

Dental Health in Ancient Egypt

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Abstract

The Ancient Egyptians suffered from devastating dental disease through the millennia and this may have caused premature mortality. The changes in types of dental disease were influenced by the transformation of life from hunter-gatherers to settled agriculturists and the introduction of new crops. The supply of crops was also affected by periods of famine caused by flooding or drought. Over 500 skulls from different geographical regions and time periods were examined for this study and examples of caries, premature loss of teeth and abscesses will be shown. Age at death has been calculated from the dentition. Although there were seven individuals with the title of "dentist", their role is uncertain and an apparent lack of effective treatment has been observed despite dental prescriptions in the medical papyri.

Introduction

There is abundant evidence that the Egyptians suffered from the ravages of dental disease for most of their adult lives. It may have even been the cause of premature mortality.

Why did this happen and was there any effective dental intervention?

Before the Neolithic period, around 5000 BC, the inhabitants of the Nile Valley had been hunter gatherers and their diet was rich in protein from the abundant wildlife. When the population became settled agriculturists their numbers increased and the communities were dependent on the crops. Their state of nutrition was affected by drought and flooding which sometimes resulted in periods of famine. Because of reliance on cereals, their

protein intake became less and this affected both bones and teeth as their formation is dependent on an adequate intake. Another result is the reduction in average stature in communities eating a mainly cereal diet. Even in the present day the height of the hunter gatherers has not been regained (Brewer et al., 1994).

Evidence of diet

The evidence of diet has been gleaned from deposits in early settlements where fish bones and butchered animal bones have been found. Spikes of triticum dicocuum, emmer wheat, and barley have also been uncovered (Dixon, 1969).

Tombs may contain bread and mummified food offerings. Wall paintings and reliefs show offering tables laden with a variety of foodstuffs and wine.

Food in the viscera contained in canopic jars has also been analysed.

Rations, which were given to soldiers and workmen, are listed in papyri.

Diet

The diet was varied but mainly vegetarian. The ancient Egyptians were known as 'artophagoi' or 'Eaters of Bread'. It was the bread, surprisingly, which was responsible for much of the dental disease. Other dietary constituents were onions, garlic, pulses, melons, pomegranates and grapes, figs and dates. Honey, no longer the prerogative of the gods and kings, became generally available in later periods. A substance from the first dynasty has been analysed and is thought to be cheese (Saffiro, 1972). Examination of stomach contents of predynastic bodies showed barley husks (Dixon, 1969). Fishing was common in the early Predynastic period and papyrus was roasted and chewed. Despite scenes of butchering found in models, it is thought that meat eating was not common as large animals were used for farming. Beef was slaughtered for the food offering to the gods and, indirectly, the priests benefited from this as they had access to the meat when the offering was replaced. An example of this is the New Kingdom priest, Natsef Amun, examined by the Manchester Mummy

Team who was found to have atheromatous plaques in his femoral arteries (Tapp, 1992)

Preparation of bread

The dental problems which arose from the bread were caused by its preparation and the quality of the coarse wheat. The emmer wheat was harvested with flint tools which would flake. Limestone saddle querns were used to crush the wheat and a limestone mortar and pestle was used to grind it and bits of grit would be incorporated into the flour.

Pliny wrote that the Carthaginians added sand to aid the grinding of wheat and, in an experiment at Manchester University Museum, John Prag, using a saddle quern and mortar and pestle, found that after fifteen minutes of grinding there was little change in the grains. When he added some sand he achieved fine flour rapidly. There is no direct evidence of the Egyptians using this technique but if it was done in Carthage it is possible that this was also a method practised in Egypt at a similar period (Leek, 1984). It is also possible that the wind blown sand would have been sufficient to aid the grinding of the wheat. Sieves have been found and would only have removed the larger impurities.

The bread was often baked on outside of stone oven and would have been contaminated with wind blown sand. Specimens of bread from tombs were examined by Leek. He separated the organic and inorganic components and found that the organic part contained husks which would have been abrasive. An X-Ray examination of the inorganic sample was then photographed and enlarged and shown to contain feldspar, hornblende and mica but mainly quartz from sand.

Dental problems arising from the diet

Wear was the main factor. It has been classified in the past as attrition but the problem is caused by the combination of attrition and abrasion. Attrition is the wear of tooth against tooth but abrasion is the physical wear of a contaminant against a tooth surface which is what happened with the grit in the bread. When enamel on the surface of the tooth has been breached by the wear and the sensitive dentine is exposed this stimulates the cells that lay down dentine during life to develop an extra layer of irregular secondary dentine. In the ancient Egyptians dentition sometimes the wear was so rapid that this protective layer could not be formed quickly enough and the pulp of the tooth became exposed (Fig. 1). This resulted in oral bacteria entering the unprotected pulp chamber causing the pulp to die. When this happens, pus forms from the breakdown products of blood and bacteria. The volume of pus increases and penetrates the apex of the root which results in a very painful apical abscess (Fig. 2). Under great pressure the pus pushes through the cancellous - honeycombed bone - alveolar bone and reached the

surface through a sinus in the compact bone. The incidence of periapical infections differed at different time periods because of changes in the diet.

Another dental problem which was prevalent was periodontal disease. This starts as gingivitis which is inflammation of the gums caused by bacteria lying in the dental plaque (Soames and Southam, 1998). Advanced periodontal disease has been found in a protein deficient diet. The inflammation of the gingivae results in pocketing and so more plaque can form. The supporting bone is resorbed and the teeth become mobile and infection can cause periodontal abscesses. These are very destructive but

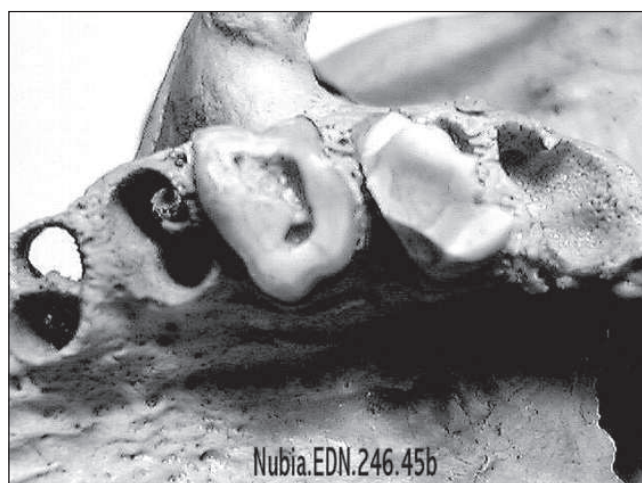


Fig. 1 - Extreme wear on the upper left 1st molar with exposure of the pulp.

not as painful as periapical abscesses. The teeth may fall out because of loss of bone support (Fig. 3).

A common problem nowadays is caries. The incidence was less in the Predynastic and Pharaonic periods. Caries is caused by the demineralisation of the inorganic part of the tooth as a result of the acid formed by the bacteria and plaque. And this results in the destruction of the organic matrix. The site of attack changed during the time period

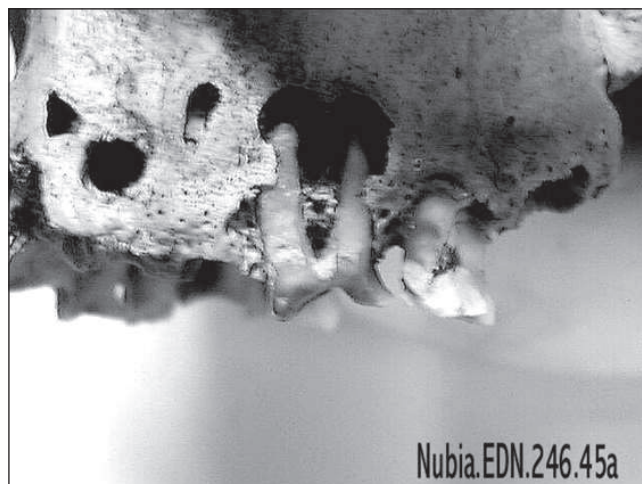


Fig. 2 - The extreme wear of the upper left 1st molar has caused a bony lesion suggestive of periapical infection.

examined. The earliest specimens from the predynastic period were around the root at the neck of the tooth, probably caused by the sticky residue from the bread which pushed the gum margin towards the root and exposed the cementum around the necks of the teeth which is softer than the crown enamel and more susceptible to caries. By the Graeco Roman period the position of caries was as we find it at the present time – the occlusal and interproximal surfaces (Fig. 4). This was because the wear was less and the fissures were prone to attack and because the diet contained more honey which was no longer the prerogative of the gods. When the bacteria from the caries entered the pulp chamber periapical abscesses would develop. These were the main dental problems discovered and must have caused great discomfort eating at the earlier stages and developed into acute bouts of pain and halitosis later in life. The only method of oral hygiene that has so far been

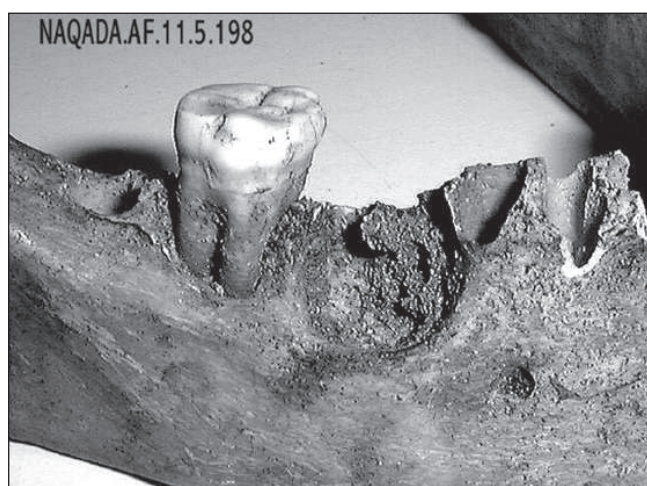


Fig. 3 - The lower right 1st molar has exfoliated because of periodontal breakdown and the 2nd molar has lost bone support.

discovered was written in the Pyramid Texts where pellets of natron were used to purify the mouth for social and religious reasons. It says that *the mouth was as pure as a sucking calf on the day it was born*. As natron contains bicarbonate of soda it would increase the pH and so it could have reduced the incidence of caries – it is used in toothpaste today.

These were the main dental problems discovered. Was anything done about them?

Evidence of dental treatment?

Herodotus said that *'The practice of medicine they split up into separate parts, each doctor being responsible for the treatment of only one disease. There are, in consequence innumerable doctors some specialising in diseases of the eyes, others of the head, others of the teeth, others of the stomach and so on; while others, again, deal with the sort of troubles which cannot be exactly localised.'*

From this there is the general impression of an active dental profession. However, Herodotus was writing in the

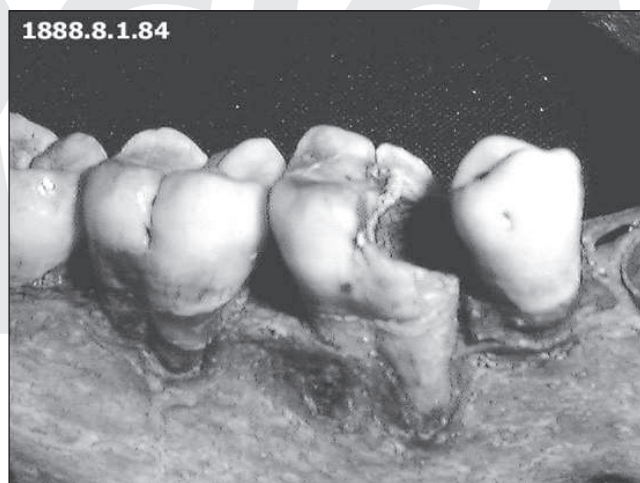


Fig. 4 - Gross interproximal caries in Graeco-Roman period.

5th century BC which coincided with the Late Period. There are six known dentists from the Old Kingdom and then the title appeared to die out until 2500 years later when it appeared again in the Late Period, only once. These were:-

1. **Hesy re;** 3rd Dynasty - Chief dentist, chief physician, royal scribe, priest of Min & Elder of builders.
2. **Nefer irites;** 3rd Dynasty - Dentist
3. **Khuy;** 3rd Dynasty - Chief physician of the palace, Physician of the palace Chief dentist, Chief physician of Lower & Higher Egypt, Shepherd of the Anus, Interpreter of the internal organs (or secret art)
4. **Redi en ptah;** 3rd Dynasty - Physician, Overseer of physicians, Overseer of dentists.
5. **Ny ankh sekhmet;** 5th Dynasty - Chief physician, Chief physician of the palace, Chief dentist of the palace.
6. **Men kau re ankh;** 5th Dynasty - Dentist.
7. **Psmtk-snb;** 26th Dynasty - Chief of physicians, Chief of dentists of the royal palace (Ghaliounghui, P, 1983).

It could be that other dentists have yet to be discovered. The multiple designations of all but two could mean that it was not a practical role but recognition of a need. Or could it be a misinterpretation of the Hieroglyph, the elephant's tusk, as 'dentist'?

Prescriptions

5 of the 10 known medical papyri have dental prescriptions mainly treatment for loose teeth – of doubtful efficacy. There appears to be none for the relief of pain. The Edwin Smith papyrus has a prescription for the reduction of a dislocation of the mandible by the same method as is used today (Breasted, 1930).

A medicament used is honey which is bactericidal as it dehydrates through osmosis. However, after a careful examination of over 500 skulls from all periods and considering the reports of other dentists there is absolutely no evidence of any practical dentistry to be observed. No extractions have been deliberately been performed for relief of pain or to drain abscesses even

when the teeth could have been removed by digital manipulation. Many teeth have been lost because of the poor periodontal condition. All cases which appear to support dental treatment have been reported by individuals with no dental training. For example there is the suggestion by Breasted who translated the Edwin Smith papyrus of the use of a fire drill to drain a dental abscess. He used as an illustration the sinuses through which an abscess would drain naturally with no intervention. A further fallacious interpretation of a dental 'bridge' was made by Junker of two teeth tied together which has been refuted by Leek (1984) and other dentists and it is now thought to be an amulet in a tomb (Becker, 1994).

Conclusions

From the evidence, it can be seen that the ancient Egyptian suffered horrendously from dental disease. The majority must have experienced great pain when eating because of teeth sensitive to hot and cold, swelling and pain from abscesses resulting in osteomyelitis and limited opening of the jaw because of osteoarthritis. In some cases death could have been caused by septicaemia from an untreated abscess.

Though their diet was good there must have been little pleasure in eating. It may be that the reason for the abundant food offerings in the tombs was to give the

deceased the opportunity to enjoy his first pain free meal in the After Life.

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