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A critical assessment on proposed outbreaks of plague and other epidemic diseases in Ancient Egypt

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Highlights

- The study of evidence for pandemics in the past is relevant to understand the current pandemic
- Ancient Egypt is a reliable source for such studies due to its rich cultural and archeological sources
- In the ancient Egyptian context possible evidence for endemics and pandemics are series of skeletal and mummified remains, literary sources and cultural references
- Based on the available data it can be assumed that certain epidemics reoccurred frequently but were only mentioned in sources if the outbreak was massive

Abstract

The current Covid-19 pandemic has brought back memories of past epidemics. Pharaonic Egypt has often been associated with epidemics and disasters through the ten plagues of the Bible. The study examines which epidemics and serious diseases can be effectively proven for Ancient Egypt in mummies and historical source texts. The biblical plagues cannot be proven because there is no agreement on the dating of the Exodus or the Exodus is a conglomeration of memories of different events. Other diseases such as malaria and schistosomiasis have been proven for ancient Egypt, while polio and smallpox are still uncertain. From the time of the middle 18th dynasty there are indications of a bubonic disease, but its exact nature cannot be extracted from source texts or mummies, as they are too vague.

Keywords: Epidemic; Pandemic; Ancient Egypt; Biblical plagues; bubonic plague; smallpox, polio, malaria

Article

During the COVID-19 pandemics, several popular articles on epidemics and plagues in Ancient Egypt have been published (2020a). Mummies offer a unique chance to investigate the past (Cardin 2014) due to preservation of soft tissue. Whether there were pandemics in ancient times and how people reacted to them in the past is highly relevant for the present, as all measures we can take to control new pandemics must necessarily rely on our past experiences (Habicht et al. 2020). Egypt is frequently connected with the 10 biblical plagues (hebr. *Makot Mitzrayim*, Exodus 7:14 to 12:36). As one example, the documentary “The Exodus decoded” (Jacobovici and Cameron 2006; 2020b) claims the exodus took place at the beginning of the New Kingdom under Pharaoh Ahmose I. and was contemporaneous with the Minoan eruption and a postulated related limnic eruption in the Nile Delta (similar to the events at Lake Nyos in Cameroon in 1986). A limnic eruption is a lake overturn with

sudden eruption of CO₂ from the lake leading to death all fish, except the frogs, then to lice and flies, followed by bacterial epidemics etc. Other publications tend in the same direction (Trevisanato 2005). It is considered impossible by many that a limnic eruption can happen in a river like the Nile at all - because it is not standing water. Furthermore, such studies are in conflict with chronology and political situation: an early exodus at the beginning of the New Kingdom contradicts the Egyptian control over the territory of later Israel/Juda during the whole New Kingdom. It seems more realistic that the biblical plagues and the exodus are a conglomerate memory of independent events at different times merged to the exodus. Due to political situation, the exodus of Moses may took place at the end of the New Kingdom under Ramses XI (Habicht 2020) or later or not at all (Finkelstein and Silberman 2006).

In a proto-historical context, however, we must keep in mind the typical archaeological attributes indicative of a pandemic: Mass burials in which all age groups and both sexes were buried together and simultaneously, or "rushed burials" not conforming with established religious-social practices, e.g., in the ancient Egyptian context, the lack of mummification attempts. Indeed, those are only rarely found in ancient Egypt. Clear evidence of excessive mortality is missing, without any evidence-based population statistics available. The only remaining indicators of possible major disease events are, series of skeletal and mummified human remains, literary sources, and cultural references.

A few literary sources point towards major catastrophic disease events: The papyrus Leiden I 344 "The Admonitions of Ipuwer", is the most prominent example and is sometimes mentioned to infer possible epidemics at the end of the Old Kingdom. However, this papyrus dates to the Middle Kingdom and describes the social chaos after the collapse of the Old Empire. It is not a contemporary account, but an art form lamenting the reversal of living conditions (www.reshafim.org.il). Consequently, this work must be understood from a sociological-political rather than an epidemiological perspective.

The alleged mass burial of several queens of the reign of Mentuhotep II in the 11th dynasty (approximately 2000? BCE) may also be a potential indication of an epidemic. The queens seem to

have all died within a very short period and were buried in shaft graves in the king's mortuary temple at Deir el-Bahari. Shortly afterward, a porticus of pillars was built over the tomb entrances, and the tombs were no longer accessible, so they must have been buried almost at the same time. Some of the mummies were discovered by Herbert Winlock (1884–1950) in the 1920s and were in excellent condition (Derry 1942; Winlock 1942). Any speculation about an epidemic shortly after the reunification of the country at the beginning of the 11th Dynasty (c. 2050 BCE) is, however, strongly questioned by the following: According to the autopsy of Douglas Derry, Queen Ashayet - one of the queens - supposedly died while giving birth. Unfortunately, the once excellently preserved mummies are today in a deplorable state, mostly decomposed into skeletal remains (Fletcher 2004).

It is assumed that during the Middle Kingdom (ca. 2100-1800 BCE) the ancient Egyptians may have contracted the problem of malaria (*Plasmodium falciparum*) after settling in the Faiyum Oasis and creating channels with stagnant water. Malaria has been sporadically diagnosed in mummies from the New Kingdom (ca. 1800 BCE) (Nerlich et al. 2008; Hawass et al. 2010). However, tracing the disease's development from the Middle Kingdom to the New Kingdom is complicated by only very few mummies from the Middle Kingdom being preserved. At the beginning of the New Kingdom (c. 1550 BCE), the papyrus Edwin Smith (New York, Academy of Medicine) also describes an annually recurring disease (Stuhr 2008). The description points to a flare-up at the end of the Nile flood relates to an insect in spell 6 (column 19,14-19,18). The disease is described as a breeze of pestilence spreading through the air. It is tempting to associate stagnant water and mosquitoes with malaria, but this assumption cannot be conclusively proven based on source texts alone.

The presumed plague (*Y. pestis*?) at the end of the Bronze Age can be reviewed indirectly in Egypt in different ways. The earliest hints for this plague may be that Pharaoh Amenhotep III (ruled c. 1379-1340 BCE) ordered hundreds of statues of the lion-headed goddess Sekhmet to be made (Sekhmet being thought to bring epidemics - but also to remove them from society). These Sekhmet statues are now on display in numerous museums around the world (Norrie 2016). Except for one Amarna-letter (EA II) written under his son Akhenaton (ruled c. 1340-1323 BCE), which mentions a plague in the

time of his father, we have no direct historical evidence for an epidemic in the time of Amenhotep III. Some researchers suggested that the bubonic plague may have originated in India and spread over to the Middle East, and eventually reached Egypt (Norrie 2016). The decision of Amenhotep III to relocate his palace to Malqata on the western bank near Thebes, in a somewhat isolated location, might be one of the first known mitigating strategies of isolation known in history (Norrie 2016). It is possible that a decade later, an epidemic broke out in the new residence of Akhenaton in Tell el-Amarna during the 14th year of the king's reign. Not only numerous inhabitants but also members of the royal family died: three daughters of Akhenaton and his wife Nefertiti died and were buried in the Royal Tomb (Neferneferure, Setepenre, and Maketaton). Shortly afterward, the queen mother Tjye also died. However, her mummy shows no clear evidence of any infectious disease. In the time of Amenhotep III or Akhenaton, the village of the necropolis workmen in Deir el-Medina (Thebes-West) was destroyed by a fire. This may have been by accident or, in view of an epidemic, an attempt to purge the village from a disease (Norrie 2016). After the death of Tutankhamun (c. 1323 BCE), a military conflict between Egypt and the Hittite Empire led to an equally unclear epidemic among the Egyptian army, which spread to the Hittites. The Hittite king Šuppiluliuma I (ruled c. 1350-1322 BCE) and his successor Arnuwanda II (ruled c. 1322-1321 BCE) both died of this disease. As a result, the war against Egypt collapsed. The plague apparently disappeared under the next ruler Muršili II (ruled c. 1321-1290 BCE). The story of the plague is handed down in literature in the Hittite plague prayers (KUB XIV 10 and KUB XXVI 86) (Kimball et al. 2020): Translation: “And the land of Hatti has been sorely, greatly oppressed by the plague. Under my father (and) under my brother there was constant dying...” (Kimball et al. 2020). However, an exact identification of the disease is not possible as the descriptions are too vague to identify any one particular disease: hi-in-ga-na-az -- noun; ablative singular of <hinkan> plague -- by the plague (Puhvel 1991; Kimball et al. 2020).

The question of the presence of **poliomyelitis** (*poliovirus*) has also not been clarified, since the often-consulted mummy of King Siptah (ruled c. 1196-1190 BCE) shows a shortened leg, however, without an established aetiology (Harris and Weeks 1973; Harris and Wentz 1980; Galassi et al. 2016).

Also, the question of **Variola** (*variola maior /minor*) in ancient Egypt remains unresolved. The mummy of Ramses V (ruled c. 1150-1145 BCE) was postulated as the first known victim of the epidemic in the early 1980s as part of the WHO eradication campaign (Hopkins 1980). To this day, however, smallpox could not be identified at a molecular level in Ramses V, although the pustules on multiple areas of his body (face and lower abdomen in particular) might be considered indicative of a smallpox-like disease (Habicht et al. 2019). Thus, the relation to the now eradicated strains of smallpox of the modern age is quite uncertain (Duggan et al. 2016).

Schistosomiasis (aka bilharzia / *Shistosoma* sp.) was discovered in Egyptian mummies already more than 100 years ago, as the parasites could be microscopically identified (Ruffer and Moodie 1921). Because the description and the determinative signs of the “*aAa*-disease” (*aAa* is described as poison) in the famous Papyrus Ebers may be matched with schistosomiasis, this identification also seems likely but not certain (Stuhr 2008). The recipe prescribes a cure of the *aAa*-disease with honey (antibacterial) and the *Sams*-plant (perhaps *Anacyclus pyrethrum* (pellitory, Spanish chamomile, a medicinal herb used in Ayurvedic medicine, where it is known for its blood cleansing properties).

To summarize, the philological source texts are generally not specific enough to identify particular diseases or epidemics with enough certainty in Ancient Egypt. On the other hand, there are established medical diagnoses for preserved mummies that point to infectious diseases (despite that some pathogens, e.g., viruses, often do not leave disease-specific marks on the preserved human tissues). In fact, the philological, Egyptological, and paleopathological sides rarely come together, especially due to the lack of evidence-based medical diagnoses for mummies matching Egyptologically documented events with sufficient accuracy. A study from the Ottoman period suggests that at least two centuries ago, the plague reoccurred frequently, culminating in a massive outbreak in 1791 CE (Mikhail 2008). We can assume that certain epidemics reoccurred frequently but were only mentioned in sources if the outbreak was massive.

As shown, a closer look at the existing scientific evidence for epidemic incidents in ancient Egypt may put many previously published statements and opinions into perspective. Nevertheless, a

systematic recording of paleo-epidemiological data from ancient populations over a long time promises a better understanding of possible factors underlying host-pathogen co-evolution, either leading to a mostly controlled coexistence - as in the case of tuberculosis - or to periodic outbreaks and even pandemic disasters - as in the case of smallpox or the bubonic plague.

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