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Growing Old at Tombos: A View of Older Adults in an Ancient Egyptian-Nubian Community

تقدم السن أو خة في تمبس: نظرة على كبار السن في المجتمع المصري النوبي القديم

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Keywords: aging | ancient sudan | burial practices | disability | health

ABSTRACT

Objectives: The experiences of older adults in ancient communities are often overlooked in studies due to many factors, such as preservation, methodological issues, and less frequent mention in available texts.

Materials and Methods: This study combines community- and individual-level data to explore life for older adults at the ancient Egyptian/Nubian Tombos site (c. 1450–660 BCE) in modern-day Sudan ($N = 125$). Age data, estimated using Transition Analysis, are examined in conjunction with health, physical activities, burial context, sex, cultural, and geographic identities.

Results: At Tombos, 29% of discretely buried individuals who could be aged are estimated to be 50 years of age or older, including individuals estimated to have reached their late 70s. This percentage is high compared to regional sites; however, the use of traditional age estimation methods in other studies may have impacted estimates above age 50.

Discussion: Overall, older adults are found at Tombos in a range of socioeconomic statuses ranging from modest to elite and were buried across different cemetery areas reflective of cultural and/or religious variation. Few older individuals show evidence of nutritional deficiencies from early life, infectious disease, or very high physical workload. The osteobiographies presented suggest individuals likely received assistance due to injuries and possible disabilities. Individuals who were able to live until old age may have been those with access to better resources.

:الملخص

الأهداف:غالبًا ما يتم تجاهل تجارب كبار السن في المجتمعات القديمة في الدراسات بسبب العديد من العوامل، مثل الحفظ والقضايا المنهجية وقلة ذكرهم في النصوص المتاحة.

المواد والأساليب:تجمع هذه الدراسة بين البيانات على مستوى المجتمع والفرد لاستكشاف حياة كبار السن في موقع تمبس المصري النوبي القديم حوالي (1450-660 قبل الميلاد)في السودان الحديث (N=125) يتم فحص بيانات العمر المقدره باستخدام تحليل الانتقال جنبا الي جنب عند تقاطعه مع الصحة والأنشطة البدنية وسياق الدفن والجنس والهويات الثقافية والجغرافية.

النتائج: في تمبس، يقدر أن 29% من الأفراد المدفونين بشكل منفصل الذين يمكن تقدير أعمارهم يبلغون من العمر 50 عامًا أو أكثر ، بما في ذلك الأفراد الذين يقدر أنهم بلغوا أواخر السبعينيات. هذه النسبة عالية مقارنة بالمواقع الإقليمية، على الرغم من أن الاختلافات المنهجية قد تساهم في الفروق.

المناقشة:بشكل عام، يوجد كبار السن في تمبس في مجموعة من الوضع الاجتماعي والاقتصادي تتراوح بين المتواضع والنخبة، وتم دفنهم في مناطق مقابر مختلفة تعكس الاختلاف الثقافي و/أو الديني. قلة من كبار السن يظهرون أدلة على نقص التغذية من الحياة المبكرة أو الأمراض المعدية أو عبء العمل البدني المرتفع للغاية. تشير الادلة العظمية المقدمة إلى أن الأفراد ربما تلقوا مساعدة بسبب الإصابات والإعاقات المحتملة،
الظروف البدنية، وأن الأفراد الذين تمكنوا من العيش حتى سن الشيخوخة قد يكونون أولئك الذين لديهم إمكانية الوصول إلى موارد أفضل.

1 | Introduction

Age identity has often been overlooked in archaeological and bioarchaeological spaces (Appleby 2017). Undertheorization of age identity results from the entangled nature of the biological, cultural, and chronological concepts of age (Gowland 2006). Over the last decades, theory and research into the concept of social age have increased extensively, although much of this research has focused on the first several decades of life (e.g., Halcrow and Tayles 2008; Perry 2006). Different aspects of identity do not exist in a vacuum; rather, aspects of identity overlap and entwine with one another. As such, age identity is related to other identities, including gender, kinship, social status, marital and reproductive status, ethnicity, and religious affiliation, among others (Appleby 2010). By emphasizing the importance of the social life of the skeleton, intersectional approaches have been used to examine intersecting aspects of identity, including gender and aging (Gowland 2006), aging and growing old (Appleby 2010; Gowland 2007), childhood (Blom and Knudson 2014; Perry 2006; Redfern and Gowland 2012), and aging and disability (Lovell 2016; Welinder 2001). The examination of aging in specific contexts provides more detailed models of past communities (Appleby 2017; Bethard et al. 2024).

Older adult individuals are estimated to make up 6%–8% of past populations, but little research has been conducted on them (Maaranen and Buckberry 2018). The lack of research may be due to preservation issues. For example, Walker et al. (1988) suggest that the remains of older (>45 years) adults more rapidly disintegrate due to poor calcification, resulting in underrepresentation in comparison with young and middle-aged adults. Older adults are relatively neglected in archaeology in comparison with other aspects of social identity. Age is more than just chronology; through the examination of older individuals, we may be able to understand individuals who were able to survive to older life due to a better immune response than those who died young (Appleby 2017; Armelagos et al. 2009; Wood et al. 1992). Cross-cultural uniformity in older adults should not be assumed; instead, studies should address variability in physical, chronological, and social age (Maaranen and Buckberry 2018). Methodological developments in recent decades have allowed for more nuanced age estimations (Boldsen et al. 2002) for older adult individuals that had been previously difficult to assess accurately above 45 years and were often underestimated, creating a skewed view of life expectancy (Boldsen et al. 2022).

The focus of this study is individuals who were buried at Tombos, a site located on the Third Cataract of the Nile River in the northern part of modern-day Sudan (Figure 1). The cemetery at Tombos was used continuously from the New Kingdom (founded *c.* 1450 BCE) through the early Napatan (Third Intermediate in Egypt) Period and into the Napatan Period (*c.* 750–650 BCE). Tombos served as an Egyptian administrative center concerned with the tribute from Kush (Nubia) to Egypt and at least one high-level administrator, Siamun the "Scribe Reckoner of the Gold of Kush," was buried at Tombos. Excavations at the Tombos settlement, which is associated with the cemetery, indicate that Tombos may have in fact been the Egyptian fortress of Taroy (Smith and Buzon 2018). Here, the intersection of age with health, burial context, sex/gender, cultural, and geographic identities is explored at Tombos by combining community- and individual-level data to understand more fully what life was like for older individuals in this community.

2 | Old Age and Elders

As discussed above, old age is underexamined in archaeological and bioarchaeological contexts. Often, old age is mentioned tangentially to other discussions of age. The difficulties in examining old age are frequently attributed solely to difficulties in osteological aging techniques (Appleby 2010, 2017). The aging process, however, can provide valuable information to the understanding of past peoples within archaeology and bioarchaeology. Initial investigations into age in past societies focused on early life due to the more detailed methods available for age estimation in juveniles. Modern Western perspectives on old age, the negative connotations associated with aging, and the social invisibility/marginalization of elders in Western contexts may also contribute to the lack of focus on old age (Appleby 2010; Gowland 2007). Yet, more recent osteological research, historical demography, and ethnographic studies all support the idea that meaningful numbers of individuals reached old age in the past (Appleby 2017).

The view of 'old age' or 'elders' as a category is culturally constructed; aging as a process or experience is not universal or fixed (Gowland 2007). In modern Western society, great emphasis is placed on chronological age and chronological age is often the basis for categorizing individuals into different groups, participation in certain activities, and legal status (e.g., legal adult, habitation in senior communities, voting in elections). This way of thinking, which is primarily associated with post-Enlightenment societies as a way for the state to control access to particular status by age, may not hold true for past societies (Appleby 2017). Individuals are deemed 'old' at different points during their life course and factors such as appearance, bodily ability, and appropriate social roles influence the perceptions of old age (Appleby 2010).

The concept of functional age provides a way to recognize the link between biological status and one's ability to contribute to the community (Tayles and Halcrow 2015; Appleby 2017). Some skeletal markers of age, such as cranial suture closure, result

FIGURE 1 | The parents of Pashed, Menna and Huy, depicted with white/gray hair in Pashed's tomb at Deir el-Medina (c. 1250 BCE) (photo by Stuart Tyson Smith).

in no changes to appearance. Others, such as dental attrition and antemortem tooth loss, result in changes to appearance via toothlessness; one's posture might show osteoporosis, osteoarthritis, or vertebral compression. These more visible characteristics could be better indicators of how old age was perceived in the past (Appleby 2010, 2017). Evidence for the maintenance of one's physical appearance, such as the dyeing of hair, may indicate the desire to deny aging (Appleby 2017). Additionally, there are issues directly relating chronological age with social age when examining archaeological populations, and chronological age may not have held as great importance in the past as it does today (Appleby 2010, 2017).

The lack of focus on old age and aging is likely also a result of methodological restrictions related to age estimation of individuals over approximately 45 years (Appleby 2010). Estimation of age from skeletal remains attempts to examine physiological/biological age to reconstruct chronological age. For example, some standard methods for estimating old age only provide a broad age range (e.g., 20–55 years). These methods may combine individuals in dissimilar stages of the life course into one age category and mask variability. The life experiences and associated skeletal markers of an individual who is 45 years old may be quite different from an individual of the same community who is 80 years old. Terminal age estimation of 45–50 years of age can obscure the age structure in past communities, leading many to assume that most people did not survive past middle age (Milner and Boldsen 2012; Maaranen and Buckberry 2018, Clark et al. 2020). As a result, the presence of older individuals is concealed, removing the agency of older adults, and skews our understanding of the dynamics between groups.

Additionally, there are issues with many age estimation methods. Not only is age strongly influenced by environmental factors (whereas early development during childhood is strongly tied to genetics), but Mays (2015) found that around 60% of the variation in the features used for age estimation in skeletal remains was not actually related to age. The Transition Analysis method, established by Boldsen et al. (2002), provides specialized confidence intervals for each individual examined and generates a maximum likelihood estimate of age using uniform and informative priors. As a true multifactorial option, it has considerable advantages for understanding error over traditional methods.

Average life expectancy estimates for past populations are influenced by all members of the community, including those who die at younger ages (Sattenspiel and Harpending 2017). Infants commonly succumbed to infection, which lowers the average age at death to a much younger age. Additionally, the risks associated with childbirth meant that some women died during their reproductive years, again lowering the average life expectancy. As mentioned above, traditional bioarchaeological age estimate methods generally include an oldest adult age category of

45 years and above, and the estimates include large age ranges. These open-ended maximums have contributed to misunderstandings about individuals living beyond 45 years. As a result of these combined complications, an "average" at death often underrepresents older individuals due to the ambiguity in estimates. The more recently developed methods provide evidence that there were many individuals, both male and female, living well into older age categories (Boldsen et al. 2022; DeWitte 2022). Furthermore, census and regnal records attest to the existence of older individuals in ancient Egypt, as described below.

There is a strong tie between disability and age, especially old age. Zakrzewski (2015:162) argues that disability is "an age-related and universal phenomenon" and "permits being 'disabled' to be viewed as simply a point upon a continuum of ability rather than as a binary opposition to able-bodied." As individuals age, the body undergoes degenerative changes that affect a person physically and older adults are more likely to experience those changes (Appleby 2010). Individuals experience increased disease risk as they age and in fact, the accumulation of risk increases not only over a single lifetime but over generations (Gowland 2015). However, care should be taken to avoid placing Western paradigms onto past communities (Byrnes and Muller 2017). The idea that old age and aging requires accommodation from community members necessitates that the able-bodied adult (but not the old adult) is the basis for what is 'normal' and that all other statuses are deviations from the 'normal' (Appleby 2017). Conversely, there are examples of benefits that come with old age, such as respect as venerable advisers (Frood 2010). In many archaeological settings, evidence for what was considered to be 'old', 'impaired', or 'disabled' by a community is limited or difficult to evaluate.

3 | Old Age in the Ancient Nile Valley

Comparatively little is known about how old age was perceived by ancient Nile Valley inhabitants in comparison to other age categories. While resources for Nubian ideas are very scarce, artistic depictions and textual documentation from ancient Egypt provide clues to how older adults were viewed in Egyptian society (Graves-Brown 2010; McDowell 1998), though treatment and perspectives on aging are variable and tied to factors such as time period, gender, wealth, and status (Janssen 2006). Egyptians aspired to live into old age; however, youth, beauty, and fertility are core themes in artistic depictions. The entrances to several Old Kingdom tombs show the tomb owner as youthful on one side and elderly on the opposite (Graves-Brown 2010; McDowell 1998). In some contexts, older age is depicted as desirable, especially among elite individuals, where it is reflected in the status and success of the tomb owner. In contrast, the Old Kingdom *Instruction of Ptahhotep* depicts old age as associated with physical and mental weakness (Janssen and Janssen 2007, p.142).

Indications of old age include wrinkles and vertical lines between the eyes, abdominal fat, gauntness, bags beneath the eyes, sagging breasts, and gray or white hair (Figure 1; Graves-Brown 2010; Janssen and Janssen 2007). Graves-Brown (2010) suggests that these signs change over time; in the Old Kingdom, both weight and gauntness are used to denote aging, while white hair is common in the New Kingdom. Beginning in the Old Kingdom, individuals are depicted with white or gray hair and leaning on a staff, a pose which often indicated age in art and hieroglyphic determinatives (logograms) connected with words associated with old age as well as higher status (Janssen and Janssen 2007). There are fewer representations of older women in ancient Egyptian art, and those that do appear are never shown as overweight but instead appear on Old Kingdom serving statues grinding grain (Roth 2002). Elite individuals would have had enough wealth and servants to be cared for in old age. Those with fewer resources would rely on their children in old age. The Old Kingdom Ebers Papyrus includes remedies for the process of aging, including those to stop the graying of hair and to counter sagging breasts (Graves-Brown 2010). In the Old Kingdom *Instruction of Ptahhotep*, old age is depicted as a period of wisdom and authority and as a time when parents needed the care and support of their children (Frood 2010). In fact, there were social consequences for a child failing in their duty to care for their parent. In a will from New Kingdom Deir el-Medina, the woman, Naunakhte, disinherited some of her children for failing to care for her (Austin 2024; McDowell 1999; Meskell 2002).

McDowell (1998) suggests that generally life expectancies were low in ancient Egypt (20–25 years) citing Strouhal's (1992) study of New Kingdom to Late Period skeletons from secondary burials of poorer individuals. However, McDowell (1998) also notes that a fortunate few did reach old age. Through the examination of texts and human remains at Deir el-Medina (18th–20th Dynasties, New Kingdom), Austin (2024) explains that while many individuals died as younger adults, there are examples of individuals living into their 80s from census records as well as skeletal age estimates. She notes that older adults feature much less in the site's textual record, especially state documents, in comparison to younger adults who participated in the government workforce. Other documents, such as personal letters, indicate that there is an expectation of adult children supporting older adult family members and that older adult elite men could maintain a salary without working by appointing their son to share the position (Austin 2024). For royal and elite individuals, textual references, such as the New Kingdom *Inscription of Beknekhonsu*, indicate lifespans into the 80s; the New Kingdom pharaoh Ramesses II was likely the longest-living pharaoh and is estimated to have lived to be over 90 years old (Janssen and Janssen 2007).

Physical changes associated with old age are sometimes associated with the concept of disability. Disability is complex, as it varies in sort and extent by cultural community, location, and temporal association (Vogel 2025). Some researchers indicate conceptual differences between disability and impairment, though there is no complete consensus. Impairment may indicate functional limitation or a deviation from the typical human body, while disability is used as a cultural construct in which the impairment restricts the ability to fully participate in community life (Bohling et al. 2022; Whitmore and Buzon 2025). While some case studies of impairment and disability in archaeology have been published over the decades, the access to visual and material culture, human remains, and textual sources for ancient Egyptian peoples has allowed for a more in-depth consideration of disability, as highlighted in the recent volume by

Morris and Vogel (2025). For example, researchers explore representations of conditions in private tombs, evidence related to spinal disabilities, the impact of club foot on disability, baldness, disabled masculinity, eunuchs, and dwarfism, including a case study of an individual with dwarfism at Tombos by Whitmore and Buzon (2025) that uses the Bioarchaeology of Care paradigm to understand possible health-care provisioning for a less severely limiting example of disability.

Human individuals and gods with atypical physical conditions are represented in ancient Egypt, where there is ample evidence for impairment and disability in comparison with other past cultures. However, perceptions of these conditions and the individuals likely differed by time, place, and other social circumstances. Beginning in the Predynastic period, there are many artistic depictions of physical impairments including pharaohs (Morris 2025). Non-royals are also displayed, such as on the New Kingdom (18th Dynasty) stela of Doorkeeper Roma, which shows a man with an atrophied right leg and flexed foot assisted by a staff (Dodson 2025). Individuals with spinal deformities (kyphosis or "hunchback") also have an iconographic presence beginning with Predynastic statuettes (Lhoyer 2025) and old age is considered a factor in leading to impairment associated with kyphosis as well as other leg impairments (Kamal 2025). In the Old Kingdom *Teaching of Ptahhotep*, a sense of socially acknowledged impairments is understood through this vizier's cries of old age ailments (Cariddi 2025). Old age, injury, and physical weakness are connected in relation to tax exemptions in Greek papyri in Roman Egypt (Reggiani 2025). Gods portrayed with physical conditions include Bes, Beset, and Pataikos with dwarfism, Harpocrates and Harpocratis with cerebral palsy, Horus with blindness, and Hephaestus, craftsman to the gods, with a clubbed foot (Morris 2025).

Given the considerable contextual information available from ancient Egyptian sources, this study seeks to explore the experiences of older adults at Tombos, an Egyptian colonial community in Nubia. Osteobiographies assist in exploring the relationship of aging, physical conditions, and possible disability. This site provides an excellent opportunity to investigate if the textual and artistic depictions of older adults are consistent with a community that included individuals of different status levels, as well as subgroups defined by mortuary practices and tomb types at Tombos. Additionally, the integration of colonial Egyptians, local Nubians, and their descendants provides an exceptional occasion to broaden the understanding of experiences in this multicultural context for this understudied group in comparison with other regional locations.

4 | Materials and Methods

4.1 | Tombos

The cemetery is comprised of three main burial areas with different structure styles (Figure 2). The cemetery in the northern part of the site contains three large underground mud brick

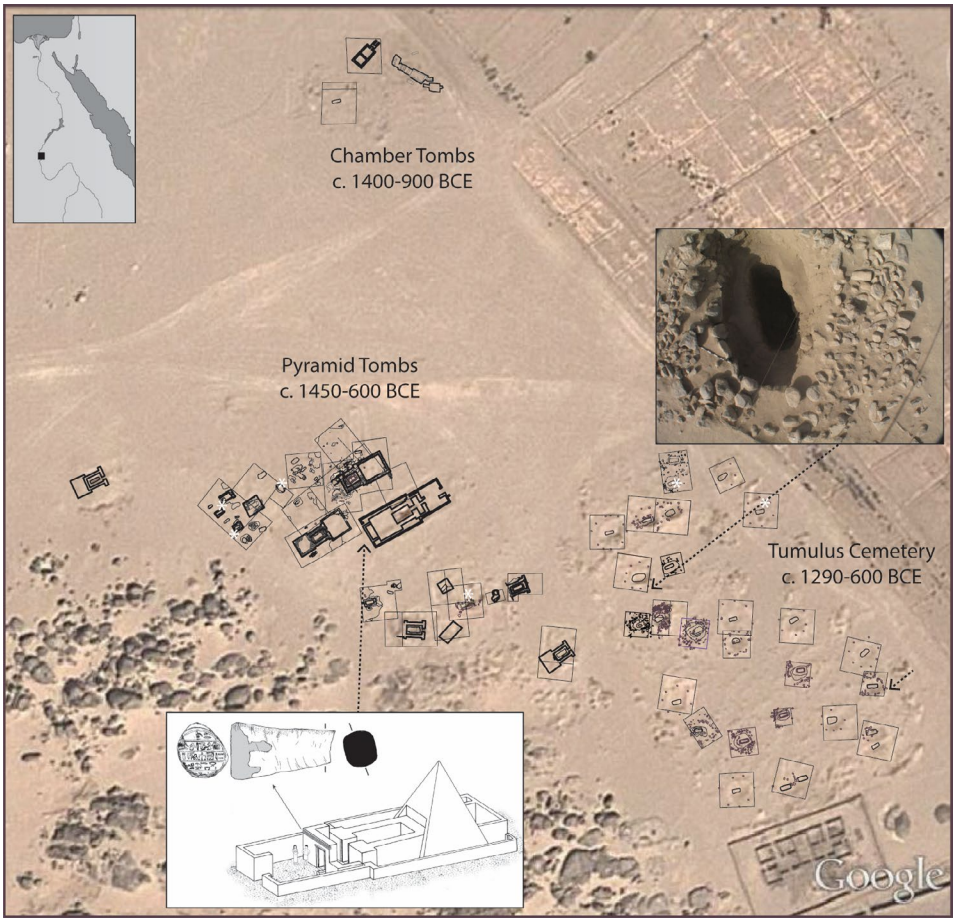

FIGURE 2 | Location and plan of Tombos.

chamber tombs as well as pit tombs. The large tombs are communal structures in which multiple individuals were buried and are similar in design to contemporary tombs found in Egypt. Burial practices indicate that lower ranking bureaucrats and other individuals employed by the administration (such as artisans, scribes and servants) were likely buried here (Buzon et al. 2016; Smith 2003). Strontium isotope analysis suggests that the highest number of first-generation immigrants were buried in this cemetery area, associated with the founding of the community (Buzon, Guilbault, and Simonetti 2024). The burial area in the west contains Egyptian-style pyramids, chapel tombs, shaft tombs, and pits. A range of status levels are represented in these graves from the high-level administrator, Siamun (mentioned above), to lower status individuals, as documented through burial inclusions and practices, as well as suggested by indications of heavier labor (Schrader et al. 2025). A small percentage of these individuals were identified as nonlocal via strontium isotope analysis (Buzon, Guilbault, and Simonetti 2024). In the eastern area of the cemetery, Nubian-style tumulus graves are found, which correspond with local burial traditions (Buzon and Smith 2023). All individuals tested in this area have strontium isotope values within the local range. The categories of differentiation by burial practice include chamber burials (north cemetery), pyramid/chapel/shaft tombs (west cemetery), tumuli (east cemetery), and pit burials (north and west cemeteries).

Previous research on osteological conditions in the Tombos community has generally shown that the community members examined experienced relatively low levels of nutritional deficiencies and infection (Buzon 2006, 2014), as well as violent injuries (Buzon and Richman 2007; Schrader and Buzon 2017) and strenuous activities (Schrader 2012; Schrader and Buzon 2017). Excavations at Tombos by the University of California - Santa Barbara and Purdue University (2000–2020, co-directors Stuart Tyson Smith, Michele R. Buzon, and Mohamed Faroug Ali) resulted in a substantial group of well-preserved intact burials from the past Tombos community, including a considerable number of adults with age estimations of 50 and older. Given the paucity of preserved discretely buried older adult individuals with clear archaeological context in this region, the deceased individuals from Tombos provide an important opportunity to illuminate the lives of the older segment in this ancient society.

4.2 | Sample of Individuals and Methodological Approaches

The archaeological remains used in this study were excavated and exported with the cooperation of the National Corporation for Antiquities and Museums (NCAM) in Sudan in collaboration with the Tombos excavations inspector. The Tombos Archaeological Project has worked closely with the Tombos community since the first field season in 2000. During each field season, the project directors, team members, and NCAM representatives gathered with various community groups (men, women, and school children) to discuss research goals, findings, and future plans. As a result of direct community requests, the Tombos project created pamphlets and educational materials in English and Arabic, posted web site field findings in Arabic, distributed publications, and worked collaboratively on future plans for a community and tourism center. Conversations with the local Tombos community and their desired role in archaeological research are ongoing with the Tombos team.

The individuals ($N = 125$) included in this study are the intact, discrete burials from all three cemetery areas at Tombos (northern chamber tombs, western pyramid/chapel tombs, eastern tumulus tombs), with a minimum age of 15. This is the approximate age that is associated with puberty, marriageable age, and work status in ancient Egyptian texts and skeletal analyses (Dabbs 2020; Eiseman et al. in press; Graves-Brown 2010). Displaced and commingled bones were common in the larger communal graves but are not included here due to the lack of associated age-at-death information. Data for all intact adult burials are presented in order to contextualize the results of the older segment of Tombos society. Os coxae and cranial morphology were observed for sex estimation in adults following Buikstra and Ubelaker (1994) and individuals were assigned to categories of female, male, and indeterminate. It is acknowledged that sex-related features exist on a continuum without strict binary distinctions. While estimated sex is often a starting point in archaeology for examining gender, biological sex does not conclusively associate with how individuals understand their own gender identity (Agarwal and Wesp 2017) and contextual information is needed to explore this aspect of identity.

The utility of the Transition Analysis method for age estimation is well established within bioarchaeological and forensic anthropological settings (Boldsen et al. 2002; Milner and Boldsen 2012). The availability of software has increased the prevalence of this method in bioarchaeological literature and is particularly useful in bioarchaeological contexts because it accommodates incomplete and fragmentary remains. Traditional methods for estimating age in the skeleton often used an upper limit to age at 45 or 50 years due to methodological issues. The Transition Analysis method (Boldsen et al. 2002) provides a means to estimate age in the older adult categories, therefore illuminating those 50 years of age and older.

Studies on the accuracy of Transition Analysis indicate that it is best equipped to illustrate population trends in mortality, rather than specific age at death estimates. However, this technique is generally more successful in accurately estimating age for older individuals compared to traditional methods; it is also suggested that the method is more accurate for individuals categorized as 'Black [American]' rather than'White [American]' in the software database (Simon and Hubbe 2021). Transition Analysis was completed on all individuals from Tombos with preserved elements in 2020 using ABDOU Ver 2.1.046 2016, which combines scoring of cranial sutures, features of the pubic symphysis, and iliac auricular surfaces in addition to estimated sex and ancestry group. The category of 'Black' (Americans of African American descent) was used as the closest ancestral group in the Transition Analysis program, with the acknowledgment that the reference samples in the program come from a 20th century United States collection, which is considerably different than the ancient Nile Valley.

Bioarchaeological studies are well suited for investigating the effects of social hierarchies on human health as well as variation in the human experience due to social factors (DeWitte and Yaussy 2020). Through a biocultural perspective, biological and

cultural aspects are recognized as intertwined; these processes exist within an ecological framework (Zuckerman and Martin 2016). Data on the age at death of individuals provide important information from physiological and social perspectives. For example, survival through multiple stressors can demonstrate greater resilience. Poor health at early ages is associated with decreased longevity (Marklein et al. 2016). Indications of non-specific stress and chronic conditions associated with nutritional deficiencies and infectious disease (Buzon 2014) were recorded. Childhood conditions, cribra orbitalia (cranial orbit lesions) and linear enamel hypoplasia (altered mineralization of dental enamel resulting in pits or grooves), are associated with generalized physiological stress such as nutritional deficiencies, infection, and metabolic issues (Goodman and Rose 1990; Hillson 2014; Walker et al. 2009). Bilateral lesions of osteoperiostitis were recorded as indicative of systemic infection (Goodman and Martin 2002).

To investigate physical abilities and challenges, degenerative changes and injuries are recorded as reflections of physical encounters including daily actions associated with social, economic, political, and cultural influences (Schrader 2022; Schrader and Buzon 2017). Injuries are recorded via bone fractures. Trauma to long bones is usually associated with accidental falls and missteps (Judd 2006; Redfern 2016). Depression fractures and sharp force trauma to the skull are attributed to intentional violence. All individuals were examined for injuries and recorded by bone, type of injury, position, and state of healing (Lovell and Grauer 2019). Osteoarthritis refers to lesions that result from primarily inflammatory processes. Most commonly, lesions present as marginal (osteophytic) lipping, and in more severe forms as eburnation (articular surface is pitted and/or polished). Degenerative joint disease is related to several factors including mechanical stress, genetic predisposition, and variation in age (Steckel et al. 2002). However, the largest influence on osteoarthritis, both in terms of onset and severity, is age (Anderson and Loeser 2010). In modern cases, osteoarthritis is first determined by joint pain symptoms and is typically treated with pain management. Individuals vary in pain and symptoms, though many follow a similar trajectory (Katz et al. 2021). For a diagnosis of osteoarthritis in this sample, individuals needed to present with eburnation or display both lipping and porosity at a moderate level (Waldron 1995). Data on entheseal remodeling (Schrader et al. 2025) are included in the discussion to complement osteoarthritis information as a way to understand overall levels of physical activity.

5 | Results

Of the 125 individuals with an age estimate included in this study (Figure 3), 32 are from chamber tombs (26%), 49 are from pyramid/chapel/shaft tombs (39%), 34 from tumulus tombs (27%) and 10 are from pit tombs (8%). The age distribution of the sample shows that 15% (19) are 15–24 years, 29% (36) are 25–34 years, 27% (33) are 35–49 years, and 29% (37) are 50+ years of age. Individuals are divided into these age categories in order to facilitate comparison with other regional samples (e.g., Austin 2024; Dabbs 2020; Kemp et al. 2013). Using Transition Analysis to estimate age, this oldest age category can be divided into 50–64 years and 65+ years, which shows an even split for the entire category. Each tomb type includes the full range of adult ages except for the pit tombs, in which the oldest adult category is absent. Sex estimation reveals that females outnumber males in every age category, ranging from 56% to 61% of the sample: 15–24 (17, 59%), 25–34 (36, 59%), 35–49 (32, 59%), 50–34 (18, 56%), and 65+ (19, 61%).

The frequencies of pathological conditions by age are illustrated in Figure 4; frequencies by age, sex, and tomb type can be found in Table 1. Individuals ($n = 44$) with the requisite anterior dentition were evaluated for enamel hypoplasia; 11 individuals (25%) displayed the condition. The affected individuals, which included more females than males, were in the three youngest age categories and from all tomb types. It should be noted that while the older age categories do not display the condition, dental attrition on teeth can obliterate where lesions may have once existed (Minozzi et al. 2020). Eighty individuals could be evaluated for cribra orbitalia; seven (9%) of those individuals were found to have healed lesions. The individuals with the

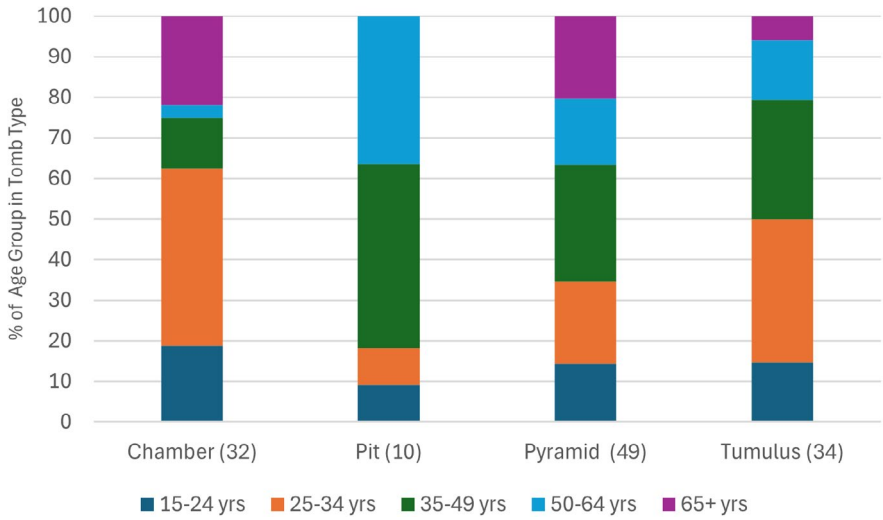

FIGURE 3 | Age distribution by tomb type ($N = 125$).

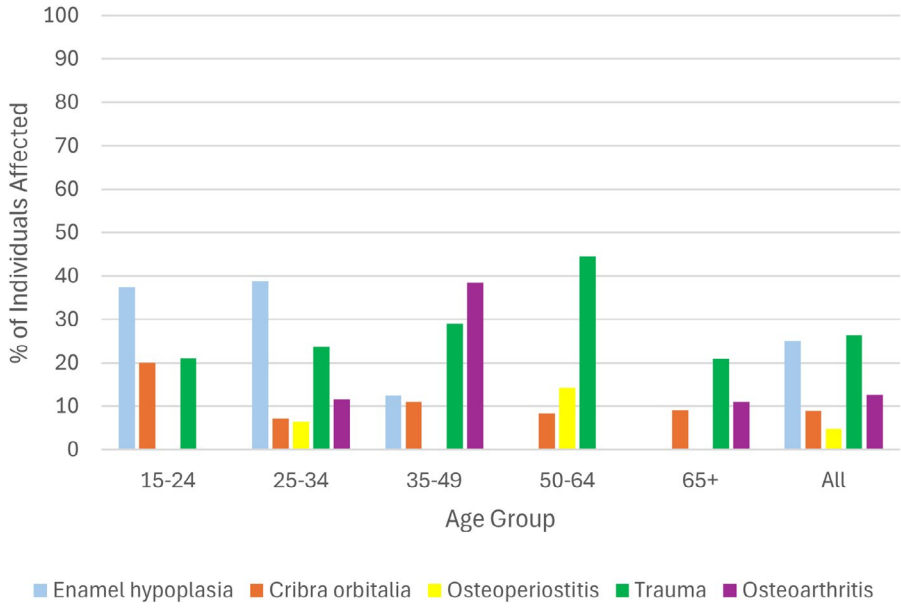

FIGURE 4 | Frequency of pathological conditions by age group.

condition were found in all categories except 50–64 years, all tomb types. Bilateral osteoperiostitis was evaluated in 86 individuals. Four (5%) individuals presented the healing condition, including three females and one male from tumulus and chamber tombs.

All individuals were observed for traumatic injuries. Rates are similar between age groups and sexes, generally increasing with age (21%–44%) until the oldest age group. Only four [M 35–49, F 50–64, 2F 65+] of the 33 affected individuals show cranial depression fractures. The remaining injuries are most likely due to accidents, primarily involving hand, forearm, and rib fractures. Individuals display similar rates of injuries across the tomb types. Seventy-one individuals with intact long bone joints were observed for osteoarthritis. Only nine individuals (13%) displayed eburnation or moderate lipping and pitting in a joint surface diagnostic of osteoarthritis. The rate (38%) of osteoarthritis in individuals 35–49 years old is significantly higher than the 15–24 year group and 50–64 year group, who show no individuals with the condition (ANOVA, Post Hoc Tukey HSD). Females and males are similarly affected and come from all tomb types except pit tombs.

6 | Osteobiographies—Examples of Older Adult Experiences at Tombos

The examination of old age provides a broader understanding of health at the site of Tombos; a more detailed consideration of the experiences of those who were able to reach old age is possible through the combination of diverse types of data. Some examples of well-preserved older individuals (maximum likelihood ages above 65 years) buried in the three main cemetery areas across the site provide important contextual information for how older individuals may have been viewed at Tombos and explore the relationship between the chronological, biological, and social age aspects in these individuals.

6.1 | North Cemetery Chamber Tombs

In the northern cemetery, large communal underground chamber tombs included six individuals with estimated ages above 65 years (Table S1) (Figure 3). These tombs reflect Egyptian-style structures and are associated with mid-status community members and their families, who may have worked with the Egyptian colonial administration as scribes or artisans (Buzon et al. 2016; Smith 2003). One individual (Unit 6, Pit G, Burial 8), estimated to be male with a maximum likelihood age of 75 years (95% CI 52.7–89.7 years), was buried in an extended Egyptian-style body position with a scarab on the left hand, a common practice, and traces of a poorly preserved wooden mummiform coffin (Figure 5). The scarab could be read *User-ma'at-Re Mery Ptah*, likely a reference to Ramesses II's throne name, "The justice of Re is powerful" with the addition "Beloved of Ptah," the patron god of Memphis in Egypt. This individual has a strontium isotope value ($^{87}Sr/^{86}Sr = 0.707484$) within the local range ($^{87}Sr/^{86}Sr = 0.70710–0.70783$; Buzon, Guilbault, and Simonetti 2024). A number of documented conditions may have contributed to physical appearance, physiological function, and age identity for this person (Appleby 2017). Several healed fractures (rib, clavicle, and metacarpal) may have resulted in some pain and minor change in usage. Numerous thoracic and lumbar vertebrae show degenerative changes such as osteophytes on the body with T1 and T2 nearly completed fused due to the degenerative ostephytic growth; a lumbar vertebra displayed spondylolysis and spondylolisthesis. Clinical and functional impacts include pain (Plomp 2017) and changes in posture with compromised mobility with some need for health care provisioning (Tilley 2015). Low entheseal remodeling scores and the lack of diagnosed osteoarthritis suggests a life of lower physical labor. Dental health and function were relatively good; while teeth showed wear, only three teeth were lost antemortem and teeth exhibiting disease were low in number.

TABLE 1 | Frequencies of pathological conditions by age, estimated sex, and tomb type.

	15–24		25–34		35–49		50–64		65+		All adults	
	F	M	F	M	F	M	F	M	F	M	F	M
Enamel hypoplasia												
Chamber	0/0	0/2	3/5	2/4	0/2	0/0	0/0	0/0	0/3	0/2	3/10	2/8
Pit	0/0	0/0	0/0	0/1	1/1	0/0	0/1	0/1	0/0	0/0	1/2	0/2
Pyramid	1/2	0/0	0/0	0/0	0/1	0/0	0/0	0/0	0/0	0/0	1/3	0/0
Tumulus	1/3	1/1	2/6	0/2	0/3	0/1	0/3	0/0	0/0	0/0	3/15	1/4
All	2/5	1/3	5/11	2/7	1/7	0/1	0/4	0/1	0/3	0/2	8/30	3/14
	3/8		7/18		1/8		0/5		0/5		11/44	
Cribra orbitalia												
Chamber	0/0	0/3	1/6	1/5	0/2	0/0	0/0	0/0	0/4	0/2	1/12	1/10
Pit	0/0	0/0	0/0	0/1	1/1	0/1	0/1	0/2	0/0	0/0	1/2	0/4
Pyramid	1/2	0/1	0/3	0/1	0/5	0/1	0/1	0/4	1/2	0/3	2/13	0/10
Tumulus	1/3	0/1	0/7	0/4	1/6	0/2	0/4	0/0	0/2	0/0	2/22	0/7
All	2/5	0/5	1/17	1/11	2/14	0/4	0/6	0/6	1/8	0/4	6/49	1/31
	2/10		2/28		2/18		0/12		1/12		7/80	
Bilateral osteoperiostitis												
Chamber	0/0	0/2	0/4	0/5	0/2	0/2	1/2	0/0	0/3	0/3	0/11	0/12
Pit	0/0	0/1	0/0	0/1	0/1	0/2	0/1	0/2	0/0	0/0	0/2	0/6
Pyramid	0/0	0/1	0/5	0/2	0/5	0/2	0/1	0/3	0/3	0/1	0/14	0/9
Tumulus	0/4	0/0	1/8	1/6	0/5	0/3	1/5	0/0	0/1	0/0	2/23	1/9
All	0/4	0/4	1/17	1/14	0/13	0/9	2/9	0/5	0/7	0/4	3/50	1/36
	0/8		2/31		0/22		2/14		0/11		4/86	
Traumatic injury												
Chamber	0/2	1/4	1/7	3/7	1/2	1/2	0/1	0/0	0/4	2/3	2/16	7/16
Pit	0/0	0/1	0/0	1/1	0/2	1/2	2/2	0/2	0/0	0/0	2/4	2/6
Pyramid	0/4	0/3	2/8	0/3	2/8	0/5	1/2	3/6	0/5	0/5	5/27	3/22
Tumulus	2/4	1/1	1/7	1/5	1/6	3/4	2/5	0/0	2/2	0/0	8/24	5/10
All	2/10	2/9	4/22	5/16	4/18	5/13	5/10	3/8	2/11	2/7	17/72	17/53
	4/19		9/38		9/31		8/18		4/19		34/125	
Osteoarthritis												
Chamber	0/2	0/0	0/5	1/7	0/2	0/0	0/0	0/0	0/3	1/3	0/12	2/10
Pit	0/0	0/0	0/0	0/0	0/1	0/1	0/1	0/2	0/0	0/0	0/2	0/3
Pyramid	0/1	0/0	0/1	0/2	0/0	1/1	0/2	0/4	0/2	0/0	0/6	1/7
Tumulus	0/4	0/1	1/6	1/5	3/5	1/3	0/5	0/0	0/2	0/0	4/22	2/9
All	0/7	0/1	1/12	2/14	3/8	2/5	0/6	0/6	0/6	1/3	4/42	5/29
	0/8		3/26		5/13		0/12		1/9		9/71	

Another individual (Unit 7, Burial 6), estimated to be female with a maximum likelihood age of 72 years (95% CI 43.7–89.3 years) was buried in a Nubian-style flexed position with a Nubian-style ceramic pot, possibly buried on top of a bed (Figure 5). This individual is one of two estimated females in the flexed position who were interred alongside Egyptian-style extended

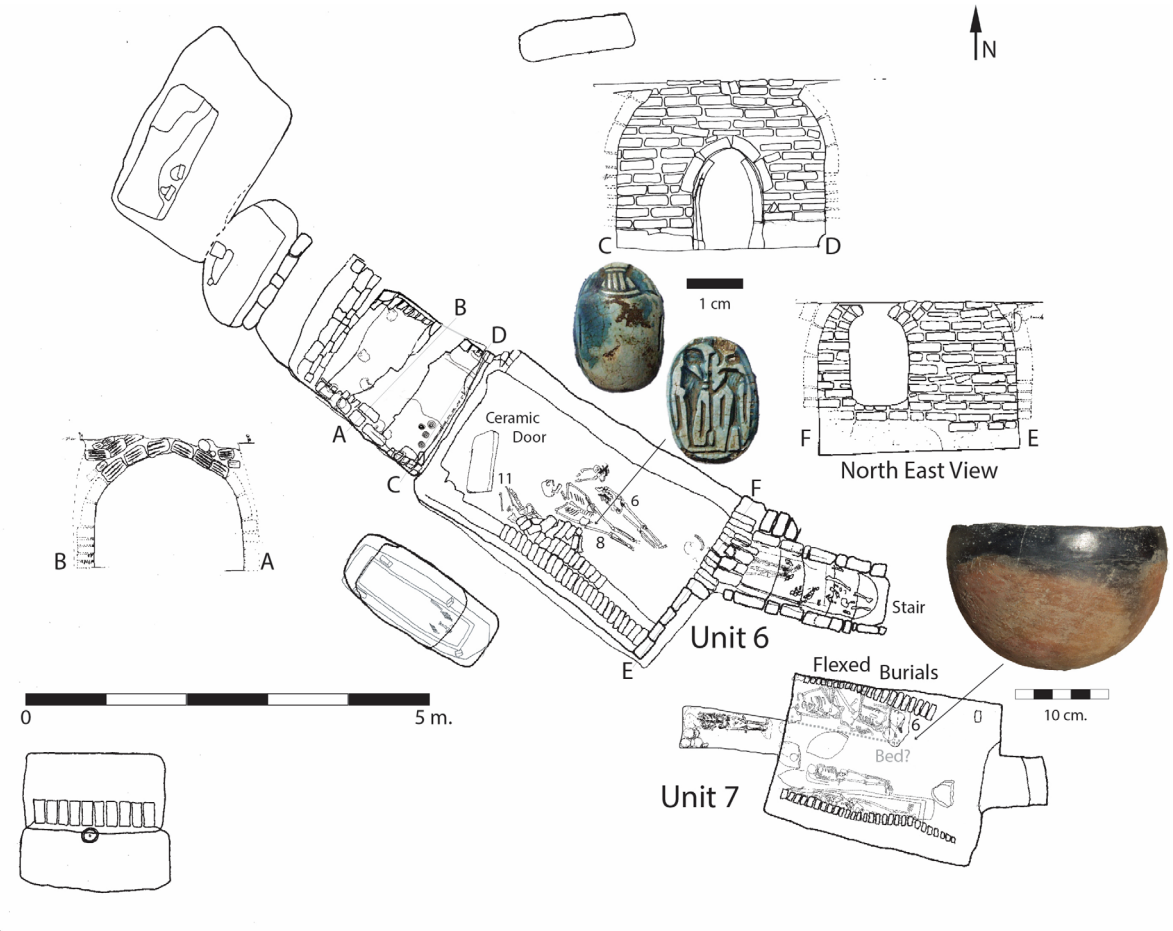

FIGURE 5 | Units 6 and 7 showing burials discussed.

burials within this tomb. The strontium isotope value is local ($^{87}Sr/^{86}Sr = 0.707905$). Entheseal remodeling was very low, and osteoarthritis was absent. However, osteophytes were common in the vertebrae, and several vertebrae displayed collapsed bodies, which likely resulted in clinical and functional impacts of pain, compromised mobility, and changes in appearance. Additionally, this female had a completely edentulous mandible and heavy tooth wear on the remaining teeth. Chewing would have been compromised and appearance affected. The need for health care provisioning is evident, requiring some help with movement and food preparation (Tilley 2015).

6.2 | Western Cemetery Pyramid/Chapel Tombs

In the western cemetery, there are several Egyptian-style pyramids, chapels, and shaft tombs with individuals 65+ years of age ($n = 10$). This part of the cemetery, especially in the large tombs, was greatly affected by poor preservation of the human remains and associated grave inclusions due to groundwater issues (Buzon, Guilbault, and Simonetti 2024). As a result, observations on the skeleton and burial context were much more difficult. Burials in small tombs and pits, which were generally much shallower, were considerably more intact. One particular burial of an older individual in a smaller tomb stands out: Unit 35, Tomb 2, Burial 3 (Figure 6). This shaft was oriented east–west with no indications of a superstructure. The tomb was completely carved into the alluvium, except for the very bottom, which was partly carved into the granite bedrock. There was an intact northern side-niche burial at the bottom of the shaft, still sealed by a mud brick wall. This niche contained the burial of an individual estimated to be female with a maximum likelihood age of 69.7 years (95% CI 38.8–88.3 years). This individual was clearly mummified and placed in an anthropoid coffin with inlaid eyes; unfortunately, the coffin was badly eaten by termites, to the point of almost complete destruction. Several sections were lifted by our conservator (Elizabeth Drolet) for examination. Some potential traces of decoration suggest a black background consistent with a later 18th Dynasty date, but otherwise very little remained. However, the use of eye inlays points towards a higher quality of decoration and thus a higher status for its inhabitant.

A finely carved serpentine heart scarab (Figure 6a) with a human head was also recovered, inscribed with the name, Weret (literally, "great one," traditionally a woman's name, Ranke 1935: 82), with the appropriate spell from the Book of the Dead. Like the coffin, this highly specialized funerary object points towards Weret's higher social status, ensuring that during her soul's journey towards immortality her heart would be compelled to assert her innocence when it was weighed in the balance against *ma'at* (truth). A fine, well-preserved blue-green glazed plaque amulet was recovered from near the left side of the pelvis (Figure 6b), where it had presumably fallen (from the left hand). It contained representations of the goddesses Bat-Hathor on one side and

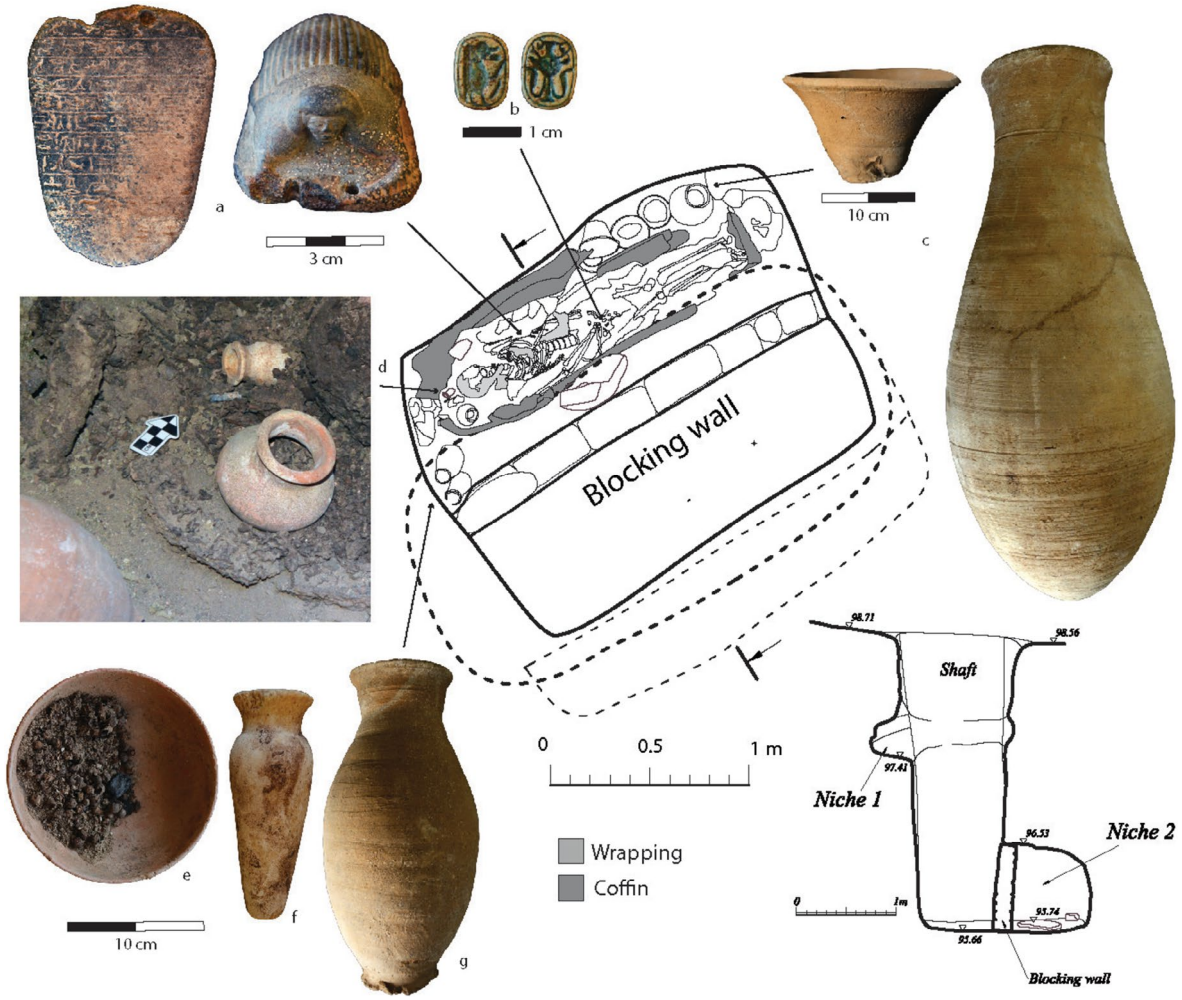

FIGURE 6 | Plan of Weret's burial in Unit 35, Tomb 2, with associated objects.

Taweret on the other. Several intact pots representing offerings of provisions were arrayed near the head and along the side of the burial, including five "flowerpots" perhaps used for brewing, one bowl, a large jar, and two bottles (Figure 6c,g). The bowl was filled with juniper berries, which could have been used as a scent or more likely a spice for food (Figure 6e). Additionally, inside the coffin were the remains of a cosmetic kit, including a small carinated vessel likely imported from Upper Egypt that had originally been wrapped in cloth, a small limestone/alabaster jar imported from Egypt, and the remnants of a wooden kohl tube (Figure 6d,f). A mass of termite frass located near the head may be the remains of a headrest and/or other wooden object(s). Finally, pieces of granite were placed at the shoulders and feet of the coffin in order to raise it above the floor, a practice seen in several other tombs at Tombos, perhaps meant to discourage termites and/or protect the coffin from water seeping into the tomb.

Strontium isotope analysis provided a value within the local range ($^{87}Sr/^{86}Sr = 0.70759$). Facial appearance and chewing ability were probably affected by severe tooth wear and some antemortem tooth loss (which prevented observation for enamel hypoplasia). This individual displayed relatively high entheseal remodeling common in older individuals; otherwise, no other skeletal conditions that would have affected physical appearance were observed. Generally, this person may have needed some assistance but direct and constant care may not have been required (Tilley 2015).

6.3 | Eastern Tumulus Cemetery

In addition to tomb structures that followed Egyptian patterns, Tombos also included burials associated with more local styles in Nubia. These tumulus graves began during the Egyptian colonial New Kingdom and continued through the subsequent Early Napatan period (~1300–830 BCE; Buzon and Smith 2023). These tumuli reflect the creation of new practices that combined local and colonial styles in innovative ways that included tomb structures using local practices with body position, grave goods, and burial containers that combined rituals seen across the Nile Valley (Buzon and Smith 2023). Made for only one or two individuals with stone ring superstructures and 2–5 m deep shafts, the tombs still required considerable effort and resources to construct (Smith and Buzon 2018). There are two older adult individuals with ages above 65 years who demonstrate care and support of individuals who may have required extra help as a result of illness and injury.

The individual buried in Unit 34 (Burial 1) was found undisturbed in a tumulus grave in an extended position on top of a

wooden bed. Grave goods included a wooden headrest and ceramic transport vessel from southern Egypt (Buzon et al. 2024, Figure 1). As detailed by Buzon et al. (2024), this individual, estimated to be female and 79.2 years of age (95% CI 59.7–92.2), displayed a pathologic fracture on the proximal femur associated with lytic destruction and resorption of the femoral head, neck, and trochanters. This condition may have been caused by a cyst or neoplastic tumor. This hip fracture would have resulted in some level of disability and necessitated a degree of care (Appleby 2017).

In addition, this individual displayed severe vertebral degeneration with osteophytic growth, compression fractures, and Schmorl's nodes (Buzon et al. 2024), which would have, along with the femur fracture, adversely affected mobility, physical appearance, and gait, having clear clinical and functional impacts. Heavy tooth wear and some teeth lost antemortem may have contributed to some chewing difficulties. Analysis of this individual's conditions provides insight into the type and nature of potential health-related care provisioning provided by the community. Remodeling and resorption on the femur indicate survival of some weeks after the start of the condition (Buzon et al. 2024). During the period after the initial fracture, direct care provisioning would have been required with high levels of pain, immobilization of the right leg, and inability to walk. Household or community members would have needed to provide food and water, assist with eating and drinking, as well as with hygiene (Tilley 2015).

Another burial in the tumulus cemetery, Unit 50 (Burial 1) is estimated to be female and 71.4 years of age (95% CI 44.9–88.7). While some of the bones were no longer in situ, the tomb contained the remains of only one individual. The intact portions suggest the individual was in an extended body position. A large whole jar, a similar transport vessel from Egypt, was included with the burial in addition to remnants of decayed fabric. Strontium isotope analysis reveals a value within the local range ($^{87}Sr/^{86}Sr = 0.707522$). This individual has two healed depression fractures on the cranium (Figure 7), likely caused by blunt force trauma (Lovell and Grauer 2019). Fracture 1 is midway along the sagittal suture of the parietal bones (39 mm × 13 mm). Fracture 2 is on the right parietal bone (35 mm × 29 mm). In addition, this individual shows evidence of osteoarthritis on the right temporomandibular joint affecting both the glenoid fossa and mandibular condyle. Heavy tooth wear was observed, though few teeth were lost antemortem.

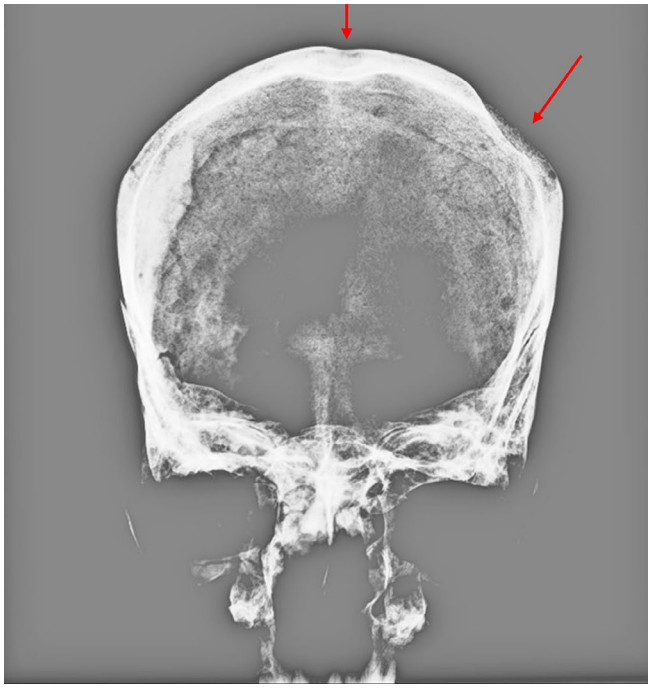

FIGURE 7 | Cranial depression fractures on Unit 50 Burial 1 individual.

The two fractures appear fully healed (Figure 7) and it is difficult to estimate when the injuries occurred. However, the inner table may have been affected, especially in the larger Fracture 2 on the right parietal. At the time of injury, which may have been when this individual was much younger, clinical and functional impact may have included hemorrhage and possibly loss of consciousness (Bethard et al. 2021). TMJ osteoarthritis may have resulted in chewing difficulties and a need for food preparation provisioning (Tilley 2015). No other skeletal conditions affecting physical appearance and bodily movement were observed.

7 | Discussion

7.1 | Older Adults at Tombos

A broad examination of old age at Tombos reveals that many individuals were living into their 60s, 70s, and even into their 80s (Figure 1; Table S1). This sample size is noteworthy in comparison with contemporaneous sites. Given that the comparative studies did not use the Transition Analysis method and thus ages beyond 50–60 years were not estimated, it is more appropriate to evaluate numbers of individuals estimated to be over the age of 50. At Tombos, 29% of the discretely buried individuals examined here are estimated to be over 50 years of age. Researchers report extremely few individuals over 50 at Amarna South and North Tombs cemeteries (Dabbs 2020; Kemp et al. 2013) and Amara West (Binder and Spencer 2014; Spencer 2014). Mortality at the Amarna cemeteries, especially the northern area, was likely affected by the heavy work of moving to and constructing a new capital (Stevens 2017). At Amara West, there is evidence that the community was under ecological stress as the drying of a paleochannel of the Nile exposed the town to desert encroachment, eventually leading to the site's abandonment (Binder and Spencer 2014). Nerlich et al. (2000) also report very few individuals at Thebes in the 'senile' category of 60+ years. As detailed by Austin (2024), the remains examined from Deir el-Medina do contain a considerable number of older adults (50+ years) similar to the number of middle adults, though most of the remains are extensively commingled and reported as minimum numbers of individuals by element.

Few individuals older than 50 years of age from Tombos can be diagnosed with osteoarthritis, suggesting that the inhabitants of Tombos were not subjected to strenuous physical activities throughout their life. This is supported by entheseal remodeling data (Schrader et al. 2025). Individuals with very high levels of entheseal remodeling in both upper and lower body sites are not

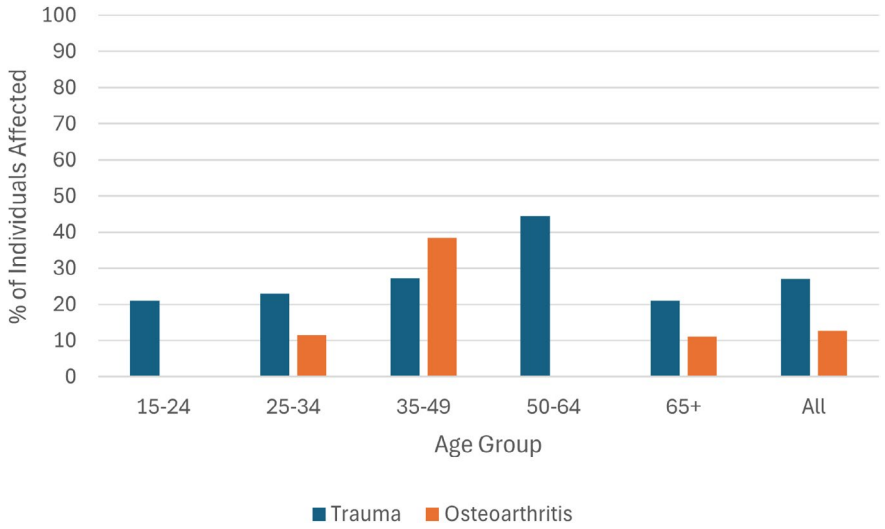

FIGURE 8 | Frequency of very high entheseal changes and osteoarthritis by age (entheseal data from Schrader et al. 2025).

confined to older adults, which is surprising given that osteoarthritis and entheseal changes are typically positively correlated with age (Schrader et al. 2019). These data reflect variation across the community in physical activity (Schrader et al. 2025); it is also possible that individuals subjected to heavy labor did not live as long (Figure 8). While the rate of traumatic injuries is highest in the 50–64 year category, the type and location of injuries indicate that they are most likely accidental, which is to be expected with aging individuals (Glencross and Sawchuk 2003). In addition, adults from Tombos show relatively few nonspecific indicators associated with infection and nutritional deficiency. Rates of enamel hypoplasia and cribra orbitalia are highest in the earlier adult age categories, suggesting that those who experienced difficulties in early life do not tend to live as long into the older adult ages. However, dental attrition and antemortem tooth loss could obscure observation of linear enamel hypoplasia in older adults; additionally, cribra orbitalia experienced earlier in life would have more time to remodel fully in older adults. These results correspond to evidence that suggests Tombos was an administrative center with a community of individuals and household members involved in the coordination of the tribute from Kush to Egypt (Buzon et al. 2016), though variation in markers of nonspecific stress does occur across age groups and burial context. The town likely retained its character after the end of the empire by virtue of its strategic location at the headwaters of the Third Cataract and increasing importance as a quarry for royal statues and architectural components of temples in the Napatan period.

7.2 | Osteobiographies

Osteobiographies of individuals who are chronologically in the oldest age category provide illustrations of personal experiences and the intersections of age with other aspects of identity. For example, the two burials from the northern chamber tomb cemetery provide examples of individuals from different segments of the Tombos society in terms of sex and cultural group. The female individual (Unit 7, Burial 6) buried using Nubian-style practices is relatively rare in the Tombos sample; most individuals in this area are buried using Egyptian rituals (Buzon, Guilbault, and Simonetti 2024; Smith 2003). The placement in the tomb and the local Sr value suggest that the burial represents early cultural entanglements at Tombos, with some community members expressing local traditions, interred in the flexed position with local pottery (Smith 2003). The male buried using Egyptian practices (Unit 6, Burial 8), also with a local value, may have been a descendant of original colonial immigrants, of mixed heritage, or a local individual who was buried using Egyptian rituals, which was common during the New Kingdom (Smith 2003).

Overall, there are sex-related patterns in the burials at Tombos with regard to the usage of local customs. The local flexed body position is only found in individuals estimated to be female; the use of beds, also a local practice, is primarily found with estimated females as well. This tumulus cemetery began during the New Kingdom colonial period at Tombos and continued through the subsequent Early Napatan period. Nubia has a long history of the connection of women with ritual importance; in this multicultural context, burials of women appear to honor longstanding Nubian traditions. It is possible that males of Egyptian descent married women who maintained local funerary rites, especially in the early years of the colonial community. In the northern chamber tombs, flexed female burials are found in the earliest levels placed at the beginning use of the tombs alongside Egyptian-style extended burials of both males and females. While societal roles differed for men and women, there does not appear to be any marginalization by sex in terms of access to resources as reflected by skeletal observation or burial (Buzon and Guilbault in press). A large proportion of individuals from the northern cemetery chamber tombs survived to the oldest age categories, suggesting good conditions for these members of the Tombos community. These two examples indicate that health care provisioning was likely provided to both individuals.

In the eastern tumulus cemetery, individuals buried using local tomb superstructure traditions indicate a high level of health care provisioning was available for these two females. The number of females in the local style cemetery is nearly double that of males (Buzon and Smith 2023). Additionally, there are no males with a maximum likelihood age above 50 years, while there are

seven (out of 24) females above 50 years. This cemetery began in the New Kingdom colonial period with the first few tombs; the majority of tombs date to the Early Napatan period. This post-colonial period marks a shift from a colonial administrative center to a quarry for monumental statuary and a possible change in some daily lifeways (Buzon and Smith 2023). Varying gender roles may have resulted in different experiences for males and females impacting lifespan.

The osteobiography from the western cemetery (Unit 35, Tomb 2, Burial 3) provides an example of a rather exceptional burial. While the strontium isotope values suggest that this was not an original immigrant, Weret was clearly well provisioned and adhering to traditional Egyptian practices, likely a descendant of elite colonists. Burial in the intact niche and inclusions suggest a level of socioeconomic status that may have afforded Weret servants and resources in older age (McDowell 1999), resulting in fewer pathological conditions. All aspects of Weret's burial manifest Egyptian colonial funerary ritual, including a spell from the Book of the Dead asking for the heart to not betray the body. This burial included grave goods of the highest quality at Tombos, including the inscribed heart scarab and painted coffin with inlays, both of which were associated with elite burials in Egypt (Smith 1992).

Generally, the majority of individuals in this 65+ age group come from burials that display some degree of socioeconomic status evidenced by the presence of a coffin, bed, and/or grave goods such as pottery and jewelry. Indication of lower status, such as burial in reed matting, is not associated with burials in this age group. As noted above, this western cemetery was negatively and severely affected by wet conditions in the large tombs. Skeletal remains and grave goods were poorly preserved in many contexts. Entheseal remodeling in combination with burial practices indicates that the large tombs did include individuals from various status levels from elite to individuals who may have been household workers with higher physical labor and lower status (Schrader et al. 2025). For example, burials wrapped in reed matting are associated with lower status, used by three individuals in this area. None of these individuals was estimated to be in the oldest age category (Unit 36 Tomb 2 Burial 3, 18.1 years, Unit 36 Tomb 2 Burial 4, 55.3 years; Unit 36 Tomb 2 Burial 6, 36.1 years). It is possible given the 95% CI (34.5–81.5 years) that 36.2.4 was part of this old age group. This male demonstrated high upper body entheseal scores and some vertebral osteophytes. However, the relatively low amount of wear and antemortem tooth loss suggests a younger age. The other reed burials have relatively poor bone preservation preventing observation of some conditions.

Although aging methods now allow for the identification of individuals above age 50, it is important to consider that the social concept of old age encompasses more than just a skeletal age estimate and chronological concerns. While counting years, such as the number in a pharaoh's reign, was a part of Egyptian practice (Janssen and Janssen 2007), for the typical community member physiological changes may be more likely used to identify someone as old (Appleby 2017). Do individuals at Tombos with younger age estimates show skeletal indications of physical appearances and physiological function that might be associated with old age? Generally, these observations, such

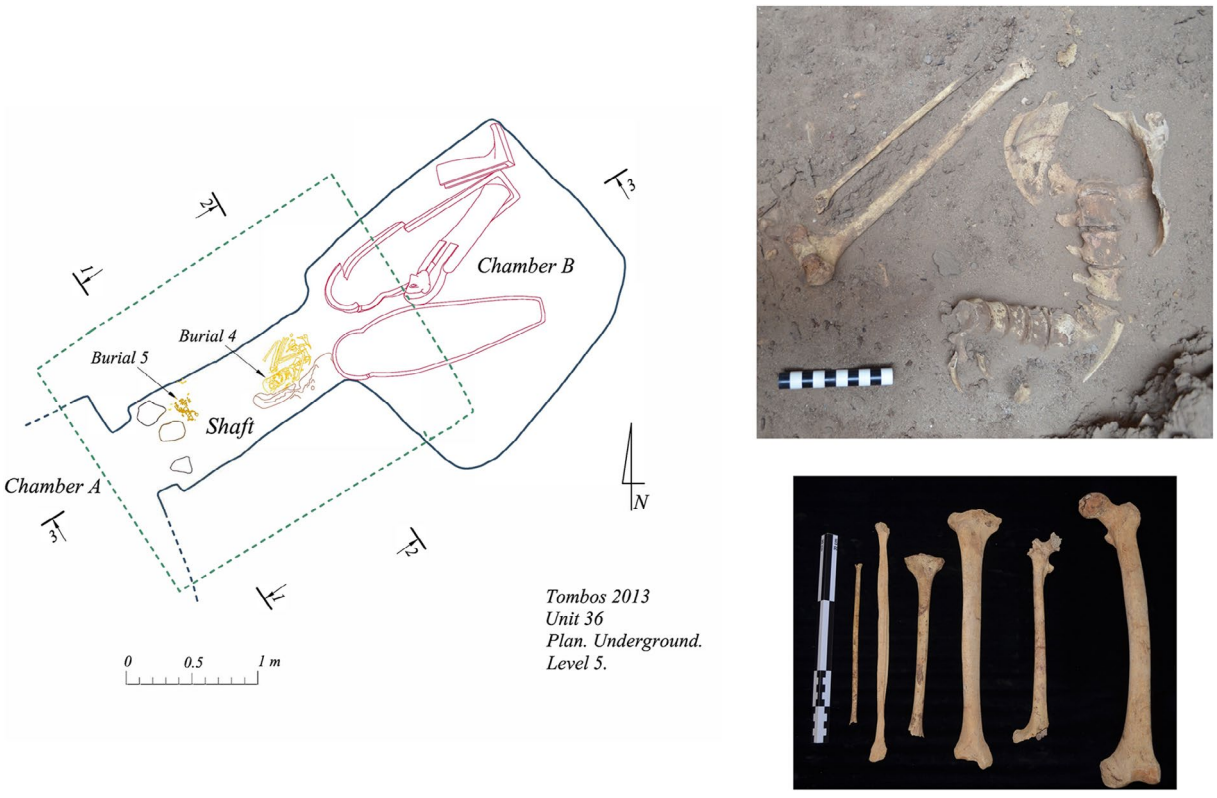

FIGURE 9 | Unit 36 Tomb 1 Burial 4 showing burial context, vertebral changes, and atrophy of long bones in comparison to a typical individual from Tombos.

as skeletal evidence of back postural changes, osteoporotic fractures, or antemortem tooth loss at Tombos, are found in those with estimated older ages. In addition, individuals who may have been identified as "old" based on physical appearance and bodily function assist in more fully conceptualizing age identity (Appleby 2017). One particular example, an individual with an estimated age nearing the older adult category, provides an excellent illustration of bodily degeneration that could be associated with an older social age.

In the western cemetery, Unit 36 Tomb 1 Burial 4 (Figure 9) is a female with a maximum likelihood age of 48.2 years (95% CI 31.2–73.9). This individual was recovered from a New Kingdom funerary chapel with a shaft leading to east and west chambers in a flexed body position. This individual displayed atrophy in the pelvis, femora, tibiae, and fibulae of both legs. Atrophy was also observed in the humerus, ulna, radius, scapula, and clavicle of the right side. There is a severe angle in the lower spine with fusion of two lumbar vertebrae and arthritic changes. These skeletal changes are consistent with this individual having an infectious disease earlier in life, like poliomyelitis, that can result in paralysis and bone effects such as scoliosis (Waldron 2020; WHO 2016). The slight atrophy in the right arm, scapula, and clavicle could be a result of post-polio syndrome where lack of use due to new weakness can occur after the fact (Headley et al. 2011). Pictorial evidence of leg impairments along with examples from skeletal remains indicate that polio may have been common in ancient Egypt (Kamal 2025). Clinical and functional impacts would include severe mobility issues and postural changes and would be associated with a considerable disability requiring substantial health care provisioning to obtain necessary daily sustenance and hygiene (Tilley 2015). These bodily changes would have necessitated extreme behavioral change, resulting in this individual possibly being viewed socially as an older individual in the community.

7.3 | Experiences at Tombos

The Egyptian-style tombs discussed above in the northern and western cemeteries display a range of socioeconomic status levels for individuals of all ages in their burials. Elaborate monuments of the colonial and postcolonial elite marked their position in society, correlating with specialized grave goods like inlaid coffins and heart scarabs that were only accessible to those of higher status. Those with more modest means were buried around the larger monuments or in communal crypts below them. The most modest were contained in coarse reed matting similar to the poorer burials at Amarna. Regardless of status, the mortuary rituals undertaken suggest respect for the poorer members of the community in death, while skeletal analyses point towards assistance provided during life as was socially expected for older community members in Egyptian society (Frood 2010; McDowell 1999). The local, Nubian-style burials also indicate varied effort implying a range of socioeconomic statuses, from substantial to simple tumuli and burials with elaborate jewelry and ebony and ivory woodwork to those with modest or no grave goods (Buzon and Smith 2023). Both of the tumulus burials described above fall at the more modest end of the distribution. One was buried with a bed and headrest but no jewelry. The other apparently was without a bed and also lacked jewelry, although their presence cannot be entirely ruled out given poor preservation of organic material and disturbance of the body. Both tombs contained large intact transport vessels from Egypt suggesting a level of access to valuable goods, and each had physical conditions that would have necessitated assistance despite the relatively modest character of their tombs and burials. In terms of sex-related patterns, both males and females, including those estimated to be older adults, show respect in their burials and physical conditions that involved healthcare provisioning within both Egyptian and Nubian style graves.

Analyses of Tombos individuals over the years of site excavation have consistently shown low levels of conditions indicative of poor health and strenuous activities. Combined with a substantial proportion of older age adults in the sample, these data strongly support the idea of a generally well provisioned, peaceful community during and beyond the Egyptian colonial control that favored prosperity even among the lower levels of society. Access to economic and household care resources is suggested by the number of older adults, their treatment in burial, and the presence of some individuals with conditions necessitating extra assistance. While these older adults may not have continued in their original community roles during their later decades (Frood 2010; McDowell 1999), there are no indications that aging was necessarily associated with extreme disability. Individuals who were able to live to old age may have been those with better resources than other members of the community. However, it is notable that burials across the site in cemeteries that likely represent different social (ethnic, religious, economic) groups all have older adults. Individuals expressing local practices, such as flexed burial and tumulus graves, were also able to survive to older ages. These data and specific examples serve to illuminate the nature of the colonial enterprise and cultural interaction at Tombos.

Author Contributions

Michele R. Buzon: conceptualization, investigation, funding acquisition, writing – original draft, methodology, validation, visualization, writing – review and editing, software, formal analysis, project administration, data curation, supervision, resources. **Katie M. Whitmore:** conceptualization, funding acquisition, investigation, writing – original draft, methodology, writing – review and editing, formal analysis, data curation. **Stuart Tyson Smith:** funding acquisition, writing – original draft, writing – review and editing, formal analysis, data curation. **Mary Sophia DeWitt:** methodology, formal analysis, writing – review and editing, data curation. **Sarah A. Schrader:** writing – review and editing, methodology, formal analysis, data curation.

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Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that supports the findings of this study are available in the Suppoting Information of this article.

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Supporting Information

Additional supporting information can be found online in the Supporting Information section. **Table S1:** Supporting Information.