

The Dentition of the First Agriculturists (Jarmo, Iraq)¹

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Many characteristics of the dentition serve to distinguish individuals or even populations from each other and can be utilized in forensic, anthropologic and dental studies. Odontologists have become increasingly aware of the existence and the significance of differences between dentitions (Moorrees, '57; Pedersen, '49; Dahlberg, '51).

Various types of dentitions have existed throughout man's history. Some were seemingly essential for survival in various environments, others were not. Consequently, it is of interest to know the morphology and conditions of the teeth in the individuals who were associated with the great steps in man's advance from the primitive to the modern.

One of the most significant of these progressive moves took place in the transition from the nomadic hunting and collecting existence to the more sedentary agricultural village life involving the cultivation of crops and the domestication of animals. This change did not develop necessarily as the culmination of the efforts of one precocious group, but probably resulted from the gradually evolving comprehension and exchange of ideas in the environment which offered the proper moisture, soil, temperatures and conditions suited to such activities (Braidwood, '58). There were circumstances in some geographical areas under which this could not and did not happen. Related to our present civilizations it was in the lands of the fertile crescent of Mesopotamia, in the wake of the withdrawal of the last glaciation, that these favorable backgrounds invited man with his increased capacities to forge ahead in what Childe ('52) and others have called the agricultural revolution.

In 1951 and 1955 Robert Braidwood ('53, '59) and his associates engaged in successful expeditions in Iraq to locate some of these earliest villages. The site which they exploited is known as Jarmo and is located in the Kurdish foothills of north-central Iraq. The village dates back to 6750 B.C. \pm 500 years by Carbon 14 determinations (Braidwood, '58; Braidwood and Howe, '60).

MATERIALS

In addition to the implements, pottery, dwelling evidences and other archaeological articles that were found, some of the bones and teeth of the Jarmoites themselves were unearthed. Preservation had not been the best, therefore specimens were fragmentary. In total, parts of 7 individuals were collected including 96 permanent teeth and 30 deciduous ones with varying amounts of alveolar bone still attached to the teeth.

The bones were very friable and had to be cleaned and prepared with the utmost care. The teeth had a normal outward appearance. However, because they were leached without mineral replacement such as ordinarily occurs in the fossilization process, they were very easily broken, such as a piece of chalk under pressure (fig. 1). This was an advantage for inspecting the interiors of the teeth to study pulp chamber size and other details. Several specimens of each type of tooth were available. The material was not sufficient to permit a definitive statement on the teeth, but it does give some intimation of the dentition of these people.

¹This study was supported in part by the National Institute of Dental Research grant D-165.

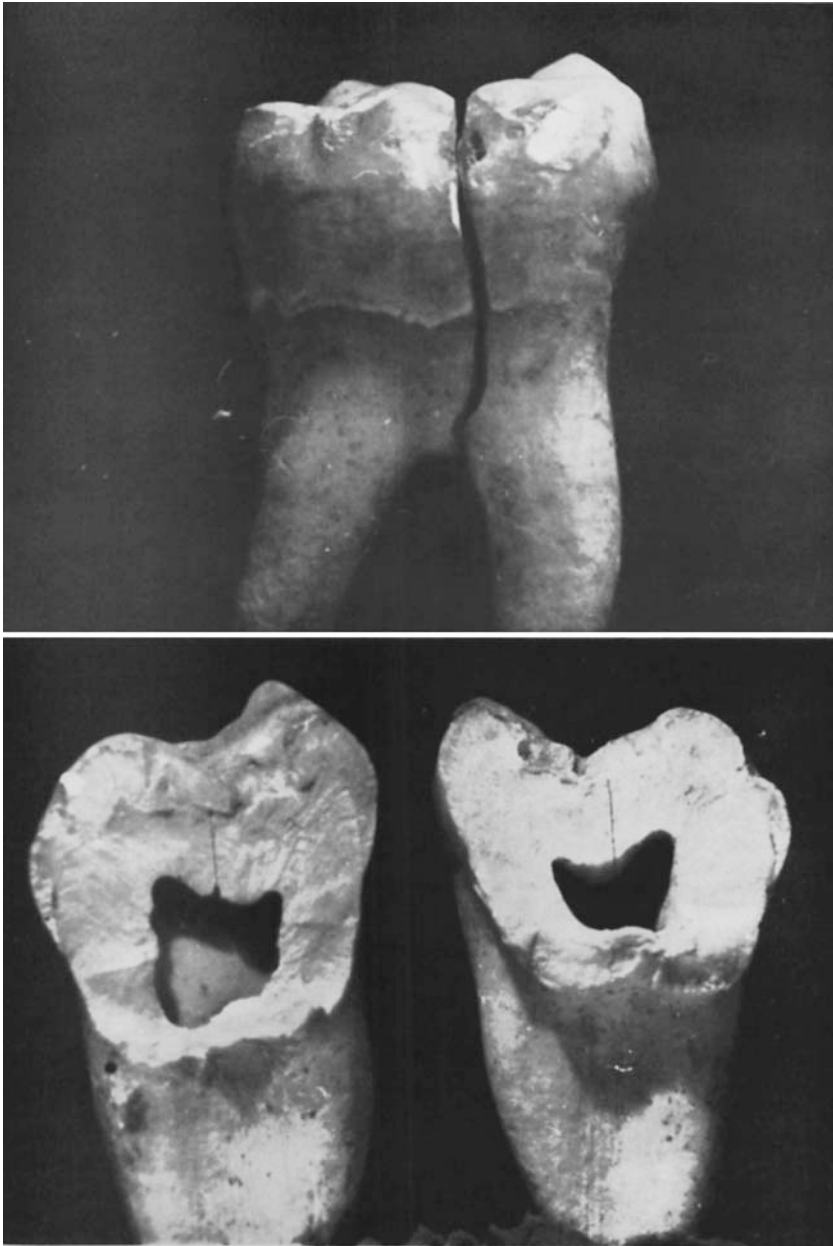


Fig. 1 Fractured permanent mandibular right first molar of Jarmoite. The size of the pulp chamber is easily seen in this section.

The excellent straight alignment and absence of malpositions in the teeth is suggestive of a relative homogeneity of the group. The dental arches were generally narrow in form with a high palate.

*General description
of the teeth*

Whatever induced the Jarmoites to leave the caves for the more exposed areas of farmlands they must also have had

TABLE 1
Mesiodistal crown diameters (mm) of permanent maxillary teeth of Jarmoites, Natufians and Chicago White Males

	Jarmoites		Natufians ¹			Chicago White Males ²		
	N	M	N	M	SE _M	N	M	SE _M
I ₁	2	8.8	9	8.92	0.18	104	8.77	0.06
I ₂	4	6.7	8	6.67	0.15	92	6.78	0.06
C	5	8.3	10	7.72	0.13	76	7.87	0.06
Pm ₁	2	7.5	13	7.01	0.08	74	6.90	0.06
Pm ₂	3	7.8	15	6.85	0.09	71	6.73	0.06
M ₁	5	10.8	14	10.87	0.18	79	10.54	0.06
M ₂	5	10.2	11	10.52	0.16	55	10.04	0.01
M ₃	1	8.4	8	9.34	0.26	9	8.87	0.36

^{1,2} From unpublished data of tooth measurements, right side of the dental arches only. The Jarmoites and the Natufians are both of mixed sexes.

TABLE 2
Mesiodistal crown diameters (mm) of permanent mandibular teeth of Jarmoites, Natufians and Chicago White Males

	Jarmoites		Natufians ¹			Chicago White Males ²		
	N	M	N	M	SE _M	N	M	SE _M
I	3	5.3	10	5.37	0.12	104	5.38	0.04
I ₂	3	6.0	13	5.95	0.16	105	5.99	0.05
C	4	7.1	13	7.03	0.11	96	6.88	0.05
Pm ₁	3	8.0	16	7.06	0.13	90	6.97	0.06
Pm ₂	3	8.3	14	7.18	0.09	70	7.06	0.05
M ₁	6	11.4	16	11.52	0.12	80	10.97	0.08
M ₂	6	11.0	16	11.05	0.11	53	10.78	0.13
M ₃	2	11.1	14	10.90	0.12	7	10.20	0.59

TABLE 3
Labiolingual and buccolingual crown diameters (mm) of permanent maxillary teeth of Jarmoites, Natufians and Chicago White Males

	Jarmoites		Natufians ¹			Chicago White Males ²		
	N	M	N	M	SE _M	N	M	SE _M
I ₁	2	6.6	8	7.26	0.14	98	7.11	0.06
I ₂	4	6.0	8	6.82	0.17	83	6.32	0.06
C	5	8.4	9	8.61	0.17	68	8.44	0.09
Pm ₁	2	9.5	13	9.44	0.14	84	9.15	0.07
Pm ₂	2	9.8	15	9.53	0.13	83	9.38	0.07
M ₁	5	11.4	14	12.3	0.09	90	11.32	0.08
M ₂	5	11.4	11	12.14	0.12	71	11.28	0.14
M ₃	1	10.7	8	11.3	0.24	12	10.85	0.24

TABLE 4
Labiolingual and buccolingual crown diameters (mm) of permanent mandibular teeth of Jarmoites, Natufians and Chicago White Males

	Jarmoites		Natufians ¹			Chicago White Males ²		
	N	M	N	M	SE _M	N	M	SE _M
I ₁	3	5.8	10	6.21	0.16	102	5.94	0.05
I ₂	3	6.1	13	6.61	0.12	103	6.25	0.05
C	4	7.7	13	7.91	0.12	90	7.53	0.07
Pm ₁	3	7.4	16	7.82	0.11	88	7.64	0.06
Pm ₂	3	8.6	14	8.24	0.40	79	8.20	0.10
M ₁	6	10.5	16	10.76	0.07	90	10.58	0.06
M ₂	6	10.1	16	10.62	0.08	62	10.50	0.08
M ₃	2	10.8	13	10.40	0.15	12	10.23	0.24

capacities and means for protection. Certainly this was not forthcoming from their dentition which was small to medium in size with many elements reduced in prominence and efficiency. These teeth, seen in the limited number available are small compared to most fossils and even to most of the hominid dentitions of the present time. Tables 1 to 4 contain the tooth crown measurements of a modern white

male population and a middle-east group from Mesolithic Palestine for comparison with those of the Jarmoites. The small number of teeth from Jarmo does not permit detailed statistical comparison, but it is to be noted that the means in many instances deviate less than three times the standard error from the means of the other two groups. The teeth have no Mongoloid features. With respect to size and



Fig. 2A Front view of facial bones of Jarmoite and occlusal view of the corresponding mandible.

conservativeness in form they resemble the general Mediterranean pattern. The newly erupted teeth of the young presented a wrinkled occlusal surface which might have had a temporary advantage in mastication, but was not a prolonged aid to the individual. These wrinkles normally wear off within a few years after

the teeth have become functional. Four of the 7 individuals available for study lived to advanced age as evidenced by the extent and character of the wear and the condition of their teeth.

The only prominent feature about the face was the pointed chin. This is apparent from parts of the 4 mandibles that



Fig. 2B Lateral view of mandible and occlusal view of maxilla of Jarmoite.

were preserved. The jaws were not prognathic. The angles of the jaws were acute. J. L. Angel ('57), in describing one of the specimens states that, "the face is therefore relatively narrow though not really high (figs. 2A and 2B). The chewing plane may have been more sloping than usual as in Iranian skulls and the nonflaring jaw

angles were probably not obtuse. The general impression is a face showing Iranian as well as Mediterranean traits, with possible similarity to the Lower Egyptian Dineroid type of Mediterranean as in the ninth dynasty sediment series of Woo and Morant."

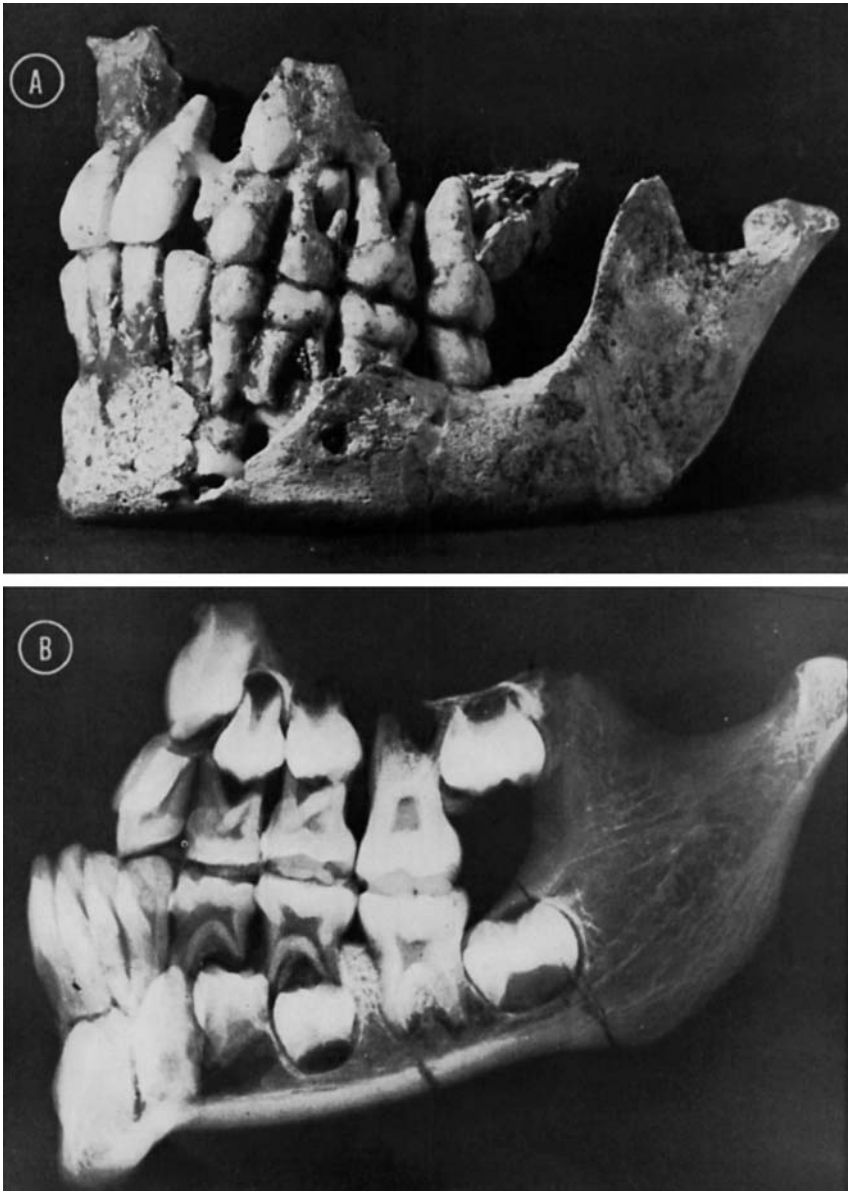


Fig. 3 Antero-lateral view of jaws and radiograph of the Jarmo juvenile SJ2.

In most instances ancestral morphologic pattern was well expressed in the stable teeth (maxillary central incisor, canine, first premolar, and first molar), but it was severely modified in the others which are traditionally variable. (Dahlberg, '49). A brief description of the natural tooth groups one by one will furnish a base for comparison with other dentitions.

Incisors

Four sets of paired maxillary central incisors present approximately similar patterns of non-Mongoloid features and a tapering to ovoid form of crown (fig. 3A). Although lateral marginal ridges are present on the lingual surfaces, these are not pronounced and therefore are not to be classified as shovel-shaped (fig. 4A). The finger-like projections reaching incisally from the basal tubercle or cingulum conform to the type that Weidenreich described in *Sinanthropus*. These projections are not prominent and the fossa consequently has more of a flat to convex appearance. This distinguishes them from the shovel-shaped incisors which show a decided concavity on the lingual of the tooth. It is important to add that our attention here is focussed on the more variable regions of incisor teeth. All teeth have particular areas that show greater variation than do other parts. These variable secondary features, such as the finger-like projections in the incisors, are seemingly not under the same developmental and morphological restraints as are the primary architectural units. They give the impression of "left overs" so to speak, which take the form of convenience rather than of definite plan. Scrutiny of these areas reveals that they most frequently do not have bilateral symmetry of form. It should be stated also that it is not impossible to have bilateral concordance of detailed form in these areas, but generally complete symmetry is rarely seen.

The roots are short compared to the height of the crowns. The lateral incisors, notoriously variable in most populations are reasonably conservative in form in all but one of these individuals, namely the maxillary left lateral incisor of the juvenile (SJ2, fig. 3). This tooth is stunted and appears somewhat like the maxillary

left later incisor on the model k of the P2 plaque of the Dental Anthropology series of the Zoller Laboratory. The other incisors show similar lateral marginal ridges and projections as do the central incisors.

The mandibular incisors are of conventional form and moderate in size with little difference between the central and lateral incisors. These teeth generally show little variation in morphology except in size and proportion.

Canines

Both maxillary and mandibular canines are pointed and narrow with relatively little bell shape (fig. 4B). The lingual surfaces of the upper ones show a small cingular eminence and here again the lateral marginal ridges are definitely noticeable but not with very much prominence. No other special morphological characteristics are present.

The mandibular canine shows no special characteristics. It is flat on the lingual surface with only a suggestion of lateral marginal ridging.

Premolars

The maxillary premolars have rather pointed buccal cusps and moderate wrinkling of the occlusal surfaces. The mesial and distal developmental pits are closer together in the second premolars than in the first, thereby leaving only a very short central developmental groove. The first premolars have a long central groove with the pits well over to the mesial and distal margins, respectively (fig. 4C and 4D). The lower premolars have complex occlusal surfaces, divided into a mesial anterior and a distal portion. The lower second premolars are larger, but have less of the oblique shape than the first premolar. None was anomalous or grossly variant in size, although the maxillary second premolars are somewhat smaller than the first.

Maxillary molars

All the permanent maxillary first molars have a rhomboidal shaped occlusal surface with 4 well-developed cusps. Occlusal surface wrinkling is evident. Small Carabelli's cusps (model d, plaque P12)

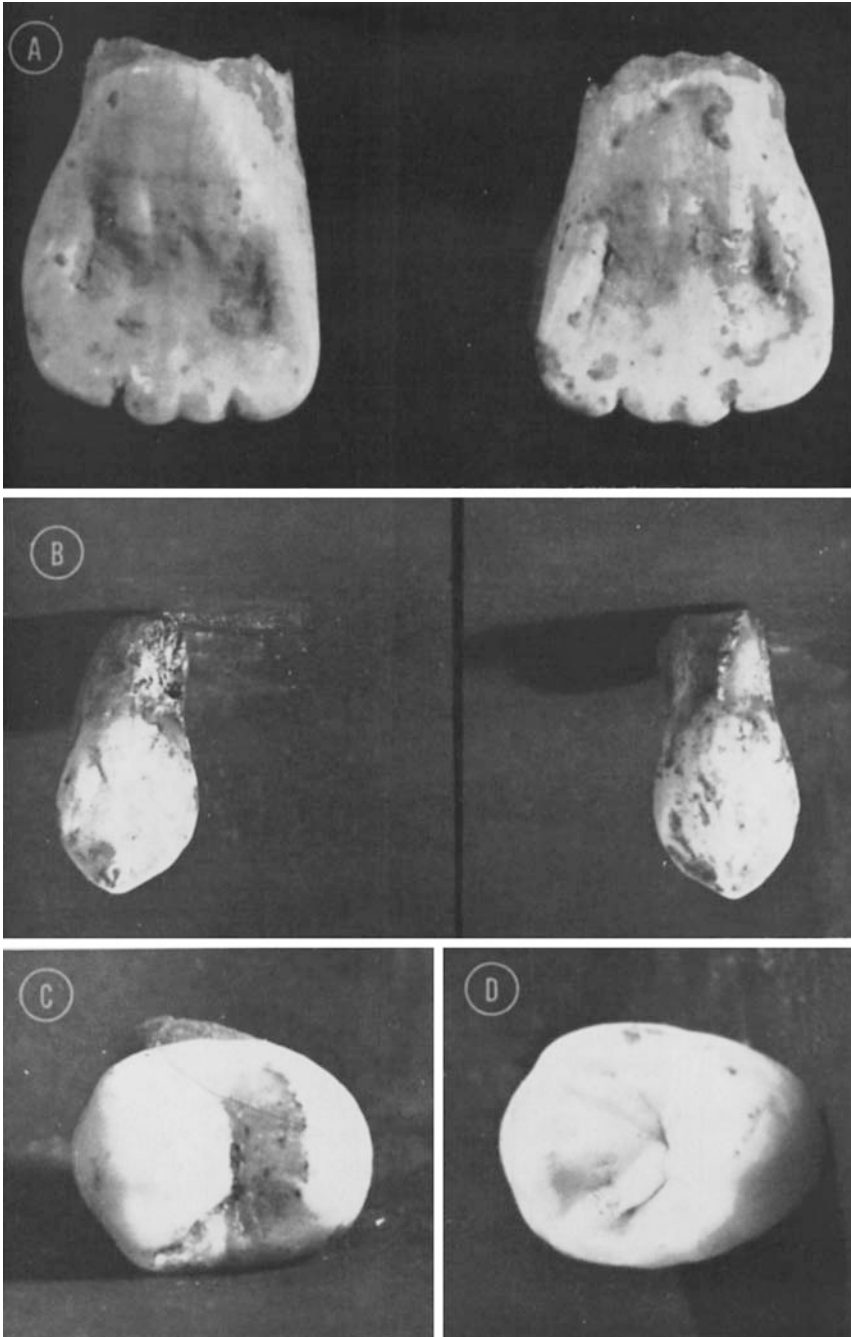


Fig. 4 A, lingual view of permanent maxillary central incisor crowns. B, labial view of permanent maxillary canines. C, occlusal view of maxillary right first premolar. D, occlusal view of maxillary right second premolar.

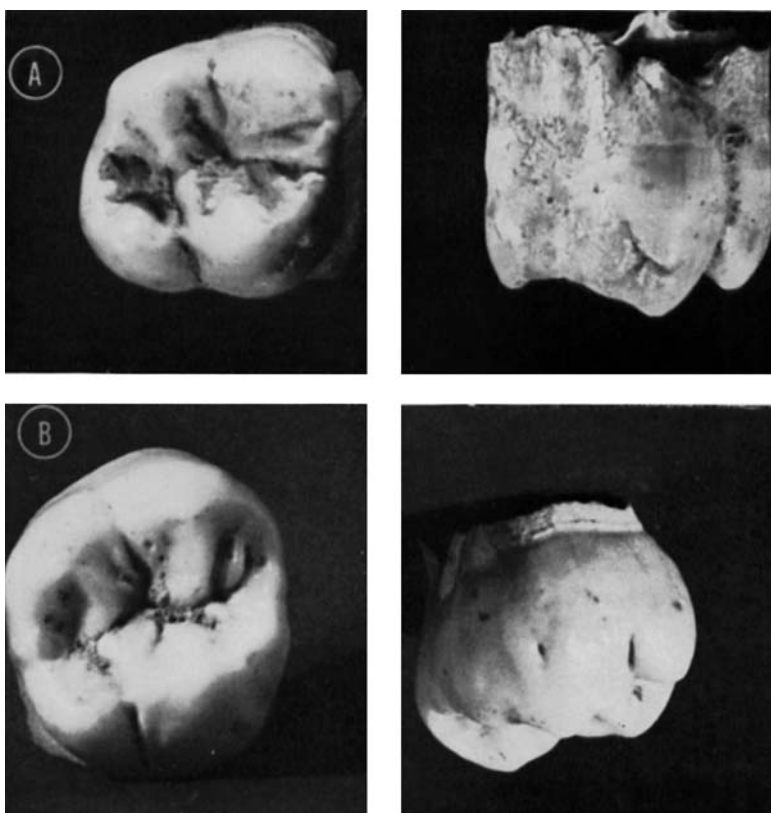


Fig. 5 A, occlusal and mesiolingual view of permanent maxillary right first molar. B, same views of the permanent maxillary right second molar.

are present on the first molars (fig. 5A). However, only pits are found at this site on the maxillary second molars (fig. 5B). In all the second molars there is a marked reduction in the hypocone (distolingual cusp) with complete absence in some instances. The hypocone is one of the most variable structures in the human dentition as well as being the least conservative part of maxillary molar teeth. Consequently, the fact that this cusp is so definitely modified in its expression in all the available Jarmo specimens is of importance. The metacone (distobuccal cusp) is not reduced in size whatsoever. This observation is in contradistinction to the form seen in most eastern Mediterranean dentitions.

Mandibular molars

The mandibular molars are similar to those of modern European and Mediter-

ranean peoples in their occlusal surface morphology. The dryopithecoid Y5 pattern of grooves and cusps is present in the first molars and the +4 pattern is found on the second molars (fig. 6). The third molars available show a 5 cusped tooth with an indication of the typical size and location of cusps producing a + pattern of grooves. There is no indication of any cingular buccal cusps.

One feature of both maxillary and mandibular molars is the larger size of pulp chamber than is generally found in contemporary populations (figs. 1, 3 and 7). In a few instances their character approaches what may be termed a mild taurodontism. The individuals in Matarrah, a later neighboring group of the Jarmites, have an even greater display of this trait.

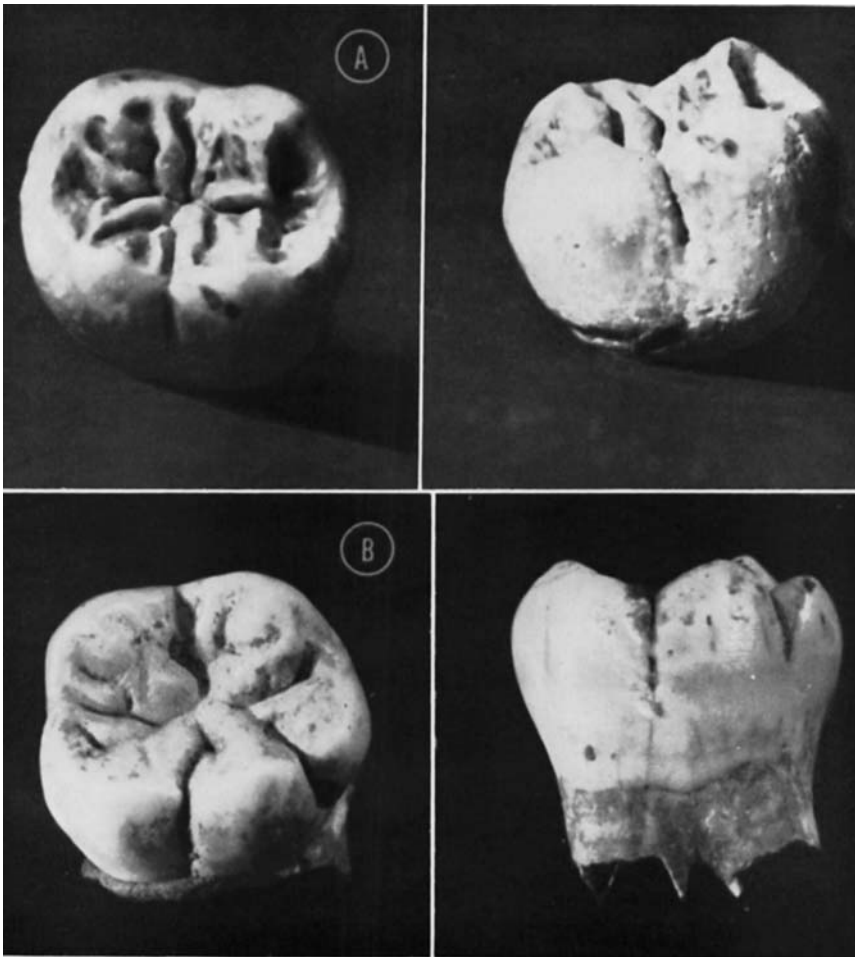


Fig. 6 A, occlusal and buccal views of permanent mandibular left second molar. B, same views of permanent mandibular left first molar.

Deciduous dentition

The deciduous teeth of this group of individuals are of moderate size (tables 5 and 6) and of the conventional Mediterranean-European type (fig. 8). The incisors, particularly, have a bluish cast to the enamel. The long roots of the upper incisors bend labially from the apex to a point midway on the root. No shovel-shaping form is present. The surfaces are generally smooth and rounded. Carabelli's cusp and pit are of a size and form corresponding to those of the permanent teeth. The molar roots diverge with narrow necks at the gingival areas.

Nongenetic features

The nature of the abrasion of the teeth in the older individuals does not suggest the presence of gross, coarse particles in their food. They show, rather, an even milling of the teeth, probably from fine abrasive matter such as silt. No marginal enamel fractures are noted in any of the teeth. A high polish existed on some of the molars. All the teeth of the older individuals are worn flat with exposure of dentin apparent on all the occlusal surfaces. Excessive wear is noted, as is to be expected, on the buccal cusps of the lower first molars. These later teeth carry the major

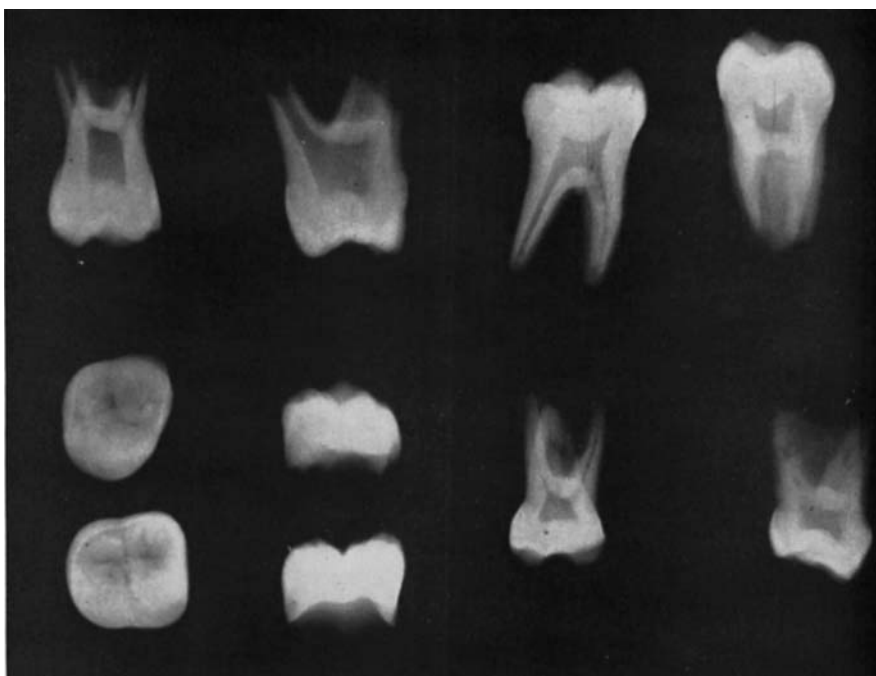


Fig. 7 Radiographs of Jarmo molars showing a mild degree of taurodontism.

load in all populations during the transitional period of change from deciduous to permanent dentition. No exceptional areas of wear are noted that might indicate industries or special uses of the teeth.

Dental caries are found in two of the individuals. One has a cavity in the occlusal surface of a lower deciduous second molar. The other has two interproximal cavities of moderate size and a third one with considerable involvement and a resulting alveolar abscess.

No evidence of pyorrhea or excessive calicular deposits are found in the individuals.

DISCUSSION

Most of the pertinent features referred to in these limited dental evidences of the Jarmo inhabitants are seen to be secondary characteristics, that is, modifications or suppressions of the primary genetic architecture. These phenomena occur in a very orderly fashion in an established sequence within each tooth group and are a sort of measure of penetrance and expressivity. In the case of the Jarmo peoples penetrance and expression of many of the com-

mon primary characters is not strong or complete. This suggests the presence of factors which in one way or another impose a negative quantity in a positive manner. These reduced sizes, absences and modifications have been generally attributed to genetic origins and very likely are. Certain Arab groups are known to have a marked and most unexpected reduction in the size of the metacone of the maxillary second molars as well as distinctive intertooth-group size proportions. These features are not found in the Jarmo teeth. Rather, the Jarmo dentition resembles more the Indo-European type. It also holds a close resemblance to that of the Anatolians (Senyurek, '52). The teeth are smaller than those of most modern dentitions. Specializations and drift in small populations are of increasing interest. More material from Jarmo is necessary, of course, in order to give real substance to these analyses. The 7 specimens from Jarmo show a consistent trend towards reduced form and size of the dentition. There are also certain characteristics which give a basis for comparison with

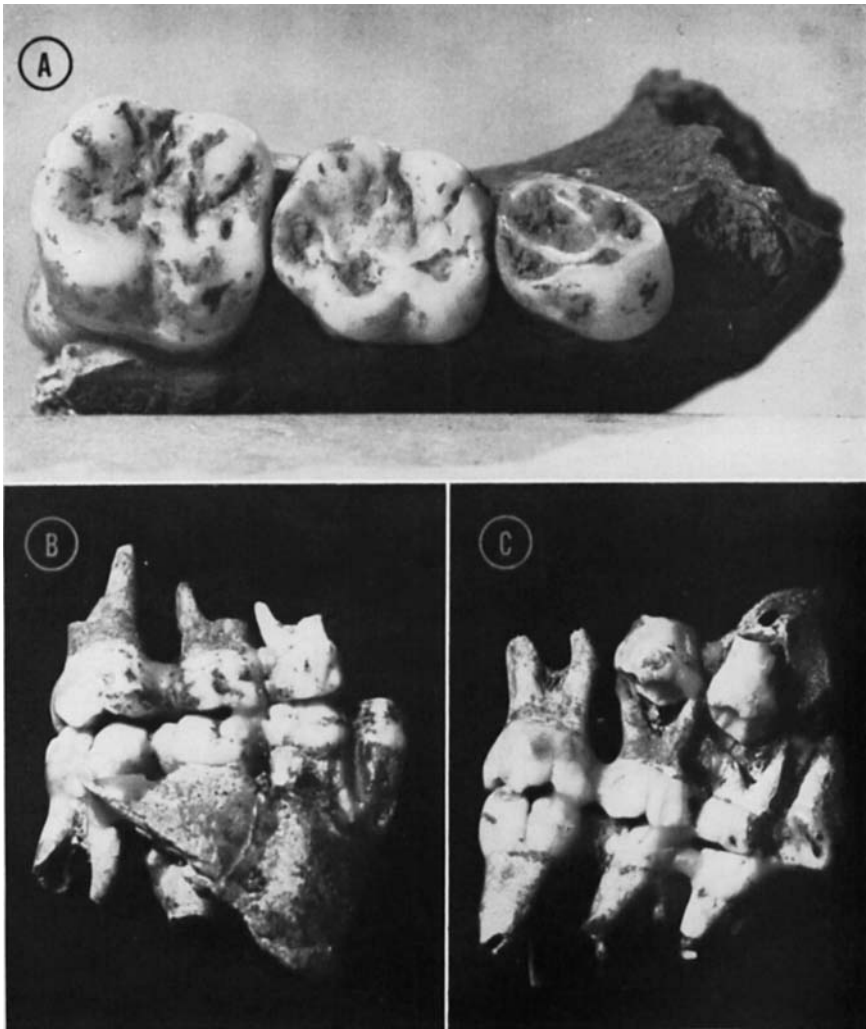


Fig. 8 A, occlusal view of the deciduous mandibular right first and second molars and permanent first molar. B, buccal view of deciduous molars and permanent right first molars. C, lingual view of the same Jarmo specimen.

other populations of this historic era when man first embarked upon the food production phase of his existence.

SUMMARY

Genetic and nongenetic dental features of the early agriculturists of Jarmo, Iraq (6750 ± 500 B.C.) have many similarities to those of the modern Mediterranean and European peoples. They resemble the Iranian and Indo-European more than the others, and have no Mongoloid traits. Ninety-six permanent and 30 deciduous

teeth from 7 individuals were available for the study.

There is no irregularity in tooth alignment nor any prognathism. Mild taurodontism is present in some molars. Small modified Carabelli's cusps are present in two of the individuals, making a distinction from the earlier Natufians in whom this cusp is well-developed. No protostylids are present. Hypocones on second and third upper molars are markedly reduced. Shovel-shaped incisor form is absent. Un-

worn teeth have crenated surfaces. Extreme abrasion of the occlusal and proximal surfaces indicate heavy function, but with only mild abrasive assistance. No marginal fractures are present that would suggest gross coarse substances in the diet.

ACKNOWLEDGMENT

Acknowledgment is made to the Iraq-Jarmo project of the Oriental Institute for the dentitions studied and to Professor Theodore McCowan of the University of California for permission to publish the data on tooth measurements of the Natufians.

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