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Research Article

A preliminary bioarchaeological study of the funerary urns from Los Tamarindos, Tierra Caliente, in Michoacan, Mexico

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Abstract

This article presents the results of a preliminary bioarchaeological study of 10 funerary urns containing human burned remains from the Los Tamarindos urn-field cemetery dated to the Postclassic period. I was able to determine the basic biological profile data. In addition, I determined the fragmentation rate as well as the thermal alternation of bones from funerary urns from Los Tamarindos, which allowed me to propose the first observations about the Pretarascan cremation burial practices in this region. The low weight of bones indicates that burials should be determined as partial burials; however, they contain fragments of bones from each anatomical region. The structure of the bones and the chromatic discoloration caused by the thermal alternation indicate that temperature during the cremation did not exceed 900°C, given that the cremains did not exhibit the recrystallization structure, which is interpreted as a characteristic feature of the high maximum temperature of a funerary pyre during the cremation.

Resumen

En este artículo se presentan los resultados del estudio bioarqueológico de diez urnas funerarias del sitio arqueológico Los Tamarindos, fechado en el período Postclásico. Este análisis es el primer estudio en esta región que se centra en los aspectos tafonómicos y biológicos de los individuos enterrados en el cementerio precolombino de la región de Tierra Caliente en Michoacán, México. Pude determinar los datos básicos del perfil biológico como el número mínimo de individuos dentro de cada entierro y evaluar su edad y el sexo. Además, se ha reportado la presencia de artefactos y fragmentos de huesos de animales. Además, pude determinar el fragmentación así como la alternancia térmica de los huesos de entierros de cremación seleccionados de los entierros de Los Tamarindos que permitieron proponer las primeras observaciones sobre las prácticas de entierro de cremación en esta región durante el período Postclásico. El bajo peso de los huesos indica que los entierros deben ser determinados como entierros parciales, aunque contienen fragmentos de huesos de cada región anatómica. La estructura de los huesos y las decoloraciones cromáticas causadas por la alternancia térmica indican que los huesos no fueron expuestos por una temperatura superior a los 900°C, ya que las cenizas no mostraron la estructura de recristalización interpretada como un rasgo característico de la alta temperatura máxima de la pira funeraria. Por otra parte, la presencia de lascas de obsidiana retorcidas por el fuego dentro de una de las urnas funerarias indica que la temperatura máxima de la pira pudo superar los 800°C.

Keywords: cremation; burial practices; bioarchaeology; Mesoamerica; Michoacán; cremains; osteoarchaeology; taphonomy; fragmentation; Postclassic; Pretarascan

Tierra Caliente (Figure 1) is the low-elevation valley that runs from the Tepalcatepec River at the border of the states of Jalisco and Michoacán states to the basin of the Balsas River at the frontier with the state of Guerrero (González y González 2001:17; Gonzalez-Paraiso 2004:10–12; Osborne 1943:59–61; Paradis 1974). This region is distinct not only in terms of its climatic conditions but also in terms of its local culture (González y González 2001:18–30; Paradis 1974). The first archaeological survey in Tierra Caliente was conducted by Spinden (1911) in the Balsas River basin and the valley of Río del Oro in June 1910 (Spinden 1911:29). However, it was not until the 1940s that a true golden era of archaeological interest in the Tierra Caliente occurred (Armillas 1945; Brand 1943; Goggin 1943; Lister

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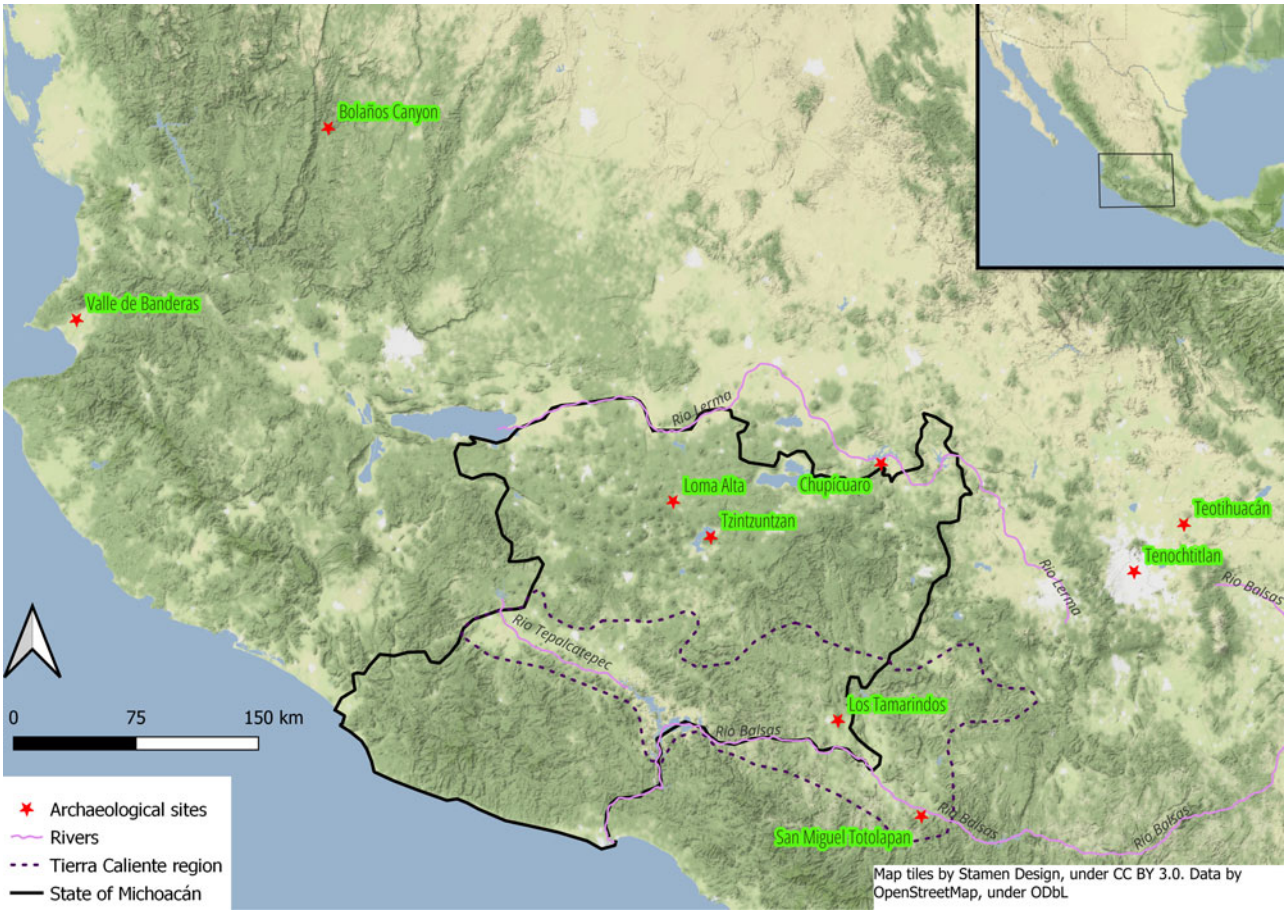

Figure 1. Map of Tierra Caliente and Michoacan with neighboring areas and the locations of major archaeological sites mentioned in the text. Map created by Budziszewski.

1947; Osborne 1943). Since that time, only a few archaeological surveys were conducted in this region (Gastelum-Strozzi et al. 2019; Grove and Paradis 1971; Medina 1989).

Pioneer archaeologists working in the Tierra Caliente region did not pay much attention to the mortuary practices. However, cremation burials in the Tierra Caliente were reported from the beginning of the twentieth century (Spinden 1911:32–33). Brand (1943) discovered singular urn and pit cremation burials in the valley of the Balsas River. Other researchers reported the presence of similar archaeological features in the Churumuco region (Armillas 1945) and in San Miguel Totolapan (Lister 1947). Cabrera Castro (1976) confirmed the presence of cremation burials during his work in the La Villita region. He also mentioned the presence of funerary urns dated to the Classic period in the Cocula Valley, Guerrero (Cabrera Castro 2002:270).

This article presents the results of a preliminary study of 10 funerary urns from the Los Tamarindos cemetery in the Chigüero region of Tierra Caliente, Michoacan. This is the first pre-Columbian cremation sample analyzed from a bioarchaeological perspective from the Tierra Caliente region. Based on the methodology proposed by McKinley (1994) and Jaskulska (2020), I was able to determine the basic information about the biological profile (age at death, MNI, and sex), observing the presence of both children and adult individuals in separate urn burials. Detailed and careful excavation of the funerary urns allowed me to draw initial conclusions about the presence of pyre goods (obsidian flakes and the remains of animals) and grave goods deposited outside of the funerary urns (unburned deciduous teeth, clay figurine, and copper bell). Based on the color of cremains and indirect pyre temperature indicators such as fire-twisted obsidian flake and shattered enamel of permanent teeth, I suggest that the maximum temperature of the funerary pyre reached at least 600°C and a maximum of 800°C. This assumption opens a further interpretive path in the context of cremation technology at the Los Tamarindos site, which should be studied with the application of specialistic analyses, such as FTIR spectroscopy and archaeobotanical investigation.

Background

In the West Mexico region, which encompasses the territories of five Mexican states (Sinaloa, Nayarit, Jalisco, Colima, and Michoacan) and parts of the Guanajuato and Guerrero states as defined by Williams (2020), the number of bioarchaeological studies on cremation burials is relatively limited. The first information about cremation burials was published by Hrdlička (1903), who presented the results of the analysis

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Figure 2. Planigraphy of the Los Tamarindos cemetery with the location of funerary urns. Drawn by Zarco Navarro, courtesy of INAH Michoacan.

of cremation burials from Totoate in the Bolaños River valley. Cremated remains from Valle de Banderas, Jalisco, were also studied by Bioarchaeologists, providing information about the taphonomy and biological profile of the deceased (Mountjoy 1993; Mountjoy and Sandford 2006:316). Osteological analysis of cremation burials from Bolaños Canyon at the border of Jalisco and Zacatecas provides data about MNI and the age of individuals (Cabrero García and López Cruz 2007:245). Eventually, Talavera González and Santiago Martínez (2017) studied Epiclassic cremation burials from La Pitayera in Nayarit.

However, the highest number of cremation burials in West Mexico was found in the Zacapu Basin, Michoacan. Until now, the largest sample of studied cremation burials comes from Loma Alta cemetery (Arnauld et al. 1993; Carot 2001; Michelet 2001). Thirty-one funerary urns excavated from this cemetery contained burned and cremulated human remains (Carot and Susini 1989). The single funerary urn dated to the end of the Epiclassic period (A.D. 800/850–900) from the El Palacio site in the Zacapu region was also studied by Grégory Pereira (Pereira and Barrientos Juárez 2020). In addition, cremation burials were found in other parts of Michoacan (Caso 1930; Espejel Carbajal 2014:27; Leon 1903:416; Macías Goytia 1990, 1997; Martínez González 2013; Plancarte 1893:83; Pulido Mendéz 2002:302).

The presence of funerary urns with burned human remains was also reported in other parts of Mesoamerica (e.g., Bonfil Olivera 2016; Cabrera Castro 1999; Duncan

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et al. 2008; Fauvet-Berthelot 1996; Garciá Payón 1979; Grove 1970:63–64 Iguaz 1993:71; López Alonso 1971; Nielsen and Helmke 2018; Ruiz González 2021; Weiant 1943; Weiss-Krejci 2006). Multiple Postclassic cremation burials were excavated in both the Mayan Lowlands and Mayan Highlands (Adams 1990; Blom 1954:124–129; Colby 1976:75; Fauvet-Berthelot 1996; Medina Martín and Sánchez Vargas 2007; Miller 2007; Palka 2018; Ruiz González 2021:21; Tiesler 2007; Weiss-Krejci 2006:76). However, the presence of cremation burials in the Maya region can be dated as early as the middle Preclassic period, and one of the earliest burials were discovered in Copan (Tiesler 2018:212; Weiss-Krejci 2006:76). In addition, historical sources (Duncan et al. 2008; Durán 1964; Ragot 2021; Román Berrelleza and López Luján 1999) and Postclassic codexes (Bellas 1997; Iguaz 1993:64–66; Oliver 2018; Zborover 2020) indicate that cremation was a burial rite reserved for Tlaxcaltecan, Mixtec, Tarascan, and Aztec warriors, nobles, and kings. The archaeological record from the Aztec capital Tenochtitlan also indicates the practice of cremation (Chávez Balderas 2007, 2018:379; Iguaz 1993:71; Ragot 2021:310; Román Berrelleza and López Luján 1999).

Material

Los Tamarindos in regional chronology

Los Tamarindos urn-field cemetery was excavated during the salvage archaeology project "Proyecto Arqueológico Salvamento Presa el Chigüero" in 2015 prior to the construction of a dam in Chigüero (Gastelum-Strozzi et al. 2019; Punzo Díaz et al. 2019, 2020a). Forty-two funerary urns were found at this archaeological site deposited at the level of the *tepetate* bedrock (Figure 2). Some offerings were deposited outside the funerary vessels as grave goods, including clay figurine, copper bells, and unburned human deciduous teeth (Figure 3). In the case of one of the copper artifacts deposited as a grave offering, a fragment of the textile was preserved (Punzo Díaz et al. 2019:202–203). Copper bell do not exhibit signs of fire patina; therefore, they should be considered grave goods, not pyre goods, which would be deposited on the pyre before or during the cremation process and burned with the body of the deceased. Radiocarbon dating of the burned human bone from urn RT28 (Gastelum-Strozzi et al. 2019; Punzo Díaz et al. 2017) indicates that the cemetery functioned during the Postclassic period (1296–1404 cal A.D. [2σ]).

Regarding the most precise regional chronology, the results of Proyecto Arqueológico Salvamento Presa el Chigüero provides the most accurate and detailed information about this matter. The project entailed a comprehensive examination of all archaeologically recognizable sites within the region. The outcomes of the fieldwork yielded precise and reliable dating information (Punzo Díaz et al. 2019, 2020b). At least four settlements dated to the Classic period were excavated in the studied region at the Loma de Piticuaro, Cuinicuaro, Piaiticuaro, and Yácata de la Casita archaeological sites (Punzo Díaz et al. 2019, 2020b). All the mentioned settlements were dated using the radiocarbon method. Moreover, the archaeomagnetic method was applied in the case of Loma de Piticuaro (Punzo Díaz et al. 2019, 2020b). In Yácata de la Casita, inhumation burials were found near residential structures. Similarly, at the El Ancón archaeological site, which was dated back to the Preclassic period (Punzo Díaz et al. 2019:119–149, 2020b), inhumation burials were excavated. The only settlement occupied in the Postclassic period excavated during Proyecto Arqueológico Salvamento Presa el Chigüero was discovered in Cupandario (Punzo Díaz et al. 2019:429, 2020b). Archaeologists encountered inhumations without burial offerings, interred under the floors of the houses. In general, the preservation of nonburned human bones discovered in Cupandario was very poor (Punzo Díaz et al. 2019:427–428, 2020a). Moreover, the presence of singular, dispersed burned human bones in Cupandario was also reported (Punzo Díaz et al. 2019:430).

The Los Tamarindos cemetery

The funerary urns excavated at the Los Tamarindos cemetery display a wide range of shapes and sizes. However, a more in-depth analysis of pottery is beyond the scope of this article, which will concentrate on the bioarchaeological data obtained from human remains intentionally placed in ceramic vessels and found in situ at the archaeological site (Figure 4). The method of placing funerary urns in clusters and the lack of architecture and other archaeological features, except for artifacts mentioned above that were deposited alongside burials, allows me to determine the funerary functions of this archaeological site. The Los Tamarindos cemetery is an example of a flat urn-field cemetery, similar to the definition of Trincheras culture sites such as Cerro de Trincheras in northern Mexico (Cerezo-Román 2021; Watson et al. 2015).

Analysis was conducted on 10 microexcavated urns (RT6, RT7, RT8, RT9, RT10, RT12, RT13, RT25, RT27, and RT28) from the Los Tamarindos site (Gastelum-Strozzi et al. 2019; Punzo Díaz et al. 2019). The term "RT," used by the team led by Jose Luiz Punzo Díaz, will be utilized in this article as the equivalent of the archaeological feature number. It will also be used to refer to the inventory numbers of the grave goods deposited outside of the urns (Punzo Díaz et al. 2019).

The urns were excavated by mechanical layers with a layer thickness ranging from 2 to 2.5 cm, followed by the methodological protocol of Jessica Cerezo-Román (Cerezo-Román 2020; Cerezo-Román and Williams 2014). In the case of RT07, the urn fill within each layer was additionally divided into quarters (Punzo Díaz et al. 2020a:368). The main purpose of this protocol was to gather extensive data regarding the spatial distribution of objects within the urn, which could be later integrated with CT scan images (Gastelum-Strozzi et al. 2019). However, the exploration of funerary urn RT07 focused mainly on the metal artifacts and confirming information about its localization derived from CT scans (Punzo Díaz et al. 2020a), not on burned human remains and their spatial distribution.

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Figure 3. Selected grave goods excavated outside of funerary urns within the funerary area at Los Tamarindos. RT17 presents the copper bell with textiles, and RT30 presents the clay figurine. RT33 presents a second upper deciduous molar with a resorbed root and a fragment of an unidentified deciduous tooth. RT34 presents left and right first lower deciduous molars with resorbed roots. Photographs by Budziszewski (RT33 and RT34) and Punzo Díaz (RT17 and RT30), courtesy of INAH Michoacan.

The remaining funerary urns from the Los Tamarindos cemetery will be microexcavated and analyzed in the future. The forthcoming research will focus on the potential of a combination of the traditional bioarchaeological analysis of osteological material with the results of computed tomography (Budziszewski et al. 2023, Gastelum-Strozzi et al. 2019). Several urns from the Los Tamarindos cemetery were left unexplored as part of an ongoing effort to preserve examples of unique archaeological features from the Tierra Caliente region.

Methods

The data collection and analytic protocol were based on the methods proposed by McKinley (1994) and Jaskulska (2020). Before the analysis, each burial was weighed on an electronic scale with a measurement accuracy of 0.1 g. Subsequently, I sieved the burials through a set of three calibrated round-opening sieves with the mesh opening size sequentially >10 mm, >5 mm, and >2 mm. This division resulted in the separation of three size fractions, which later were separately weighed. Afterward, I conducted the morphological identification of bone fragments and assigned them into one of the following categories:

1. Skull
2. Torso (axial skeleton with pectoral girdle and pelvic girdle)
3. Upper free limb
4. Lower free limb
5. Unidentified

Next, I weighed each of the categories within each weight fraction separately. I also measured the largest bone fragment using a sliding clipper with a measurement accuracy of 0.1 mm. This protocol provides the quantitative data on which the analysis was based. Data are stored in the standardized Google Sheet file for each of the burials (Jaskulska 2020:130).

The rate of anatomical identification (RAI) was calculated for each of the contexts according to the protocol proposed by Gonçalves (2012:67) as the maximum weight of all identified fragments divided by the full weight of the burial (with the 2 mm fraction included) and presented as percentage values.

During the morphological identification, I noted the presence of taphonomic and paleopathological lesions, and heat-induced alterations to the bones. Furthermore, at this step, I noted the presence of the diagnostic traits for the assessment of age at death and the sex of the individuals. Moreover, I registered the presence of animal bones, pyre goods, and grave goods within the burial (McKinley 2017). The sex of individuals was assessed based on the standards of Buikstra and Ubelaker (1994), whereas the age assessment for the subadults was based on the stage of epiphyseal fusion (Cunningham et al. 2016) and the odontogenesis (Ubelaker 1989). The age of adult individuals was assessed based on the stage of cranial suture obliteration (Meindl and Lovejoy 1985) and the general morphology of bone fragments (McKinley 1994).

The division of age categories was adapted from the work of McKinley (1994:19) at Spong Hill.

1. Infant (0–4 years old)
    a. Young infant (0–2 years old)
    b. Older infant (3–4 years old)

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Figure 4. In situ documentation of the funerary urns analyzed in this study. Photographs by Punzo Díaz, courtesy of INAH Michoacan.

2. Juvenile (5–12 years old)
    a. Young juvenile (5–8 years old)
    b. Older juvenile (9–12 years old)
3. Subadult (13–18 years old)
    a. Young subadult (13–15 years old)
    b. Older subadult (16–18 years old)

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4. Young adult (19–25 years old)
5. Mature adult (26–40 years old)
    a. Younger mature adult (26–30 years old)
    b. Older mature adult (31–40 years old)
6. Older Adult (>40 years old)
7. Adult (>19 years old)

In terms of chromatic changes of the bone, I used the scale developed by Holden et alia (1995a), and I based the classification of thermal fractures on typology developed by Symes et alia (2008).

Results

Fragmentation

Due to the low weight of the burials (Table 1), all burials should be considered as partial burials. Data from modern crematories indicate that the adult cremated burial weight should range from 900 to even more than 5,000 grams (Bass and Jantz 2004). The mean weight of the analyzed burials is 196.8 g. Despite the low amount of osteological material, the presence of bone fragments from each of the anatomical regions was recorded in nearly all analyzed burials, except for RT10, RT13, and RT28 (Figure 5). Only in the case of RT7 is the distribution of anatomical regions similar to the expected model values for the dry, unburned skeleton (McKinley 1994:6). In most cases, the prevalence of cranial bone fragments within the identifiable fragments is visible.

The RAI values ranged from 20.1% to 66.4%. The two burials with the highest RAI values have the lowest total weight, and the most identifiable fragments in those burials are cranial bone fragments with the minimum or no value of postcranial bone fragments. In the rest of the analyzed samples, the RAI value might be considered as the median value for archaeological cremation burials.

Table 1. Maximum weight along with the sum weight of identified bone fragments for each burial. The rate of anatomical identification (RAI) is presented in percentages.

Feature Number	Maximum Weight of the Burial (g)	Weight of Identified Bone Fragments (g)	RAI
RT6	176.1	35.4	20.1%
RT7	363.6	86.8	23.9%
RT8	395.2	144.7	36.6%
RT9	112.5	32.9	29.2%
RT10	22.3	14.8	66.4%
RT12	275.7	118.4	42.9%
RT13	20.4	12.7	62.3%
RT25	254.2	96.8	38.1%
RT27	284.3	93.1	32.8%
RT28	106.1	51.3	48.4%

The mean measurements of the largest bone fragments range from 20 to 35 mm (Table 2). Feature RT6 is characterized by the smallest bone fragment sizes and the largest fragmentation, whereas the bone fragment measurements in RT7 indicate the lowest fragmentation in the analyzed sample.

The proportion of fraction weights (Figure 6) indicates a visible pattern, where most of the fragments have diameters below 10 mm. The only exception is the RT25 burial, where 63.77 percent of the fragments belong to the largest fraction. The greatest variety in the percentage value of the fractions is visible in the smallest 2 mm fraction, which consists of mostly unidentifiable small fragments of cremains, teeth roots, and bone dust. These differences might be due to fragmentation of the remains as a result of cremation burial practices or differences in microexcavation between the urns and methods of collecting bone fragments, and sieving of the urn fill. Despite these differences, the predominance of the <10 mm fraction is visible, indicating high fragmentation of the cremation burials from Los Tamarindos, which can also be observed in the measurements of the largest bone fragments (Table 2).

Taphonomy

The taphonomic changes observed in this context refer to heat-induced alterations of bone structure, which include bone warping and shrinking, chromatic discolorations, the presence or absence of china-like structure, and the brittleness of cremains.

In terms of the chromatic discolorations of the bones, all burials show both inter- and intraburial diversity. Most of the burials show the predominance of blue/gray fragments over white-colored bone fragments (RT6, RT9, RT10, RT12, RT13, RT25, RT27, RT28). Most of the white-colored fragments do not exhibit the specific china-like structure typical for the recrystallization phase of bone structure thermal alteration (Correia 1996; Ellingham et al. 2015:185; Holden et al. 1995a, 1995b; Schultz et al. 2015). These white-colored fragments have a brittle structure, similar to the blue/gray fragments. Most of the china-like fragments within these burials are identifiable fragments of the cranium. Only in the case of RT8 did I observe the predominance of white china-like fragments, but even here, the blue/gray cremains represent around 40 percent of all bone fragments in this burial. RT7 exhibits the largest variety of chromatic discolorations of the bones, given that black fragments can also be observed in this context (Figure 7).

Bone warping and thermal fractures can only be observed on the bone fragments in the >10 mm fraction. These thermal alterations can be observed in each of the studied burials. Longitudinal fractures can be observed mainly in the fragments of the long-bone diaphyses (RT6, RT9, RT12, RT25, RT27). Splintering is present on the surface of cranial bone fragments (RT6, RT8, RT9, RT10, RT13, RT28) and is visible mostly on the fragments of epiphyses (RT7, RT9, RT25).

Biological profile

Age-at-death assessment. The cremation process, as an intentional funerary practice, is inherently a destructive

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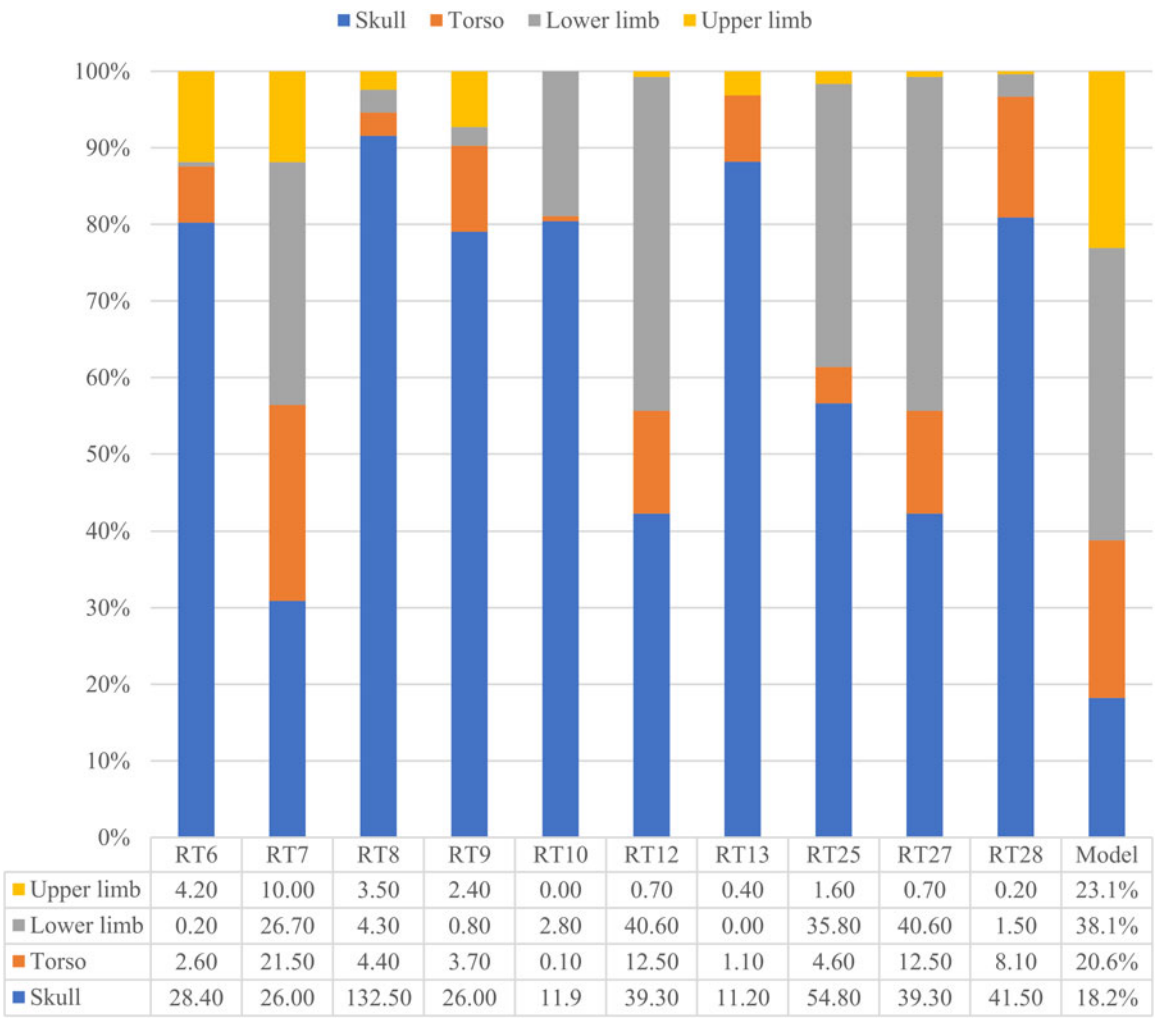

	RT6	RT7	RT8	RT9	RT10	RT12	RT13	RT25	RT27	RT28	Model
Upper limb	4.20	10.00	3.50	2.40	0.00	0.70	0.40	1.60	0.70	0.20	23.1%
Lower limb	0.20	26.70	4.30	0.80	2.80	40.60	0.00	35.80	40.60	1.50	38.1%
Torso	2.60	21.50	4.40	3.70	0.10	12.50	1.10	4.60	12.50	8.10	20.6%
Skull	28.40	26.00	132.50	26.00	11.9	39.30	11.20	54.80	39.30	41.50	18.2%

Figure 5. The percentage values of anatomical regions among all identified bone fragments within each burial are compared with the model data of the normal weight distribution of anatomical regions (McKinley 1994). The weights of the anatomical regions in grams are presented in the table below the graph. Made by Budziszewski.

Table 2. Measurements of the largest bone fragments in each of the analyzed burials in millimeters.

Feature Number	Skull	Torso	Lower Limb	Upper Limb	Unidentified
RT6	23	17	17	9	29
RT7	32	54	49	34	43
RT8	32	19	29	33	39
RT9	25	22	16	25	31
RT10	23	17	-	28	25
RT12	34	21	22	30	34
RT13	25	24	-	22	22
RT25	36	29	40	17	48
RT27	28	25	37	14	30
RT28	24	24	-	-	32

taphonomic process (Jaskulska 2020). The fragmentation and heat-induced alterations discussed in the previous results section pose challenges to the analytical potential of reconstructing the biological profile of individuals who were cremated and buried in the Los Tamarindos cemetery. Despite these limitations, the basic assumptions

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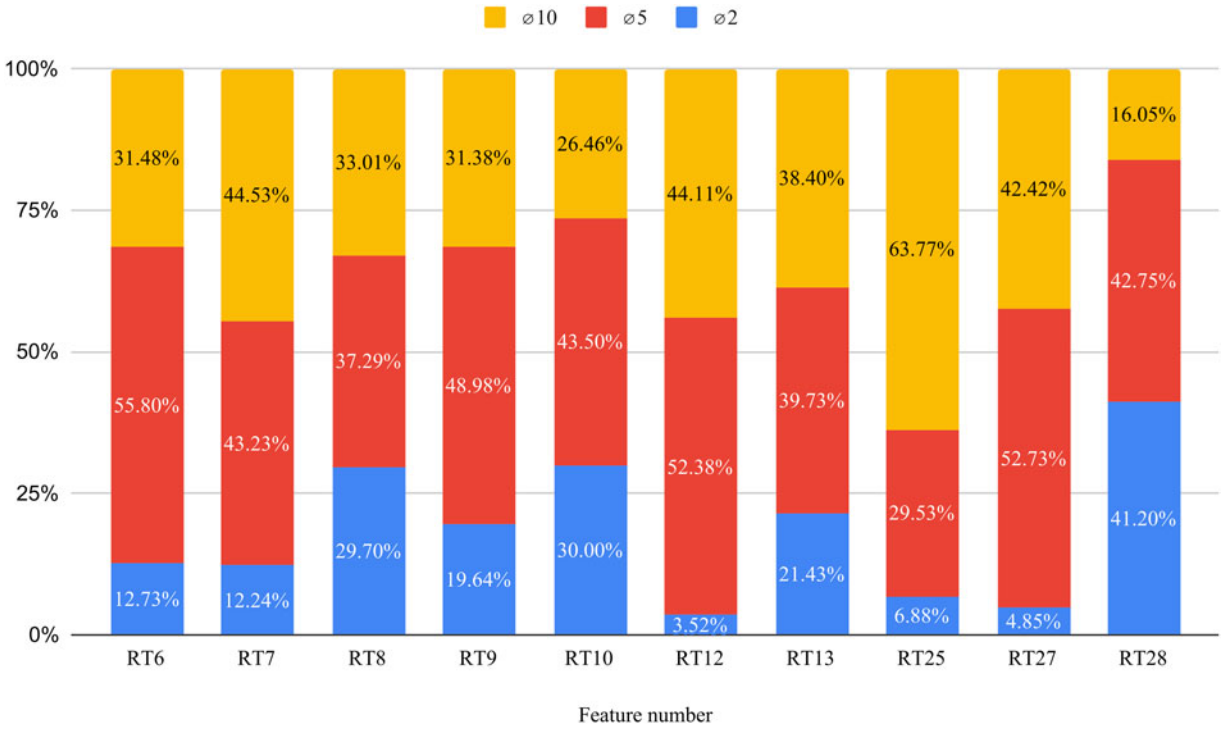

Figure 6. The cumulative bar graph presents the percentage values of each fraction (>10 mm, >5 mm, >2 mm) for each of the burials analyzed. Made by Budziszewski.

regarding the age and sex of individuals based on the presence of diagnostic bone fragments are presented in Table 3. The precision of age and sex assessments is based on the number of diagnostic fragments and their preservation. As a result, the age assessment was more precise in the case of subadults. In RT10, RT13, and RT28, the presence of permanent tooth germs provided the most detailed information about the age at death, but due to the lack of a complete dental inventory, the exact age assessment was impossible to determine, and therefore general age categories were established.

In RT12 and RT27, the only indicator of age at death preserved was the completely fused epiphyses of proximal foot phalanges, which allowed only the determination of the lower margin of age assessment. The older age of those individuals cannot be negated. The most precise age assessment for adult individuals was possible in the case of RT8, where cranial bone fragments with endocranial obliteration of sutures were observed.

In the case of RT6, RT9, and RT25, no diagnostic fragments were preserved; therefore, according to the observations of Jacqueline McKinley (1994:16) and based on the general morphology of bone fragments—including the thickness of cranial vault fragments and marrow cavities of the long-bone diaphysis—the very general age category of an adult can be determined.

Sex assessment. Similar methodological limitations also apply to the sex assessment. Only in two cases can the sex of individuals be preliminarily assessed based on the presence of fragments of the supraorbital margin (RT8 and RT9). Furthermore, in the case of RT8, the diagnostic fragment of the mastoid process was recorded.

Minimal number of individuals (MNI). The most complicated situation was encountered in RT7, where due to the presence of two right petrous parts of the temporal bone, the MNI = 2. The only diagnostic fragments for age-at-death assessment preserved in this context are the fragments of unfused femoral head and femoral neck. Due to the lack of a duplicated femoral head, the age can be assessed only

Figure 7. Cremains from RT07 show a wide range of thermal chromatic discolorations, ranging from blue to gray to chalky white. Photography by Budziszewski.

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Table 3. MNI along with the age and sex assessment, with the methods applied.

Feature Number	MNI	Age Category	Method of Age-at-Death Determination	Sex	Method of Sex Determination
RT6	1	Adult	General morphology of bones[a]	?	Lack of diagnostic fragments
RT7	2	Older subadult	Unfused femoral head <16–19; fully formed navicular bone >10–-3[b]	?	Lack of diagnostic fragments
		Adult?			
RT8	1	Mature adult?	Cranial suture obliteration[c]	F?	Supraorbital margin (score 2); Mastoid process (score 2)[e]
RT9	1	Adult	General morphology of bones[a]	F?	Supraorbital margin (score 2)[e]
RT10	1	Older infant	Dental development[d]	-	-
RT12	1	Older subadult/ Young adult	Complete fusion of proximal epiphysis of proximal leg phalanges >16–18[b]	?	Lack of diagnostic fragments
RT13	1	Older infant	Dental development[d]	-	-
RT25	1	Adult	General morphology of bones[a]	?	Lack of diagnostic fragments
RT27	1	Older subadult/ Young adult	Complete fusion of proximal epiphysis of proximal leg phalanges >16–18[b]	?	Lack of diagnostic fragments
RT28	1	Young juvenile	Dental development[d]	-	-

[a]McKinley 1994:16
[b]Cunningham et al. 2016
[c]Meindl and Lovejoy 1985; after Buikstra and Ubelaker 1994
[d]Ubelaker 1989
[e]Ascadi and Nemeskeri 1970 quoted in Buikstra and Ubelaker 1994

for one of the individuals in this burial, and the age of the second cannot be determined more precisely than that of an adult. For the rest of the analyzed burials, MNI = 1. A very interesting feature of the Los Tamarindos population is the presence of individual graves of infants. More detailed assumptions regarding MNI and other aspects of the biological profile and the frequency of individual or multiple burials and their type would be possible to determine after the analysis of the remaining burials from Los Tamarindos

Foreign objects

During the bioarchaeological analysis, additional traces of both grave and pyre goods were recorded. Shell fragments were found in five burials (RT6, RT7, RT9, RT26, and RT28). Only in the case of RT9 do shell fragments exhibit visible signs of fire discoloration. Furthermore, small fragments of the engraved shell were recorded in the RT7 urn. Additionally, a fire-twisted obsidian flake was found in burial RT27.

The presence of animal burned bones was confirmed in only one burial (RT7), where fragments of carnivore ribs, fragments of bird long bone, and fragments of an unidentified animal were encountered. More detailed species identification was unobtainable due to thermal alterations and high fragmentation of animal bones, similar to the fire transformation of human bones, indicating the presence of animal remains on the pyre during the cremation process.

Discussion

Analysis of 10 funerary urns from Los Tamarindos allowed me to draw preliminary conclusions about the Pretarascan cremation burial practices at this archaeological site. The bioarchaeological data allowed me to propose interpretations of both the technological aspect of cremation and the cultural dimension in terms of mortuary practices, presumably related to funerary behaviors of the mourners and the eschatological perception of the human body. I also propose an analysis on the social dimension of the perception of children in society using the discussed cemetery. However, before delving into the results of this analysis, it is crucial to acknowledge the methodological limitations inherent in bioarchaeological research on cremation in West Mexico.

When attempting to compare the bioarchaeological data presented in this study with previous publications on pre-Columbian burned human remains, there is a major challenge due to the absence of a unified methodology. Recently, other bioarchaeological analyses reported information about the maximum weight of cremains (Chávez Balderas 2007:212; Núñez Hernández 2004:121; Pereira 2018; Pereira and Barrientos Juárez 2020), and they provide a list of identified bone fragments (Chávez Balderas 2007:212; Fauvet-Berthelot et al. 1996:470–471; Medina Martín and Folan 2010:707; Medina Martín and Sánchez Vargas 2007:109; Pereira and Barrientos Juárez 2020:256–259) or publish quantitative data with precise and clear information (Núñez Hernández 2004:123–124; Pereira 2018:335–337; Pereira and Barrientos Juárez 2020:254–255). These data allow me to compare the results of different publications. Detailed and clear reporting of numeric data concerning weights or representation of anatomical regions allows me to understand and envision the published burials. This enables me to make further interpretations regarding

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the technological and cultural facets of cremation burial practices, including the method of collecting bones from the funerary pyre by the mourners and the cultural aspects of this funerary behavior. Many publications also present data about the estimated temperature of the funerary pyre, including the exact ranges (Bonfil Olivera 2016; Chávez Balderas 2018:391–392; Duncan et al. 2008; Medina Martín and Folan 2010; Núñez Hernández 2004:126; Pereira and Barrientos Juárez 2020; Pérez Rodríguez et al. 2017; Ruiz González 2021). In other cases, the chromatic discolorations are only listed without further interpretation (Houston and Scherer 2010:182; López Calvo and López Alonso 2018:44; Tiesler 2018:217). Pereira and Barrientos Juárez (2020:255), on the other hand, properly estimated the temperature in the case of cremation urn burials from El Palacio, indicating only its lower margin. Moreover, based on their report, I can tentatively suggest that the temperature of the funerary pyre during the cremation process in Los Tamarindos could be similar to the El Palacio cremations. Similar observations concerning the thermal discoloration and possible maximum temperature of the funerary pyre was also reported from Postclassic Mayan sites such as Dos Pilas (Weiss-Krejci 2006:77) and from Tenochtitlan (Chávez Balderas 2007:210–212, 2018:392–396).

The published osteological evaluation of cremated human remains from Tonina (Ruiz González 2021:263–267) is also an example of a well-conducted study using new methods and based on the current literature. The author evaluated thermal discolorations and thermal cracking as an important source of information about human body treatment (Ruiz González 2021:263–264). However, cremated human remains were found in the commingled context. Therefore, the funeral aspect of cremations in Tonina is not evident. Ruiz González (2021:264–265) suggested that this case is an example of a sacrificial context. The recent discovery in Tonina is not the only example of burned human bones from the Mayan region that was identified as the remains of sacrificial victims. Stephen Houston and Andrew Scherer suggest that burned human bones dated to the Classic period from Piedras Negras, Tikal, and Dos Pilas should be interpreted as the remains of sacrificial activities (Chinchilla Mazariegos et al. 2015:196; Houston and Scherer 2010:181–182; Tiesler 2018:223–225). The burials of children from El Zotz indicate exposure to fire, but based on chromatic discolorations, I can estimate that the degree of oxidation was relatively low. Taking into account the archaeological context, children's burials from El Zotz can also be considered as the remains of sacrificial victims (Scherer and Houston 2018:136–138). However, the archaeological record and historical sources suggest that the Maya could use fire to dispose of soft tissues and therefore clean bones (Chuchiak 2018:168). Consequently, it is crucial to note that not all skeletal remains that show signs of fire exposure can be interpreted as evidence of burned sacrificial victims.

Conversely, when reporting descriptive data about cremation burials, the state of the art is different. The lack of a standardized way of describing qualitative features of burned human bones and the potential subjectivity of researchers in the descriptive reporting of cremation burials limits comparisons and conclusions based on queries of the scientific literature. Specifically, when it comes to qualitative data such as taphonomic changes and thermal alterations, a broad range of terminology is often used by researchers (Duncan et al. 2008; Fauvet-Berthelot et al. 1996; Houston and Scherer 2010; Mountjoy and Sandford 2006:327; Ruiz González 2021; Talavera González and Santiago Martínez 2017). High variation and imprecision in their reporting significantly hinder interpretations. Regarding the description of thermal fractures, many bioarcheologists use the typology developed by Symes and colleagues (2008). However, many explanations for the presence of these thermal fractures refer to the traditional interpretation of bones being burned while still covered with soft tissues (Bonfil Olivera 2016:33; Chávez Balderas 2018:383; Chinchilla Mazariegos et al. 2015; Fauvet-Berthelot et al. 1996; López Calvo and López Alonso 2018:44; Núñez Hernández 2004:125; Pereira and Barrientos Juárez 2020:255; Tiesler 2018:217; Ubelaker 1989). However, this interpretation was questioned by the study, which indicates that the presence of collagen in bones before the cremation is sufficient to cause the above-mentioned thermal fractures and alternations (Gonçalves et al. 2011). Furthermore, it is notable that there is a lack of precision in the use of the term "fragmentation" in many publications. Frequently, the terms "high" or "low" fragmentation are used without providing the quantitative data (García Jiménez 2013; Mountjoy and Sandford 2006). For each researcher, the subjective determination of high/low fragmentation can be misleading. I believe that the methodology applied in this study enables the comparison of this important feature of cremation burials regardless of territory or chronology, supported by the quantitative data. This approach will help to eliminate the interpretive biases in the data and will ensure greater accuracy of the published analyses.

Regarding heat-induced alterations in bone structure and taphonomic changes, a high variability in chromatic changes was observed in the analyzed burials. The possibility of macroscopic determination of the funerary pyre temperature is very limited. Recently, microscopic studies of the crystallinity index with the application of the spectrometric analyses (Ellingham et al. 2015; Gonçalves et al. 2019; Iriarte et al. 2020; Sandholzer et al. 2014; Thompson et al. 2013) proved to be a more reliable and accurate method for estimating the maximum temperature and duration of the cremation process. Therefore, only basic observations can be proposed based on macroscopic taphonomic changes. The majority of bone fragments indicate blue/grey or white chromatic changes, which suggests the degree of oxidation connected traditionally with pyre temperature exceeding 600°C. On the other hand, in the case of Los Tamarindos, many of the white-colored bones do not exhibit a china-like structure. This thermal-altered change in bone structure is one of the characteristic features of the recrystallization phase of cremains (Correia 1996; Ellingham et al. 2015:185; Holden et al. 1995a, 1995b; Schultz et al. 2015). The temperature of the funerary pyre was probably not stable and

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constant during the whole process. As the result, the temperature and impact of the fire differed in specific parts of the funerary pyre. Therefore, bone fragments indicating different thermal-alerted changes can appear in one cremation burial as an effect of the typical process of burning human remains on the open-air pyre. Recently, multiple studies indicated that specific chromatic discolorations can be caused by lower temperatures if the remains had been exposed to fire for a longer duration (Fairgrieve 2007; Holden et al. 1995a, 1995b; Weitzel and McKenzie 2015). Because of these factors, the precise indication of the maximum temperature of the funerary pyre cannot be estimated based only on macroscopic observations of bone fragments.

However, the presence of a fire-twisted obsidian blade and the shattering of the fully erupted teeth crowns in the studied burials can serve as indirect indicators of the temperature range during the cremation process. The enamel tissue is destroyed when exposed to temperatures above 600°C (Bagdey et al. 2014; Beach et al. 2008; Mahoney and Miszkiewicz 2015). The teeth's roots are protected by maxillae and mandibular bones during the cremation process; therefore, they are the only part of the permanent teeth that will survive this funerary practice (Huntsman and Becker 2013; Lemmers 2012; McKinley 2017; Schmidt 2015). The melting point of obsidian was experimentally estimated to be at 800°C, and this data has been used in many archaeological case studies as an indication of the temperature of the funerary pyre (McGuire 2018; Reinhard and Fink 1994; Shackley and Dillian 2002). Based on this information, I can tentatively presume that the temperature during the cremation exceeded 600°C and reached at least 800°C. However, spectrometric analysis may yield more precise and certain information concerning the maximum temperature and the duration of the cremation process.

The proportion of size fractions is an important indicator of the differences in cremation burials from both intra- and interpopulation perspectives. Multiple factors can contribute to higher levels of fragmentation, including cultural aspects of cremation burial practices and postcremation behaviors, such as the deliberate crushing of bones (Evans 1996; Holden et al. 1995a; Lara et al. 2015; Sigvallius 1994), technological aspects of cremations such as the temperature and duration of the cremation process (Harvig 2015; Holden et al. 1995a; Ubelaker 2009), methods of pyre extinguishing and the manner of collecting cremains from the extinguished pyre (McKinley 1989, 1993; Pankowská et al. 2013; Szydłowski 1965), postdepositional natural processes (Harvig 2015; McKinley 1993, 1994; Minozzi 2015; Symes et al. 2008), process and methods of excavation (Harvig et al. 2012; Minozzi 2015; Pankowská et al. 2013), and the time between cremation and collection of burned remains from the pyre (Waterhouse 2013).

In the analyzed sample, the prevalence of >5 mm fractions is visible, contrary to the European samples analyzed with a similar methodology. The archaeological sites where the biggest >10 mm fraction is visibly dominant range from the British Isles (Caffell and Holst 2007; McKinley 1994; Shimmin and Rose 2015; Wysocki and Cummings 2007), through Belgium (Stamataki et al. 2019), Poland (Budziszewski 2018; Dzierlińska 2018; Jaskulska 2018), the Balkans (Thomas 2011), and Portugal (Maradoa and Braga 2018). Unfortunately, the lack of bioarchaeological analysis of cremains from the New World studied using a similar methodology makes the comparison of numerical data from Los Tamarindos to other examples from Mesoamerica or the Southwest impossible.

High fragmentation of burial from Los Tamarindos seen through the low proportion of the biggest >10 mm fractions may be one of the factors contributing to the low total weight of most of the analyzed burials. On the other hand, as mentioned earlier, fragmentation is influenced by various factors. At this stage of the analysis, it is challenging to identify the primary factors responsible for the fragmentation of the cremains. Furthermore, it is difficult to determine the extent to which fragmentation itself affects the overall weight and quantity of bone in the burials. In this regard, it is important to consider the possibility of the potential intentional manipulation of burned human remains by mourners before being placed in the funerary urns. Historical sources describing the mortuary behavior among Aztecs indicate the ritual usage and significance of the cremains and ashes of the deceased. In his opus, Diego Durán (1964) mentions that some of the burned remains were gathered and placed among the hills outside the habitation areas. The widows of the cremated warriors covered their faces with ashes and probably the remains of the funerary pyre (Oliver 2018:348). Moreover, the historical description of Tlaxcaltecan practices indicates that some of the ashes were mixed with blood and utilized as a vital symbolic substance of the figurines and statues (Oliver 2018:354).

Based on our knowledge of ethnohistorical records from Mesoamerica, it can be inferred that cremation burial practices are commonly associated with the cult of fire or the sun (Bonfil Olivera 2016:33; Eberl 2018). Additionally, the purifying attributes of fire are often considered an essential element of the religious aspect of cremation burial rites (Bonfil Olivera 2016:35; Chinchilla Mazariegos 2018:42; Palka 2018; Vail and Duncan 2018:270). The cleansing power of fire has also been confirmed in historic and ethnohistoric sources (Chinchilla Mazariegos 2018:39–40). Additionally, some variants of myth concerning the fiery death of dangerous Natsi'itni—especially the Ch'orti', Totonac, and Popoluca versions—indicate the connection of the burning of the deity with fertility and successful cultivation (Chinchilla Mazariegos 2018:41). Aztec mythologies also mention the act of self-sacrifice of gods by burning in the fire atop the Pyramid of the Sun in Teotihuacan as an act of transformation of death into life and darkness into light (Nielsen and Helmke 2018:78; Oliver 2018:347). This myth also indicates the recreating and transformative aspects of fire in Mesoamerican cosmology, including the self-sacrifice of Quetzalcoatl and numerous indications of the creation of humanity by gods out of ashes present in the Mesoamerican mythologies (Chávez Balderas 2007:122; Palka 2018:289; Scherer and Houston 2018:142). Finally, fire could be used to destroy the essence of a person or profane

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the body of an enemy (Chuchiak 2018:169–171). Fire also undoubtedly played an essential role in the Tarascan religion (Corona Nuñez 1993). This element was one of the most important aspects of the principal deity in the pantheon: Curicaueri (Corona Nuñez 1993:369–370; Pereira 2018:323). Both archaeological record and historical sources indicate that sacred bonfires dedicated to gods were constructed and burned by the Tarascans (Alcalá 2019; Corona Nuñez 1993:371–372; Pereira 2018:323).

The importance as well as the interpretative impact of *La Relación de Michoacán* (Alcalá 2019) on the archaeology of Michoacan is indisputable. This unique opus dedicated three chapters to the description of the cremation funerary rites of Tarascans. Chapter VII depicts the funeral of a warrior; chapter IX characterizes the activities in the case of the death of the Tarascan noble. Finally, chapter XVI focuses on the ritual behavior during the funeral of the king (Alcalá 2019; Pereira 2018:328–329). This source is remarkable for the reconstruction of Tarascan cremation practices. However, it is important to note that making assumptions about the individuals buried in the Los Tamarindos cemetery belonging to a local Pretarascan society does not allow for an uncritical comparison between the descriptions provided in *La Relación de Michoacán* and the archaeological data from the discussed cemetery. In addition, *La Relación de Michoacán* depicts the high funeral of the most important individuals of the Tarascan society (Alcalá 2019; Zborover 2020:146). Nevertheless, information about the usage of funerary bundles, and offerings including food, is an interesting aspect of cremation burial rites practices in West Mexico prior to the Spanish Conquest, which potentially could be detected in the archaeological context. Most of the offerings mentioned during the burial are perishable pyre goods, which would be consumed by fire during the cremation (Alcalá 2019:201–202). Only in the case of the king's funeral does Jeronimo Alcalá mention the presence of turquoise and gold jewelery on the funerary pyre (Alcalá 2019:221–222). These types of pyre goods could be detected within cremation burials as artifacts deposited into the cremation funerary urn after the burial ceremony. Finally, *La Relación de Michoacán* provides a bit of information about the Tarascan funeral pyre. According to the source, it was constructed from dry wood stacked in rows on top of each other and stabilized with pine tree sap (Alcalá 2019:223; Pereira 2018:329). Unfortunately, no well-preserved pyre debris in funerary urns or remains of funerary pyres was discovered in the Los Tamarindos cemetery. As a consequence, it is not possible to use the description of the funerary pyre in *La Relación de Michoacán* to reconstruct the pyre construction methods employed at the Los Tamarindos cemetery.

Furthermore, some interpretations of cremation burials from Michoacan were rooted in *La Relación de Michoacán*. For example, Lumholtz (1973:427–431) and Plancarte (1893:83) perceived cremation burials from the Zacapu and Zamora regions as interments of local leaders. *La Relación de Michoacán* also had an impact on such interpretation in other regions of West Mexico (Cabrero García and López Cruz 2007:253; Meighan 1959:3). However, comparable interpretations were made in other parts of Mesoamerica (Chase and Chase 2011:11–12; Chávez Balderas 2018:386; Fauvet-Berthelot et al. 1996; Gillespie 2008; Nielsen and Helmke 2018; Palka 2018:292–293; Román Berrelleza and López Luján 1999). For example, the emergence of cremation burial practices in the Mixtec highlands during the Preclassic period was interpreted as a sign of the beginning of ranked society in this region (Duncan et al. 2008). In the case of Los Tamarindos, I avoid the social status interpretation of cremation burials, as with the above-mentioned examples.

In terms of the social dimension derived from paleodemographic data, the presence of single child burials is worth highlighting. The effort to prepare a similar burial for an infant as for an adult individual might indicate the social perception of a child as a full member of society in the Pretarascan middle Balsas region in the sense of social age understood in the perspective of social sciences (Halcrow and Tayles 2008:202–206; Lillehammer 1989; Perry 2005; Więckowski and Wołoszyn 2016:225–226). Childhood is a modern idea (Aries 1980; Baxter 2005; Halcrow and Tayles 2008:199; Qvortrup 2009). In preindustrial societies, children received responsibilities and started working in the household early in their lives (Aries 1965; Baxter 2005; Hewlett 1991; Lundh 1995:36–37). The absence of child burials in cemeteries is a commonly reported phenomenon, not only in the case of societies that practiced cremation burial rites (Alesan et al. 1999; Lillehammer 1989:101–102; Millett and Gowland 2015; Perego et al. 2020; Pereira 2021:101–103; Stamboliyska-Petrova 2020; Watson et al. 2015). Multiple explanations of this phenomenon range from mainly taphonomic reasons (Buckberry 2000; Guy et al. 1997) to a cultural basis, where children dying before passing a specific age should not be buried in the same manner as an adult member of a specific society (Becker 2007; Cerezo-Román 2015:362–363; Dasen 2011; Perego 2014:163; Pereira 2021:97–98; Tiesler 2011:119) or to the mortuary practices, where separate cemeteries or parts of necropoleis would be dedicated only for children (Gill 1971:39; Pereira 2021:100; Perry 2005:90–91; Schutte 1973:30). On the other hand, previous reports from West Mexico documented the presence of cremation urn burials of individual children, such as those found at the El Palacio, Guadalupe, and Malpais Prieto sites in the Zacapu Basin (Pereira 1999:67–68, 2021; Pereira and Barrientos Juárez 2020). Therefore, this practice is not unique either in the regional or in the Mesoamerican perspective. Regarding the differences in the treatment of children in pre-Columbian Michoacan, Pereira (2021) noted the distinct treatment of infants younger than five years old during the Classic and Epiclassic periods in the Zacapu region. The children were buried in the funeral area, but they were interred in a separate part of the cemetery. He suggested that this behavior could be connected with the perception of children under five years old not being full members of society (Pereira 2021:104–106). During the Postclassic period, the distinction between children and both adolescent and adult individuals further deepened. Fetuses and infants were buried below the floor level in the household context

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(Pereira 2021:107). It is also worth noting that individual burials of children were excavated at archaeological sites of the Preclassic Chupícuaro culture (Darras and Faugère 2010; Maurer et al. 2011; Porter 1956:530). In later periods, if present, children's burials were often connected with human sacrifices, most commonly dedicated to Tlaloc (Ardren 2011; Buikstra 2007; Chinchilla Mazeriegos 2018:42–45; Iguaz 1993:71; López Luján et al. 2010; Matos Moctezuma 2002:137; Medrano Enríquez 2021; Ragot 2021:314; Sánchez Alaniz and González Miranda 1999; Scherer and Houston 2018:134–139).

In West Mexico, most of the Classic (Cahue and Pollard 1998; Pollard and Cahue 1999:266–268; Punzo Díaz 2022; Punzo Díaz and Valdes Herrera 2020), Epiclassic, and Postclassic archaeological sites on which numerous burials were found almost exclusively contained inhumation burials. In the case of Huandacareo, three distinct burial areas were identified (Macías Goytia 1990:191–192). The dominance of the inhumation burials excavated from the Tarascan centers was also observed in Urichu (Cahue and Pollard 1998; Pollard 1997; Pollard and Cahue 1999), Erongaricuaro (Haskell 2008:50–53), and Angamuco archaeological sites (Cohen 2021). However, in the latter archaeological site, partial cremations were encountered. Despite this, no additional data were published regarding the osteological materials from Angamuco, because the analysis of these materials is still ongoing (Cohen 2021:339). In the case of Tzintzuntzan, only skeletal burials were encountered near the Great Platform and yacatas. Burned human remains in great quantities were encountered in the ossuary in the Tarascan capital (Rubín de la Borbolla 1941). However, remains from the ossuary should not be considered burials, but rather the intentional manipulation of human remains as part of cultural behavior. Similarly, the dominance of inhumation is also visible in the Sayula Basin during the Classic (Acosta Nieva and Uruñuela Ladrón de Guevara 2005; Uruñuela Ladrón de Guevara 1996; Valdez et al. 2006) as well as the Postclassic periods (Acosta Nieva and Uruñuela Ladrón de Guevara 1994, 2005; Uruñuela Ladrón de Guevara 1996; Valdez et al. 2006). However, in the case of the archaeological sites of the Preclassic Chupicuaro culture excavated by Porter (1956), burned human remains were discovered in the ossuary context, where the presence of intermixed human and animal bones were discovered. Unfortunately, no further data or analysis were published (Porter 1956:528–530). On the other hand, excavations conducted on other Chupicuaro culture archaeological sites indicate the dominance of inhumation burial practices (Darras and Faugère 2010; Maurer et al. 2011).

Surely, the Late Preclassic cremation burial rite from Loma Alta of cremains pulverization (Carot and Susini 1989) is a unique funerary practice. Burned remains from Los Tamarindos burials do not exhibit any indicators or premises that would allow suggesting the partial pulverization of cremains gathered from the funerary pyre. I would expect the presence of very characteristic traces indicating the mechanical crushing of burned human remains. Previously, researchers argued that the presence of distinctive traces indicating intentional pulverization would be necessary to confirm this practice (Harvig et al. 2012). In addition, the osteological material from Los Tamarindos shows typical signs of thermal alterations caused by the cremation process (Symes et al. 2008). The high fragmentation of the cremains is likely a result of the lower resistance to postdepositional damage of burned bones that have not undergone recrystallization transformation (Correia 1996; Schultz et al. 2015). Eventually, one question that arises is, if the intention was to crush the burned remains in Los Tamarindos, why was it only done partially and not completely, as in the case of Loma Alta pulverized burials?

Conclusion

To conclude, this article presents preliminary data about the funerary practices in the Los Tamarindos urn-field cemetery. Keeping in mind the bias of biological data assessment in the case of cremains, I can tentatively state that cremation urn burials usually contained the remains of one individual. This observation seems to be most accurate in the case of infant burials, given that separate funerary urns were prepared to contain only the remains of a single child. This behavior may also indicate that children of around three and four years old were considered full members of society. In the analyzed sample, I did not observe the remains of the younger children. However, this does not mean that younger children were not cremated or were treated in a way other than the rest of the local society.

The findings related to the pyre technology suggest that the highest temperature reached during cremation did not surpass 900°C, as indicated by the taphonomic data and the degree of oxidation of the burned human bones. This is consistent with previous observations made for cremation burials in El Palacio, located in the Zacapu Basin. To further validate these remarks, FTIR spectroscopy analysis is required to obtain accurate information about the maximum temperature and duration of exposure to fire during the cremation process. This study also revealed the usage of obsidian flakes and animal remains as pyre offerings. It is possible that animal fat and bones were used as fuel for the fire during the cremation, but the cosmological significance of depositing certain animal remains should not be disregarded. At this stage, the study presents only preliminary results, and a more in-depth analysis of the religious or cosmological aspects of the mortuary practices in the Los Tamarindos cemetery cannot be performed. Future archaeobotanical analysis of the contents of the urns, and analyses merging bioarcheological data with CT scanning, can provide important information about both the technological and religious aspects of the mortuary rites in Los Tamarindos.

Finally, one of the most important observations about cremation burials is the high fragmentation of the osteological material. Although I was unable to observe any traces and indications of intentional pulverization or cremulation of the bones in the studied sample, at this moment, I am not able to determine the major and most probable factors causing the fragmentation, which have a direct impact on the amount of the cremains in the burials. However, it is

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important to consider the possibility of intentional manipulation of the cremains after the cremation process and before their placement in the secondary burials. Most of the funerary urns contained cremains from all anatomical regions, suggesting that no part of the human body was not intentionally burned on the pyre or was not placed in the secondary urn burial after the cremation process. The intentional manipulation of cremains from the extinguished funerary pyre was documented in historical sources for Aztecs and Tlaxcaltecans. Currently, however, there is no archaeological evidence to confirm the intentional deposition of any part of the burned human remains in other areas within the cemetery or outside of its boundaries. But such practices would probably be archaeologically intangible.

Data availability statement. Separate files for each funerary urn are available in the FAIR repository via the following link: https://doi.org/10.18150/8D4T3A. Each file contains raw qualitative and quantitative data obtained during the analysis of 10 cremation funerary urns containing the burned human remains from the Los Tamarindos cemetery, located in the Tierra Caliente region of Michoacan state.

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