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DISEASE AND OTHER HEALTH CONDITIONS AMONG ANCIENT PUEBLO COMMUNITIES IN THE CENTRAL MESA VERDE REGION – A REVIEW OF SELECTED SITES

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Abstract

The prevalence of diseases among pre-Columbian communities is one of the indicators of the general state of health of a given group of people, providing information about the most common diseases as well as additional information about diet and relationships between individuals. In this case, the basic source of information is osteological material from burials analysed by physical anthropologists and archaeologists. For the Ancestral Pueblo culture, many years of research by physical anthropologists have provided a wealth of information on the diet of these communities and the state of health of their residents while also confirming various social phenomena, such as conflicts and struggles, which intensified during the Pueblo III period (AD 1150–1280). Nevertheless, research on skeletons of pre-Columbian Pueblo culture has been a controversial issue that was the stimulus for the passage of the Native American Graves Protection and Repatriation Act of 1990 (NAGPRA). Today, most of the data on the health of pre-Columbian Ancestral Pueblo communities stem from analyses conducted during the 20th century. The aim of this article is to compare the state of health (and distinguish the most common diseases) and the age and sex structure for 9 sites selected from the central Mesa Verde region. The data used are from available reports on excavations.

Keywords: disease, Pueblo culture, Mesa Verde region, deformation, pathology, bones, human remains

Resumen

La prevalencia de las enfermedades entre las comunidades precolombinas es uno de los indicadores del estado general de salud de un determinado grupo de personas, brindando información sobre las enfermedades más comunes, así como información adicional sobre la dieta y las relaciones entre los individuos. Como fuente básica de información suele aprovecharse el material osteológico procedente de entierros analizados por antropólogos físicos y arqueólogos. En el caso de la cultura ancestral Pueblo, muchos años de investigación desarollada por antropólogos físicos han brindado gran cantidad de datos relativos a la dieta de estas comunidades y el estado de salud de sus miembros, confirmando, también, diversos fenómenos sociales, tales como conflictos y luchas que se intensificaron durante el período Pueblo III (1150 a 1280 dC). Sin embargo, la investigación de los esqueletos de la cultura Pueblo precolombina empezó a considerarse un tema controvertido, lo cual finalmente llevó a la aprobación de la Ley de Protección y Repatriación de Tumbas de los Nativos Americanos de 1990 (NAGPRA). Hoy en día, la mayoría de los datos sobre la salud de las comunidades ancestrales Pueblo precolombinas provienen de los análisis realizados en el siglo XX. El objetivo del presente artículo

consiste en comparar el estado de salud (e identificar las enfermedades más comunes) y la estructura por edad y sexo de 9 sitios seleccionados de la región central de Mesa Verde. Los datos citados proceden de los informes disponibles de las excavaciones.

Palabras clave: enfermedad, cultura Pueblo, región de Mesa Verde, deformación, patología, huesos, restos humanos

INTRODUCTION

The health of pre-Columbian communities can be considered in two ways, first by looking at the impact of contact between indigenous peoples and Europeans, which is known to have had a disastrous impact on the health and demographics of Indian communities. Diseases transferred by Europeans to the new continent had been, before contact, unknown to indigenous communities; thus, American Indians did not have naturally developed immunities, nor did they have access to medicine to combat new diseases. This led to several epidemics that killed many thousands of indigenous people (Bianchine and Russo 1992; Martin and Goodman 2002; Pringle 2015).

This article, however, focuses on a second issue, i.e., the health of pre-Columbian communities before the arrival of Europeans on the American continent. My research focuses on the Ancestral Pueblo culture, a population that lived in the northern Southwest – the so-called Four Corners area of southeast Utah, southwest Colorado, northeast Arizona, and northwest New Mexico. Ancestral Pueblo peoples were agricultural, and their diet was based on maize, beans, and squash. Pueblo peoples also raised turkeys, at first for feathers and other by-products, but eventually for food as well. Wild plants and game constituted a smaller percentage of the diet (Palonka 2006; Plog 1997).

Nine Ancestral Pueblo sites have been selected for this analysis; all are located in the Mesa Verde region in the southwestern part of the state of Colorado (Figure 1). These sites date from the Pueblo I period (AD 700–900) through the end of the Pueblo III period (about AD 1300) (Table 1). The end of the Pueblo III period is a natural chronological boundary, because near the end of the 13th century, Pueblo peoples in the Mesa Verde region migrated southwards – many to areas along the Rio Grande river (Palonka 2011, 2017: 141-142; Plog 1997: 9).

The sites selected for this study and the burials studied from these sites constitute only a small percentage of all burials found in this area (Figure 2). Nevertheless, the remains exhibit a fairly wide range of diseases and conditions (Table 5). Most of the information on which this study is based originates from research reports from the 1960s–1990s; the age of the data affects the quantity and quality of the anthropological descriptions.

The associated archaeological and physical anthropology research was influenced by NAGPRA, which was passed in 1990. This legislation strictly regulates archaeological excavation of American Indian skeletal remains and, *inter alia*, it precisely regulates the rules of conduct in the event of accidental discoveries of human remains (NAGPRA 2006). This law represents a major leap in the controversial issue of the rights of modern-day Indians regarding the remains of their ancestors as well as their grave goods and ceremonial objects. NAGPRA has not only had a real impact on the right of Indians to their own heritage, but also on the way research is conducted on traditional communities, and has been an important tool for the collaboration of researchers with contemporary Indians (Tsosie 1997: 64-76).

This article is based on my MA thesis (and the materials collected for it) on diseases and other skeletal conditions in Ancestral Pueblo culture.

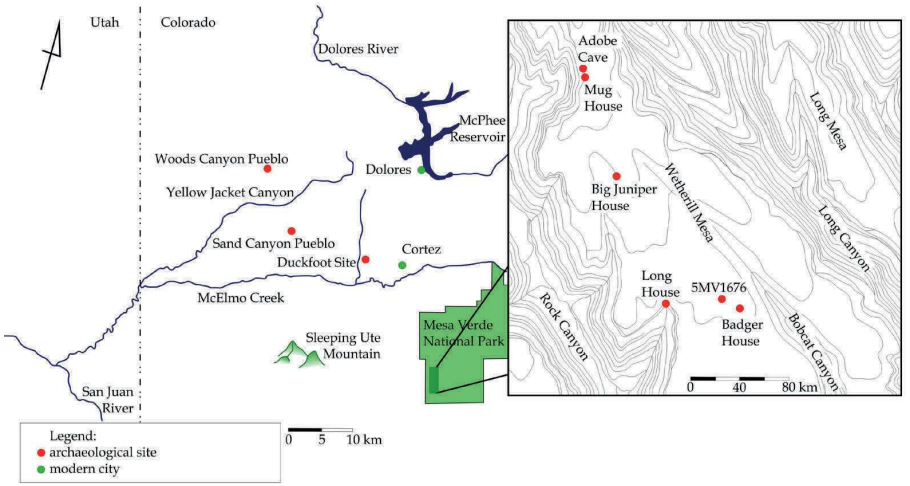

Figure 1. Localisation of all nine sites mentioned in the article from central Mesa Verde region (drawing by A. Słupianek after: National Park Service 2020; Noble 2006: Map 2; Swannack 1969: 20-21).

Table 1. Basic information about chronology and the number of individuals (after: Bradley 2002; Cattanach 1980: 141-149; Hayes and Lancaster 1975: 172-181; Hoffman 1993: 257-263; Kuckelman and Martin 2007; Rohn 1971: 88; Swannack 1969: 166-177)

SITE	CHRONOLOGY*	NUMBER OF INDIVIDUALS**
Duckfoot Site (5MT3868)	Pueblo I	14
Badger House (5MV1452)	Pueblo I and Pueblo II	33
5MV1676	Pueblo I and Pueblo II	9
Big Juniper House (5MV1595)	Pueblo I and Pueblo II	24
Mug House (5MV1229)	Pueblo III	35
Adobe Cave (5MV1228)	Pueblo III	11
Long House (5MV1200)	Pueblo III	40
Sand Canyon Pueblo (5MT765)	Pueblo III	33
Woods Canyon Pueblo (5MT11842)	Pueblo III	11

*Basic information about chronology: Pueblo I (AD 700-900), Pueblo II (AD 900-1150), Pueblo III (AD 1150-1300); **Number of all individuals: 210 (number of all burials: 199).

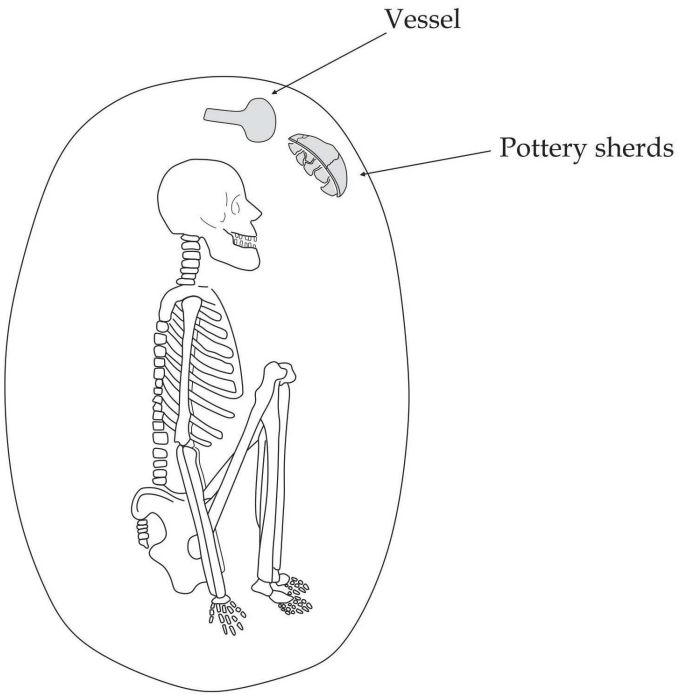

Figure 2. Schematic example of Pueblo burial (Step House: 5MV1285) (drawing by A. Słupianek after: Nordenskiöld 1990: VII).

CHARACTERISTICS OF THE RESEARCH TOPIC

The human remains described in this article, as previously mentioned, come from 9 sites of different chronologies (Table 1). In most cases, these burials were located on the floors of rooms, in trash mounds, or on talus slopes (e.g., at Mug House and Adobe Cave). The arrangement of human remains varies from site to site. The deceased were placed on their right or left side (e.g., in Long House, most bodies were placed on their left side), although some were placed supine (on their back). They were most commonly found in a flexed or semi-flexed position with their knees pulled up to the chin or chest. Some bodies were buried upright. The state of preservation of the remains varies according to the pH of the soil, the activity of rodents and larger animals, as well as of the age of the individual, because children's bones (due to their fragility) generally deteriorated more than those of adults (Bradley 2002; Cattanach 1980: 141-149; Hayes and Lancaster 1975: 172-181; Hoffman 1993: 257-263; Kuckelman and Martin 2007; Rohn 1971: 88; Swannack 1969: 166-177).

Woods Canyon Pueblo features well preserved bones, where most of the identified specimens were buried in structure 5–S, a kiva. However, detailed descriptions for some remains were not possible because the skeletons extended beyond the limits of the excavation trench. As a result, less than 10% of some skeletons were exposed and analyzed. A burial from elsewhere on the site (burial no. 11) was less well preserved (Bradley 2002). Most remains from Sand Canyon Pueblo are well preserved, but some were damaged, and their anatomical arrangement could have been disturbed by animal activity. Moreover, the burials (approximately 9) at this site were assigned to one of two categories of formal burials; some informal burials (approximately 23) were those of individuals whose remains were left in "abandonment contexts". These contexts are locations such as structure floors or collapsed roofing material that show no evidence of continued occupation after the human remains were deposited. Thus, these remains were not formally buried, and they were deposited at the same time the village was abandoned by the residents. Some of these remains exhibit evidence of violence. Formally buried remains were well preserved, whereas some of those in abandonment contexts show evidence of animal activity and are scattered (Kuckelman and Martin 2007).

Big Juniper House suffered major disturbance to its human remains, meaning that most skeletons are incomplete. This was probably caused by animal activity, which can significantly impact the preservation of remains in shallow burials (Swannack 1969: 167-177).

At the other sites, bones were in a relatively good state, but reports mention individual burials in which the remains were fragmented and incomplete, with visible animal damage (rodents as well as other carnivores). Some older burials were disturbed by one or more later burials located above the earlier one. In addition, individual human bones that could not be assigned to any of the identified burials were discovered at all of these sites (Cattanach 1980: 141-149; Hayes and Lancaster 1975: 172-181; Hoffman 1993: 257-263; Rohn 1971: 87-95).

In addition to reports on human remains from excavations, this study includes information regarding characteristics of the burials and the anthropological analysis of the remains from publications that to some extent compare burials from several sites. One is a publication by Bennett (1975: 2-6) that briefly describes and compares human remains data for several sites in Mesa Verde National Park, some of which are included in this article. A tremendous amount of information about Ancestral Pueblo culture from the area described, as well as about the burials themselves, was provided by publications from Dolores Archaeological Program research conducted in 1978-1983. During this project, several dozen Pueblo burials were discovered, carefully analyzed, and the state of health was assessed (Petersen and Orcutt 1987).

AGE STRUCTURE AND BREAKDOWN BY GENDER

While analysing the age structure of the included remains, I decided to categorise according to the age table that I had created for the purposes of my MA thesis, which includes age categories taken from the Buikstra and Ubelaker (1994) classification system (Table 2). For the age of individuals determined to fall within a certain range, the assignment of data took into account the size of this range in relation to the adopted categories.

The smallest age group in this study, a maximum of 2 individuals, are people older than 50 years. Perhaps only a few individuals lived to such an old age. In prehistoric societies, life expectancy was decidedly shorter than today. Therefore, socially, the age of a given individual was perceived differently, e.g., individuals were considered adults at a younger age than they are today.

The low mortality for individuals older than 50 years may be consistent with the higher mortality for the other age categories, in particular, the 20–35 and 35–50 age groups.

Table 2. Age category for all sites (after: Bradley 2002; Cattanach 1980: 147; Hayes and Lancaster 1975:172-181; Hoffman 1993: 257-263; Kuckelman and Martin 2007; Rohn 1971: 88; Swannack 1969: 166-177)

AGE CATEGORY*	SITES								
	Duckfoot Site (5MT3868)	Badger House (5MV1452)	5MV1676	Big Juniper House (5MV1595)	Long House (5MV1200)	Mug House (5MV1229)	Adobe Cave (5MV1228)	Sand Canyon Pueblo (5MT765)	Woods Canyon Pueblo (5MT11842)
Infant = birth to 3 years	-	7	-	4	10	15	3	8	1
Child = 3 to 12 years	5	3	-	-	7	7	2	3	5
Adolescent = 12 to 20 years	2	1	-	8	3	1	-	9	1
Young adult = 20 to 35 years	-	7	3	4	7	4	4	3	4
Middle adult = 35 to 50 years	5	8	2	2	3	6	-	4	-
Old adult = 50+ years	2	2	-	-	1	-	2	1	-
Adult = 20+ years	-	4	4	5	7	2	-	4	-
No data	-	1	-	-	2	-	-	-	-
All individuals	14	33	9	23	40	35	11	32	11

*All age categories created for my MA thesis and defined according to Buikstra and Ubelaker (1994).

Another age group of note is that of the youngest individuals, those 0–3 years of age. The largest number of specimens in this age group was found at Long House and Mug House – 10 and 15 individuals, respectively (Cattanach 1980: 142-145; Rohn 1971: 88). A relatively high mortality rate within this age group is also observable in the remains from Badger House (7 individuals) and Sand Canyon Pueblo (8 individuals). For other sites, this group is smaller and ranges from 0 to approximately 4 children (Bradley 2002; Hayes and Lancaster 1975: 172-181; Hoffman 1993: 257-263; Kuckelman and Martin 2007; Swannack 1969: 166-177). Most of the high mortality among children in this age group seems to have been caused by perinatal complications and diseases of infancy. In addition, in some prehistoric communities, the most critical time in terms of immunity was the weaning of a child at about the age of 3 years (e.g., Hühne-Osterloh and Grupe 1989). Such a high level of infant mortality at Long House and Mug House may also indicate, *inter alia*, difficult conditions under which children faced the greatest risk of death. That is, both of these sites date from the Pueblo III period, when the region experienced detrimental climatic variability and an escalation of violence. These conditions hindered the acquisition of food, which could have led to malnutrition and even starvation. It is worth noting that the greatest quantity of burials included in this study were from these 2 sites. Therefore, the greater number of children in this age category as compared to other categories may be proportional to the overall number of all examined individuals – higher than at other sites. Furthermore, in many prehistoric cultures, high child mortality was the norm. Also, the state of research and preservation of remains (especially of children's skeletons) limits the available anthropological data.

The data do not reveal any particular tendencies in the other age categories; instead, the mortality rate for those categories varies by site. For the 3–12 year category, the number of individuals ranges from 3 to 7 people, where again the greatest numbers were found at Long House and Mug House (Cattanach 1980: 142-145; Rohn 1971: 88). The remaining age categories, contain mostly 2 to 3 individuals each. In the 12–20 age group, the most specimens come from Big Juniper House (8) (Swannack 1969: 166-177) and Sand Canyon Pueblo (9) (Kuckelman and Martin 2007). The 20–35 year category presents an even level of mortality with an average of about 4 or fewer individuals per site, except for Badger House and Long House, which both have 7 (Cattanach 1980: 142-145; Hayes and Lancaster 1975: 172-181). In the 35–50 year age group, the situation is similar, except that the largest number of individuals of this age comes from Badger House (8) (Hayes and Lancaster 1975: 172-181) and Mug House (6) (Rohn 1971: 88).

In the data presented, I do not observe any patterns between the age structure or the number of individuals in particular categories by site, apart from the relatively high mortality of the youngest children and low mortality among people over 50 years of age. However, none of the sites included in this study has been fully excavated, so the available data probably constitute only a sample of the total number of individuals that were buried in each settlement. In addition, the conservation status of some remains made it impossible to gather more-detailed observations and record additional data. Therefore, it should be borne in mind that the data presented are incomplete, and new data that may be obtained in the future could change the age or gender structure for each of the sites.

Another focus of this study is the gender structure, as well as a quantitative comparison of the incidence of disease in women vs men at each site. In addition to the division into women and men, I distinguished 2 groups, namely children (up to 10 years of age) – in this category I included individuals of non-specified gender who were age 10 years or younger (sex was already determined for those older than this) – and a separate group for individuals older than 10 years of age, but whose gender was indeterminate (Table 3).

On the basis of the data in Table 3, we can see that the number of male burials is greater than that for females for most sites. The exceptions are Big Juniper House (F: 9, M: 7), Sand Canyon Pueblo (F: 11, M: 4) and Woods Canyon Pueblo, where 2 female burials but no male burials were identified. However, this may be due, *inter alia*, to the context in which most (10 out of 11) remains were found at this site.[1]

[1] 10 out of 11 people were found on the floor of structure 5-S, a kiva. Only a small area of this kiva floor was explored and thus not all skeletons were fully exposed. It is possible that if the entire 5-S structure

Table 3. Gender distribution in selected sites (after: Bradley 2002; Cattanach 1980: 141-149; Hayes and Lancaster 1975: 172-181; Hoffman 1993: 257-263; Kuckelman and Martin 2007; Rohn 1971: 87-95; Swannack 1969: 166-177)

SEX	SITES								
	Duckfoot Site (5MT3868)	Badger House (5MV1452)	5MV1676	Big Juniper House (5MV1595)	Long House (5MV1200)	Mug House (5MV1229)	Adobe Cave (5MV1228)	Sand Canyon Pueblo (5MT765)	Woods anyon Pueblo (5MT11842)
Female	4	7	1	9	7	2	4	11	2
Male	6	12	7	7	11	10	4	4	0
Children (up to 10 years old)	4	11	0	4	14	21	3	11	4
Unknown sex	0	3	1	3	8	2	0	6	5
All individuals	14	33	9	23	40	35	11	32	11

Table 4. Summary illustrating morbidity among women and men at all analysed sites (after: Bradley 2002; Cattanach 1980: 141-149; Hayes and Lancaster 1975: 172-181; Hoffman 1993: 257-263; Kuckelman and Martin 2007; Rohn 1971: 87-95; Swannack 1969: 166-177)

SEX	SITE								
	Duckfoot Site (5MT3868)	BadgerHouse (5MV1452)	5MV1676	Big Juniper House (5MV1595)	Long House (5MV1200)	Mug House (5MV1229)	Adobe Cave (5MV1228)	Sand Canyon Pueblo (5MT765)	Woods Canyon Pueblo (5MT11842)
Women with signs of disease	4	3	0	3	3	2	2	7	1
Men with signs of disease	6	7	4	5	7	5	3	3	0
Children (up to the age of 10) with signs of disease	3	1	0	2	0	1	2	8	4
Individuals of undetermined gender with signs of disease	0	0	0	0	0	0	0	0	4
Total number of individuals	14	33	9	23	40	35	11	32	11

However, the greatest number of children age 10 years or younger were found at Long House and Mug House. The remains of many children were also found at Badger House and Sand Canyon Pueblo, but these quantities are a result of combining the first 2 age groups due to the large percentage of individuals under 10 years of age of indeterminate sex. This table also shows how many individuals could not be sexed, usually a result of poor bone preservation.

In terms of disease incidence, the remains of men scored higher, with one exception. For most sites, however, the quantitative differences are not large enough to be able to unequivocally state that men tended to be burdened with more diseases than women. For a more precise comparison of the state of health of men vs women, further analyses should include qualitative data, that is, which types of diseases occurred in women and which types in men (Table 4).

SKULL BONES

Traces of various diseases, lesions, and non-metric features have been identified on the skulls of individuals discovered at the 9 sites in this study. One condition identified is craniosynostosis, which was diagnosed in a child (burial no. 41) at Adobe Cave (Rohn 1971: 88), a man (burial no. 20), a woman (burial no. 21) from Sand Canyon Pueblo (Kuckelman and Martin 2007), and a woman (burial no. 3) from Woods Canyon Pueblo (Bradley 2002). Craniosynostosis is a congenital defect in which one or more cranial sutures fuses prematurely. In such cases, the fusion of the cranial suture(s) may occur either before birth or immediately after birth. Craniosynostosis causes deformation of the skull from internal pressure exerted by the developing brain. Then the expansion of the cranial lobes is not uniform, but moves towards the flexible, non-fused cranial lobes (O'Loughlin 2004: 146-147). Doctors now suspect that this condition may be genetic or may be environmental to some extent. In some cases, its occurrence may be associated with metabolic disorders (Di Rocco *et al.* 2019).

One of the observed changes in the skulls of several individuals is the presence of wormian bones – additional, small bones in the cranial sutures that occur as a result of the presence of additional ossification foci (O'Loughlia 2004: 123-155). Their presence was observed in a woman (burial no. 3) at Sand Canyon Pueblo (Kuckelman and Martin 2007). Although the occurrence of wormian bones is genetic, their development is influenced by environmental factors. Researchers tried to find a link between the presence of wormian bones in pre-Columbian remains and skull deformities. One researcher (O'Loughlia 2004) considers these relationships. Those analyses show that the practices aimed at deforming the skull of a given individual did not affect the occurrence of wormian bones *per se,* although it seems that in a person with this trait, intentional deformation could have affected the number of bones that formed[2].

The final type of disease observed in this study is porosity of the skull. *Cribra orbitalia* was identified on the bones of the eye sockets, and *porotic hyperostosis* was found on the outer surface of the cranial lobes. Both of these ailments are characterised by local porosity of the

were to be excavated, more skeletons would be discovered, which would probably have an impact on the apparent age structure as well as gender differentiation indicators in this site (Bradley 2002).

[2] Two types of skull deformation were noted in the described sites: lambdoidal and occipital. In most cases, the most common deformity is lambdoidal. The latter type of deformation only occurs at 4 sites, and only at one of them (Sand Canyon Pueblo) does it occur in most individuals. Skull deformities were very common in Ancestral Pueblo culture as evidenced by their occurrence in women, men, and children (see Yelm 1935). Head deformities have been observed both in older individuals and in the youngest children.

bone tissue, and both of these changes are caused by disorders of the blood system. One of the reasons for their formation may be anaemia (related to iron deficiency) caused by inadequate nutrition and insufficient nutrients. The development of both described pathologies may be influenced by a deficiency of vitamin B12 (contained mainly in meat), folic acid, or vitamin C (Walker *et al.* 2009). Both of these pathologies are classified as stress markers. They can also arise as a result of infection (Bradley 2002; Kuckelman and Martin 2007; Walker *et al.* 2009: 109). The diet of Ancestral Pueblo peoples was based mainly on maize and beans, which do not contain many nutrients, and so such a diet may cause both of these pathologies. Among the remains in this study, only those from 3 sites indicate the presence of disease. *Porotic hyperostosis* occurred in 1 individual from the Duckfoot site (Hoffman 1993: 258), 5 from Sand Canyon Pueblo (Kuckelman and Martin 2007), and 2 from Woods Canyon Pueblo (Bradley 2002), whereas *cribra orbitalia* occurred in 5 individuals from Duckfoot (Hoffman 1993: 259-263, 279-280) and 1 from Sand Canyon Pueblo (Kuckelman and Martin 2007).

In the data in this study, I did not detect any clear trends in the occurrence of individual diseases, although all of the above-mentioned diseases visible on skulls were found at Sand Canyon Pueblo. One interesting observation concerns pathologies related to inadequate nutrition and the occurrence of enamel hypoplasia (described below), which occurred on remains from the same 3 sites as the other stress markers. This probably indicates difficulty of maintaining a balanced diet, the occurrence of hunger, malnutrition, and perhaps acute disorders of the digestive system (Krenz 1994: 73-88). For residents of Sand Canyon Pueblo and Woods Canyon Pueblo, which date from late in the Pueblo III period, such issues may be associated with climate change that negatively impacted local agriculture. The presence of the same type of pathology at the Duckfoot site, which dates from the Pueblo I period, may also indicate problems with nutrition. Moreover, and interestingly, at the sites that date from the Pueblo II and Pueblo III periods and located in the area of what is currently Mesa Verde National Park, the 3 diseases considered here have not been identified. Perhaps access to food was better there than in the lower areas, e.g., due to the greater amount of rainfall (some of this area including Mesa Verde National Park is located at a slightly higher elevation – approx. 1,833–2,612 m above sea level – than the locations of the other 3 sites) or, this state of affairs may only be illusory due to the limited amount of information from other sites.

MOUTH AND TOOTH DISEASE

Other types of disease that can be observed in some individuals are those related to gums and teeth. Data for Long House, Mug House, and Adobe Cave were excluded from these analyses, because the associated research reports did not contain information on such ailments. This lack does not necessarily indicate that the residents of these sites enjoyed exceptionally good dental health but rather indicates a lack of analyses in this area – perhaps due to the state of preservation of the remains or other, unknown factors.

For the remain from the other sites (Badger House, site 5MV1676, Big Juniper House, the Duckfoot site, Sand Canyon Pueblo, and Woods Canyon Pueblo), we can distinguish several diseases and defects occurring more frequently and more commonly, as well as some that tend to be more specific for a given site. It is possible that the reason for such differentiation is the state of health of different individuals at the various sites, to differing methods of anthropological analysis, or to the state of preservation of the remains.

The most common ailment at the sampled sites is caries, which occurs through an infection caused by bacteria that accumulate on dental plaque. Caries proliferation is also influenced by a diet rich in sugars (WHO 2020), including starch, which is one of the main ingredients found in maize, which was a main component of the Ancestral Pueblo diet. Caries involves the destruction of tooth enamel, which then causes a loss of dentin, below the enamel. Caries can cause successive layers of the tooth to become infected, which may ultimately lead to the destruction of blood vessels and nerves in the tooth, as a result of which it may die (Kuckelman and Martin 2007; Ortner 2003a: 590; Waldron 2009: 236). Caries were found in 2 individuals from Badger House, 1 from 5MV1676 (Hayes and Lancaster 1975: 172-181), 1 from Big Juniper House (Swannack 1969: 166-177), 7 from Duckfoot (Hoffman 1993: 257-263), and 6 from Sand Canyon Pueblo (Kuckelman and Martin 2007).

Another common ailment, which may be caused by caries, is dental abscess (Kuckelman and Martin 2007). Abscesses were found in 4 individuals from Badger House, 1 from 5MV1676 (Hayes and Lancaster 1975: 172-181), and Big Juniper House (Swannack 1969: 166-177), 7 from Duckfoot (Hoffman 1993: 257-263), and 1 from Sand Canyon Pueblo(Kuckelman and Martin 2007). In addition, the individual from Sand Canyon Pueblo (burial no. 2) also featured perforation of the upper palate, which could have been caused by an abscess of the palate or even cancerous tumour (Kuckelman and Martin 2007).

Two additional conditions that may offer some clues about the health of Ancestral Pueblo communities are antemortem tooth loss and degree of tooth wear. Tooth loss can be caused by trauma, illness, or lack of vitamins and could be another indication of poor nutrition. That the loss occurred antemortem is indicated by the condition of the alveolus – if it shows signs of overgrowth (partial or complete), it may indicate that the loss occurred during the individual's lifetime (Waldron 2009: 239). Tooth wear could have been caused by excessive abrasion due to the presence of stone particles in food. For example, such particles could have been mixed into food during the process of grinding maize for flour using the stone mano and metate. The type of food consumed may also have influenced the degree of tooth wear. Use of the teeth as tools, such as to soften leather, would also cause excessive wear. Antemortem tooth loss was reported in the remains of 3 individuals from Badger House, 2 from 5MV1676 (Hayes and Lancaster 1975: 172-181), and 3 from Duckfoot (Hoffman 1993: 253-296). Clearly visible tooth wear was observed on remains from Badger House, 5MV1676 (Hayes and Lancaster 1975: 172-181), and Sand Canyon Pueblo (Kuckelman and Martin 2007) – 1 case per site – as well as in 5 individuals from Big Juniper House (Swannack 1969: 166-177) and 8 from the Duckfoot site (Hoffman 1993: 259-263).

Another common ailment was tooth crowding, which in some individuals was probably caused by supernumerary teeth (e.g., burial no. 2 from the Duckfoot site). Tooth crowding was observed for 2 sites only – Duckfoot (3 individuals) (Hoffman 1993: 257-263), and Big Juniper House (1 individual) (Swannack 1969: 166-177).

Other tooth and mouth diseases were mainly recorded for Duckfoot, Sand Canyon Pueblo, and Woods Canyon Pueblo. For Duckfoot, 7 individuals suffered from dental calculus, which is formed by the deposition of phosphorus and calcium minerals on the tooth surface, precipitating in the oral cavity through the action of bacteria. Plaque is known to be the most common culprit for the formation of caries (Waldron 2009: 240-241). Another disease present at Duckfoot was inflammation of the maxillary sinusitis (Hoffman 1993: 257-258), which may occur, *inter alia*, as a complication of untreated dental and mouth disease. Other forms of inflammation include osteitis of the hard palate and periodontitis (5 individuals) (Hoffman 1993: 257-263). Periodontitis most often occurs as a result of a bacterial infection and is characterised in the

bone material by a lowering of the alveolar bone line, as well as cavities in the bone at the site of the inflammation (Waldron 2009: 239-240).

Another disorder in remains from the Duckfoot site (burial nos. 1, 3, 4, and 9) as well as at Woods Canyon Pueblo (burial nos. 3, 5, and 8) was mesiobuccal and mesiolingual tooth rotation, which is a congenital condition. It involves the growth of a tooth that is turned on its axis by sometimes as much as 90° compared to properly aligned teeth. This defect affects only the rotation of an individual tooth rather than every tooth (Bradley 2002; Hoffman 1993: 257-261, 284-287). Another congenital defect described for remains at the Duckfoot site is the fusion of crown and root of 2 teeth, which is interpreted as a congenital defect and was found on the remains of a female (burial no. 10) (Hoffman 1993: 261).

Changes observed on the teeth of individuals from 3 sites – Duckfoot, Sand Canyon Pueblo, and Woods Canyon Pueblo – indicate enamel hypoplasia, i.e., underdevelopment of the enamel. Enamel hypoplasia can occur on either permanent or deciduous teeth. In the latter, such hypoplasias may indicate nutritional deficiencies of the child's mother during pregnancy. As I mentioned previously, this disease is considered a stress marker because it can result from poor nutrition (Bradley 2002).

The final 2 dental disorders represented in the sampled remains are hypodontia, or the congenital absence of one or more teeth, and peg teeth of the third molars. Both conditions were identified in individuals from Sand Canyon Pueblo only (Kuckelman and Martin 2007).

Comparing the occurrence of tooth and mouth disorders for the 9 selected sites, I did not observe any clear trends or disease relationships. One can distinguish diseases that occur more frequently – such as the aforementioned caries and various types of abscesses or tooth loss – and some that appeared sporadically. Another interesting observation is the occurrence of enamel hypoplasia at Duckfoot, Sand Canyon Pueblo, and at Woods Canyon Pueblo, where the other 2 stress markers (*cribra orbitalia, porotic hyperostosis*) were also observed. Such occurrences may indicate nutritional issues such as a lack of adequate vitamins and/or problems with the circulatory system at these settlements during the Pueblo I (Duckfoot) and Pueblo III (Sand Canyon and Woods Canyon Pueblos) periods, respectively. Nevertheless, it is possible that the occurrence of tooth and mouth disorders on remains from only these 3 sites might have been the result of the state of preservation of the remains, because preservation affects the amount of data recovered. For the remains from Duckfoot, such a large variety of oral diseases relative to oral diseases at sites dating from the later period may indicate that later people enjoyed better health and exercised improved personal hygiene in later periods. This issue should be studied further during subsequent analyses and observations in this geographic area.

TRACES OF DISEASES OCCURRING ON THE POSTCRANIAL SKELETON

One of the most widespread diseases, also one of the most common contemporary ailments, is degenerative joint change such as osteoporosis, osteoarthritis, or degenerative arthritis. The degenerative changes usually affect the most mobile joints, such as those of the knee or the acetabulum, and are also visible on the vertebrae. These are the most overburdened parts of the skeleton, which is likely to contribute to the degeneration of these joints. When observing contemporary cases of degeneration, sex, age, genetic tendencies, previous injuries, and the individual's mobility are taken into account. On this basis, it is concluded that women are prone to develop such changes earlier than men (Ortner 2003b: 545-549; Waldron 2009: 28).

The most common age from which the occurrence of this type of pathology begins is about 30 years. Several young people about 20 years of age from Mug House and Big Juniper House are exceptions to this rule. Two young women from Mug House – burial nos. 3 and 21 – were between 20 and 22 years old, and the remains of both women exhibited very advanced stages of arthritis. Such serious degenerative changes in individuals of such a young age could have been a result of regular, gruelling labor, possibly related to farm duties, i.e., occupational markers. Moreover, this inference may be supported by antemortem injuries to the vertebrae in burial no. 21 (Rohn 1971: 94). Remains of young individuals with severe degenerative changes have been found in other areas of the world as well. Such changes may be a result of diet and of activities that the young person experienced on a frequent basis. If the diet of a young person is poor in nutrients, and the individual engages in frequent heavy labor, the skeleton of such a person may show many more pathological changes, including degenerative ones, than the skeleton of an elderly person who never performed heavy labor and whose diet was properly balanced and rich in nutrients and microelements (Ortner 2003c: 39).

Burial no. 3 from Woods Canyon Pueblo is interesting in terms of pathologies related to the performance of specific repetitive activities. This woman was approximately 29 to 31 years of age, and may have had many disorders. In addition, a flattened second cervical vertebra was also observed, which is believed to have been caused by the frequent carrying of a heavy load on her back in a basket attached to the forehead by a tumpline. This method of carrying baskets significantly strained the spine, especially in the cervical region. The author of the associated analytic report suggests that the observed traces may also indicate hyperextension of the neck in the cervical region (Bradley 2002).

Another example of the occurrence of osteoporosis in young individuals are burial nos. 12 and 13 from Big Juniper House; both individuals were 0-3 years of age (Swannack 1969: 173). Cranial osteoporosis was identified on both sets of remains, yet the report offered no explanation for these conditions or inference as to whether this ailment could have affected the life expectancy of these individuals.

Another joint disorder was identified in 1 individual from Badger House (burial no. 21). This person suffered from a stiff wrist (Hayes and Lancaster 1975: 173, 177).

Evidence of fractures such as bone fusion and cracks is common. Such evidence was found on the remains of an average of 1 to 4 individuals per site. Despite settlement shifts from the mesas to canyon rims, talus slopes, and cliff overhangs from the Pueblo I to the Pueblo III periods, no increases in bone fractures through time were observed.

A large variety of diseases is visible on vertebrae including kissing spine and *spondylolisthesis*. The former occurred in just 1 specimen from Long House (burial no. 12), whereas the latter was noted on remains from Long House (burial no. 12) (Cattanach 1980: 149), Mug House (burial nos. 5 and 27), and Adobe Cave (burial no. 46) (Rohn 1971: 94-95). Kissing spine consists of spinous processes of the vertebrae rubbing against each other in one section of the spine, which results in irreversible bending of the spine (Cattanach 1980: 141-149). *Spondylolisthesis*, which was observed on remains from all 3 of the aforementioned sites, is a forward shift of one or more vertebrae in relation to the vertebrae below (PWN 2020). It is believed that this condition is preceded by *spondylolysis* (breaks in the bone arch between the upper and lower articular processes), which is a congenital defect or occurs as a result of overloading the spine, or of trauma (Gładykowska-Rzeczycka *et al.* 2008: 8). All remains identified with *spondylolisthesis*, except for the Long House individual, were also found to have *spondylolysis*.

Two additional spinal disorders were observed on remains from the Duckfoot site. Klippel Feil syndrome was observed in one individual – a man 30–39 years old – or burial no. 1 (Hoffman 1993: 257). This is a congenital condition in which 2 or more cervical vertebrae fuse. A person suffering from this syndrome, apart from a limited ability to move the head and a low hairline on the back of the neck, may experience ailments related to the malfunctioning of individual organs (Waldron 2009: 218). In burial no. 1, the fifth and sixth cervical vertebrae are fused (Hoffman 1993: 257). The second disorder involves Schmorl's nodes. At the Duckfoot site, this condition was observed on the remains of 3 men between the ages of 30 and 50 years. On burial no. 2, the nodes appeared on the 7th thoracic vertebra; on burial no. 6, the 12th thoracic vertebra to the 5th lumbar vertebra were affected; on burial no. 8, such nodes were observed on the 4th lumbar vertebra (Hoffman 1993: 257, 259-260, 283). Schmorl's nodes are formed by local intravertebral disc protrusions. They usually occur in the thoracic and lumbar spine and can take a variety of forms. It is suspected that the formation of such nodules occurs through ischemic necrosis of the bone (Waldron 2009: 45; Weiss 2015: 75). There are many known causes of Schmorl's nodes: injuries sustained by falling from a considerable height, the carrying of heavy objects (usually in young people), degenerative diseases of the intervertebral cartilage and aging processes (in adults), and congenital spine defects. Clinical trials in contemporary communities have highlighted the link between back pain and the occurrence of Schmorl's nodes. These data indicate that most such pain is caused by nodes located in the central part of the vertebrae, whereas the presence of osteophytes on the vertebrae could increase the incidence of back pain (Faccia and Williams 2008). Individuals suffering from Schmorl's nodes in the prehistoric period must have experienced discomfort as well.

The remaining disorder affecting the vertebrae, *pyogenic spondylitis*, was recorded for individuals at only a few sites. This condition may have resulted from infection.

A further group of ailments affected the bones of the lower and upper limbs. One of the most interesting disorders observed is *protrusio acetabuli*, which involves the acetabulum sinking into the pelvis; this condition causes painful intrusion of the femoral head and renders the head immobile over time. The disease was identified in a man about 37 years of age (burial no. 11 from Badger House) even though today this disease usually found in people over 50 years (Hayes and Lancaster 1975: 173, 179). Another disorder, found on remains from 5MV1676 (burial no. 5) (Hayes and Lancaster 1975: 173-174) and Adobe Cave (burial no. 46) (Rohn 1971: 94), is osteochondritis dessecans. This disease is caused by the death of bone cells, which leads to the death and slow separation of the bone and cartilage of the joint (Hayes and Lancaster 1975: 173-174). At site 5MV1676, a man (burial no. 8.) suffered from a mild bunion in the area of the hallux. Bunions consist of deformation of the joint connecting a metatarsal with a phalanx, causing a distinct swelling (Hayes and Lancaster 1975: 174).

Another disorder, which was noted on the remains of a woman from Big Juniper House (burial no. 3) and 4 individuals from Long House (burial nos. 4, 7, 16, and 18), is anteversion of the femora. The remains of the woman from Big Juniper House exhibit abnormal bilateral bone anteversion of as much as 50°. Also present at Big Juniper House, on burial no. 17, was an abnormal rotation of the tibia of as much as 30° towards the outside of the leg (Swannack 1969: 167-168). A similar condition of abnormal rotation of a single long bone was noted on the remains of 2 individuals from Mug House and of 1 from Adobe Cave (Rohn 1971: 87-95). Moreover, bipartite patella (Rohn 1971: 94-95) were identified in 2 people buried in Adobe Cave (burial nos. 1 and 43). Bipartite patella involves abnormal ossification, that is, incomplete fusion of the ossification centres (Atlas Anatomii Klinicznej).

Numerous individuals from 3 sites – Duckfoot (3 individuals), Sand Canyon Pueblo (6 individuals), and Woods Canyon Pueblo (probably 1 individual) – suffered periostitis. This condition involves inflammation of the fibrous membrane – the periosteum – that covers each bone, protecting it from the outside. This inflammation may occur locally, e.g., as a result of trauma, or on multiple bones, which may indicate a general infection (Kuckelman and Martin 2007; Ortner 2003d: 205-207). Traces of tendinopathy and subperiosteal hematoma were identified in burial no. 6 at the Duckfoot site. This type of hematoma usually occurs at the site of muscle rupture due to damaged blood vessels and blood pooling under the periosteum; on burial no. 6 the condition was found in the area of the hip adductors (Hoffman 1993: 257-261). For Woods Canyon Pueblo, sclerotic bone was observed on both bones of the pubic symphysis of burial no. 3 as well as on the left humerus of burial no. 11 (Bradley 2002). Sclerotization usually occurs due to excessive calcium deposition in the bones.

Long bones of some individuals exhibit various types of growths or tumours – some of which would indicate the existence of cancer: Long House – burial no. 16 (Cattanach 1980: 141-149), Mug House – burial no. 30 (Rohn 1971: 94), and Sand Canyon Pueblo – burial no. 2 (Kuckelman and Martin 2007) – but also osteoma and osteophytes. Most were observed on the remains of individuals from Sand Canyon Pueblo (Kuckelman and Martin 2007). In addition, myostitis ossificans occurred on the remains of 1 individual at this site, whereas one man, burial no. 6 at the Duckfoot site, featured exostosis (a growth that suggests the presence of a tumour) on a femur (Hoffman 1993: 257-261).

The data used for this study also indicate the presence of other pathologies such as perforated bones as well as additional ossification centres. Furthermore, the remains of some individuals feature the unnatural fusion of some bones such as the fusion of 2 vertebrae in various parts of the spine, as well as additional bones, such as burial no. 27 at Mug House, who has an extra rib (additional ossification centres). All noted conditions are summarised in Table 5 at the end of the text. In addition to the aforementioned types of diseases, a small number of congenital diseases, as well as diseases with a potential genetic background, were discovered on the remains from the analysed sites.

BIRTH DEFECTS AND GENETIC DISEASES

Congenital defects and genetic diseases afflicted a small percentage of individuals from all 9 sites, but their occurrence was not recorded in all of analyzed sites. Congenital defects include all disorders present at birth. They may appear as isolated defects or in groups of multiple defects. In addition, they can be divided into those of unknown origin, resulting from environmental factors, and those with a genetic, intergenerational basis (PRWWR 2017).

Congenital abnormalities, some of which have already been mentioned, were recorded for remains from Duckfoot, Adobe Cave, Sand Canyon Pueblo, and Woods Canyon Pueblo. These conditions include the previously mentioned Klippel Feil syndrome, the fusion of tooth crowns or roots, mesiobuccal or mesiolingual rotated teeth, craniosynostosis, and hypodontia. In the case of a man (burial no. 2) from Sand Canyon Pueblo, the occurrence of hypodontia and a peg tooth could be related to polydactyly, a genetic condition that involves the development of an additional manual or pedal digit. Burial no. 2 had 6 toes on his right foot (Kuckelman and Martin 2007). The condition is rare, and researchers suggest a possible relationship between this individual and another polydactyly sufferer whose burial was discovered at Pueblo Bonito in Chaco Canyon, located in northwest New Mexico (Kuckelman and Martin 2007).

For remains studied from Sand Canyon Pueblo, researchers suggest several possible genetic relationships between individuals (see Kuckelman and Martin 2007); here I focus on a few examples. One is a possible relationship between burial nos. 20 and 21, in which the occurrence of craniosynostosis in both of these individuals found in the same room suggests a genetic relationship. In addition, burial nos. 21 and 12 could have been genetically related – both exhibited genetic anomalies of the sternum. Thus, thanks to the observation of genetic conditions, we can attempt to recreate genetic relationships between some individuals living at one habitation or even individuals from different settlements (Kuckelman and Martin 2007). However, the results of such attempts should be considered tentative.

A final interesting case that probably features birth defects is a woman 18 to 20 years old (burial no. 3) from Sand Canyon Pueblo. In addition to conditions such as enamel hypoplasia and *porotic hyperostosis*, skeletal features such as thin, curved and porous bones and a pointed chin indicate that the person may have suffered from osteogenesis imperfecta. This disorder is often accompanied by other birth defects that are observable only on soft tissue. Furthermore, this individual may have suffered from poliomyelitis. However, these inferences are tentative (Kuckelman and Martin 2007).

CONCLUSIONS

On the basis of the information gathered and presented above, it can be concluded that the health of these Ancestral Pueblo individuals was relatively good. Most of the noted diseases and conditions varied from settlement to settlement.

The age structure is quite varied. As mentioned above, the 2 age groups that are most noteworthy are children age 0–3 years and adults over 50 years. Among the remains of the former group, a relatively large number of remains was noted at individual sites; child mortality was high in prehistoric communities, due in part to perinatal complications and diseases of infancy. Among the latter group, the number of individuals represented was decidedly small, probably because in prehistoric societies life expectancy was much shorter than today and therefore, relatively few people lived past the age of 50 years.

In terms of gender, at all sites except Big Juniper House, Sand Canyon Pueblo, and Woods Canyon Pueblo, male burials predominate, although burials of children under the age of 10 are also numerous. Most incidents of disease were noted on the remains of men. Nevertheless, qualitative analyses are more meaningful because of small sample size. Moreover, the differences in the number of burials analyzed for each sites are significant; e.g., the remains of 9 individuals were analyzed for site 5MV1676, whereas those of 40 individuals were analyzed for Long House.

The largest amount of information provided by bioarchaeological reports addresses disorders found on remains for the selected sites. Several types of diseases, conditions, and ailments can be distinguished as nearly ubiquitous, such as, for example, joint degeneration, osteoporosis, caries and other tooth decay, tooth crowding, and antemortem bone fractures (see Table 5). It is notable that, despite the shift in settlement location from the easily accesible terrain of sites dating from the Pueblo I period to the canyon-oriented locations of sites dating from the late Pueblo III period, the number of individuals with fractures is the same for both periods. Multiple bone fractures in single individuals are observed for most sites regardless of site location.

Some disorders, however, such as *protrusio acetabuli*, patellar bipartite, or Klippel Feil disease, were found at only a single site. These are sporadic diseases, most of them related to the functioning of the joints or the proper development of the spine. The conditions listed in Table 5 also include congenital defects such as wormian bones and relatively rare genetic occurrences such as polydactyly. On the basis of some of these conditions, researchers infer possible genetic kinship between specific individuals, which may offer additional information on social relations and residential patterns.

My final observations concern the occurrence of *cribra orbitalia*, *porotic hyperostosis*, and enamel hypoplasia at 3 sites: Duckfoot (Pueblo I), Sand Canyon Pueblo (Pueblo III), and Woods Canyon Pueblo (Pueblo III). All 3 conditions are referred to as stress markers (Bradley 2002; Kuckelman and Martin 2007), because their presence may indicate hunger, malnutrition, or lack of adequate vitamins and minerals in the residents of these 3 settlements. For remains from sites dating from the Pueblo III period, the presence of these conditions may be related to, *inter alia*, environmental deterioration that occurred during this period. All 3 diseases were identified on remains from sites outside Mesa Verde National Park.

The 9 sites selected represent only a small percentage of all Pueblo sites in the Mesa Verde region, as well as a small percentage of the sites where burials of Ancestral Pueblo were discovered. The data presented here offer some insight into the state of health among the described communities; most of the diseases mentioned in the research reports consulted are included in Table 5. Even so, specific types of diseases and conditions are observably more common than others. This study indicates that the residents of the communities examined enjoyed relatively good health. Apart from the examples described above, I did not notice any distinct patterns of illness or conditions that could be attributed to the age or sex of specific individuals. Nevertheless, to more accurately assess the state of health of the population, as well as the relationships between the state of health and environmental conditions, further comparative analyses are required using a larger sample.

Table 5. Summary of the majority of diseases observed on remains from nine sites in the central Mesa Verde region (after: Bradley 2002; Cattanach 1980: 141-149; Hayes and Lancaster 1975: 172-181; Hoffman 1993: 257-263; Kuckelman and Martin 2007; Rohn 1971: 87-95; Swannack 1969: 166-177)

CONDITION	SITES								
	Duckfoot Site (5MT3868)	Badger House (5MV 1452)	5MV1676	Big Juniper House (5MV1595)	Long House (5MV1200)	Mug House (5MV1229)	Adobe Cave (5MV1228)	Sand Canyon Pueblo (5MT765)	Woods Canyon Pueblo (5MT11842)
Arthritis	-	6	2	6	-	2	2	-	-
Osteoporosis	-	-	-	2	1	-	-	-	-
Osteoarthritis	5	1	-	-	-	1	-	1	-
Degenerative arthritis	1	-	2	-	7	-	-	5	1

cont. Table 5

CONDITION	SITES								
	Duckfoot Site (5MT3868)	Badger House (5MV 1452)	5MV1676	Big Juniper House (5MV1595)	Long House (5MV1200)	Mug House (5MV1229)	Adobe Cave (5MV1228)	Sand Canyon Pueblo (5MT765)	Woods Canyon Pueblo (5MT11842)
Cribra orbitalia	5	-	-	-	-	-	-	1	-
Porotic hyperostosis	1	-	-	-	-	-	-	5	2
Wormian bones	-	-	-	-	-	-	-	1	-
Craniosynostosis	-	-	-	-	-	-	1	2	1
Osteoma	-	-	-	-	-	-	-	1	-
Schmorl‘s nodes	3	-	-	-	-	-	-	-	-
Klippel Feil syndrome	1	-	-	-	-	-	-	-	-
Kissing spines	-	-	-	-	1	-	-	-	-
Spondylolisthesis	-	-	-	-	1	2	1	-	-
Spondylolysis	-	-	-	-	-	2	1	-	-
Flattened vertebrae	-	-	-	-	-	-	-	-	1
Pyogenic spondylitis	-	-	1	-	-	-	-	-	-
Hypodontia	-	-	-	-	-	-	-	3	-
Enamel hypoplasia	2	-	-	-	-	-	-	14	6
Dental calculus	7	-	-	-	-	-	-	-	-
Supernumerary tooth	1	-	-	-	-	-	-	-	-
Tooth crowding	3	-	-	1	-	-	-	-	-
Mesiobuccal or mesiolingual rotated tooth	4	-	-	-	-	-	-	-	3
Perforation of the palate	-	-	-	-	-	-	-	1	-
Caries	7	2	1	1	-	-	-	6	-
Antemortem tooth loss	3	3	2	-	-	-	-	-	-
Abscesses	7	4	1	1	-	-	-	1	-
Tooth abrasion	8	1	1	5	-	-	-	1	-
Peg teeth	1	-	-	-	-	-	-	1	-
Osteitis of the hard palate	3	-	-	-	-	-	-	-	-
Periodontosis	5		-	-	-	-	-	-	-
Inflammation of the maxillary sinusitis	1	-	-	-	-	-	-	-	-

cont. Table 5

CONDITION	SITES								
	Duckfoot Site (5MT3868)	Badger House (5MV 1452)	5MV1676	Big Juniper House (5MV1595)	Long House (5MV1200)	Mug House (5MV1229)	Adobe Cave (5MV1228)	Sand Canyon Pueblo (5MT765)	Woods Canyon Pueblo (5MT11842)
Fusion of tooth crowns or roots	1	-	-	-	-	-	-	-	-
Bunion	-	-	1	-	-	-	-	-	-
Subperiosteal hematoma	1	-	-	-	-	-	-	-	-
External / internal torsion of the bones	-	-	-	1	-	2	1	-	-
Osteochondritis dessecans	-	-	1	-	-	-	1	-	-
Bipartite patellae	-	-	-	-	-	-	2	-	-
Protrusio acetabuli	-	1	-	-	-	-	-	-	-
Anteversion of the femora	-	-	-	1	4	-	-	-	-
Sclerotic bones	-	-	-	-	-	-	-	-	2
Periostitis	3	-	-	-	-	-	-	6	1
Muscle tear	2	-	-	-	-	-	-	-	-
Stiff or crippled joints	-	1	-	-	-	-	-	-	-
Myostitis ossificans	-	-	-	-	-	-	-	1	-
Additional bones	-	-	-	-	-	1	1	-	-
Unnatural bone fusion	-	3	-	1	1	2	1	-	2 ?
Fusion anomalies	-	-	-	-	-	-	-	-	7 ?
Compression fracture	-	2	-	-	-	1	-	-	-
Healed fracture	4	4	-	2	1	2	2	-	1
Additional ossification places	-	-	-	-	-	-	1	-	-
Tumours, possibly cancer	-	1	-	-	1	1	1	2	-
Osteophytes	-	-	-	-	-	-	-	2	-
Sternal anomaly	-	-	-	-	-	-	-	3	-
Polydactyly	-	-	-	-	-	-	-	1	-
Osteomyelitis	-	-	-	-	-	-	-	2?	-
Exostosis	1	-	-	-	-	-	-	-	-
Bone defect or perforation	-	-	-	2	-	-	-	-	-
Occupational markers	-	-	-	1	-	2	-	-	1

cont. Table 5

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