tooth loss. They studied samples from 40 sites dated to the Neolithic, Copper and Bronze Ages and suggest the changes are likely linked with increasing reliance upon agriculture.

England

Working with British samples, Moore and Corbett (1971, 1973, 1975, 1983) suggest that dental caries frequencies remained relatively low until the 17th century A.D. and modern times. Moore (1983) attributes this increase with augmented dietary intake of refined carbohydrates, especially sugar. Roberts and Manchester (1995) offer similar interpretations of the dental data.

Other sample-focused studies are available such as Hoppa (1992) documenting slow growth rates within an Anglo-Saxon sample compared with >German modern and other samples and Grauer (1993) documenting porotic hyperostosis and periosteal lesions in a Medieval sample from York.

In a study of non-specific stress indicators in Early and Late Medieval Period samples from England, Ribot and Roberts (1996) relate a temporal reduction in overall stress indicators in subadults, as well as in the percentage of individuals with multiple stress indicators.

Kerr et al. (1990) suggest that in the medieval period, Scotts had a lower rate of dental caries than English samples. They suggest that differences in dental occlusal attrition were factors.

Comparative European Studies

Relatively few investigators have attempted synthetic interpretation on a large geographic level in the Old World. Working from an Early Medieval sample from southern Germany, Huber (1968) studied patterns of stature, finding little temporal change through time.

Meiklejohn et al. (1984) examined western European trends in health indicators in the Mesolithic-Neolithic transition. They concluded that few obvious trends were apparent within the published literature. They noted an increase in cranial infection, less arthritis, increase in dental caries, reduction of dimorphism and decline in stature, mostly marked in females.

In providing the editors' summary in their landmark 1984 volume, Cohen and Armelagos note that the Old World data generally suggest a decline in health with agriculture. They note that exceptions include Rathbun's finding a decline in infection in the Bronze and Iron Ages in Iran and Iraq, rebounds in late period stature and additional variability reported by others.

Focusing specifically on caries data within western European samples, Meiklejohn et al. 1988 suggest that regional variation in caries frequencies reflect regional variation in diet, specifically dietary carbohydrates. In a related later article, Meiklejohn and Zvelebil (1991) again suggest that regional dietary patterns explain the caries data. They note the temporal reduction of arthritic problems but suggest regional variation in porotic hyperostosis and enamel hypoplasia.

Discussion

Regional studies of temporal change in health indicators in the Old World offer varying impressions. Increases in some aspects of morbidity in at least some past periods are indicated in studies from Australia, Nubia, the Near East, Hungary, Italy, Spain, and England. Increases coupled with declines in different periods are suggested for Japan, South Asia, Greece and Turkey and Denmark. Declines in aspects of morbidity are noted for Iran-Iraq (infection) and Portugal (dental pathology in the Mesolithic and Neolithic). Regional variability was found in samples from Australia and Europe.

The detection of Old World temporal trends in morbidity from the published literature is hampered by problems of adequate dating of some samples, incomplete data from most areas, variability in the time periods represented in different areas, variability in the range of data reported, and varying definitions of the traits recorded. All of these factors severely limit inter-regional comparison and even assessment of temporal change within single areas. The most useful information is that provided by single investigators over long periods of time such as Angel's work in Greece and Turkey. Such studies have the advantage of comparable data collected by a single investigator.

The general impression of the corpus of published information is that most areas likely witnessed a temporal decline in health, especially as reflected in dental problems. The extent and timing of this decline may have varied considerably, influenced by the complex factors involved. These complicating factors likely included not only the obvious ones of diet and environment, but also complex cultural ones such as food preparation, gender roles, age-related social stratification, and demographic dynamics. The true picture of this process and regional variation in temporal change remains elusive for the reasons discussed above.

Our own research project in northeastern Hungary seeks to provide sharper focus on temporal change in that area of Eastern Europe (Ubelaker and Pap 1996, 1998). In this study, data on a variety of indicators of morbidity are collected on human remains with firm chronological controls. These data are supplemented with a detailed inventory (following Buikstra and Ubelaker 1994) to produce meaningful frequency data. Published information is now available for samples representing the Bronze Age (Ubelaker and Pap 1996) and Iron Age (Ubelaker and Pap 1998). Data have been collected from the Copper Age and Neolithic as well. Because these data have been collected by the same individuals using the same techniques, they are directly comparable and offer information on regional patterning. With such an approach, we can begin to understand world-wide variation in patterns of morbidity and perhaps illuminate the underlying influences.

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