Consanguineous matings in the Egyptian population

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SUMMARY   A total of 26 554 Egyptians was ascertained to study the incidence of consanguineous marriages. They were of different ages, different socioeconomic standards, and from different areas. There were 7646 from urban areas, 11 280 from suburban areas, and 7628 from rural areas. The incidence of consanguineous matings in the general population was found to be 28·96% with an average inbreeding coefficient of 0·010, which could be considered high. The highest incidence was that in the rural areas. First cousin marriages occurred more often than the other types of consanguinity.

Two persons are said to be consanguineous if they have at least one ancestor in common and, in practice, this common ancestor is usually taken to be no more remote than a great-great grandparent.

The association between consanguineous marriages and genetic defects has been observed for a long time. The diseases observed in the offspring of these marriages include those resulting from autosomal recessive or multifactorial inheritance.

Consanguinity rates are different in different countries.[1-5] This difference is usually related to the race, the isolation of the society, and the religion. For this reason we felt that it was important to study the rate of consanguineous matings and estimate the average inbreeding coefficient in the Egyptian population.

Material and methods

A total of 26 554 Egyptians was ascertained in the study. The samples were taken from different areas to reflect properly the incidence of consanguinity. To randomise the sampling, the ascertainment was as follows.
(1) Urban. A total of 7646 was taken from the cities of Cairo and Alexandria. We chose various schools, university faculties, and companies in different districts, and all the people in each were ascertained.
(2) Suburban. A total of 11 280 was taken from Mansoura and Talkha. Various primary and secondary schools and companies in different districts were chosen, and all the people in each

were ascertained. In addition, all persons examined in the outpatient clinics of Pediatrics, Ophthalmology, and Surgery in the university hospital during the previous 6 months have been included. However, patients with inherited diseases are usually referred to the Genetics Unit, so they were mostly not included.
(3) Rural. A total of 7628, who were all the families in four villages located in different areas and representing the classical Egyptian village, was ascertained.

We recorded the relationship between the two spouses if the subject was married, and of the parents if the subject was a child or an unmarried adult.

For the purposes of classification, the relationship was divided into six groups as shown below.
Group A. Marriage between double first cousins.
Group B. Marriage between first cousins.
Group C. Marriage between first cousins once removed.
Group D. Marriage between second cousins.
Group E. Marriage beyond second cousins.
Group F. No relationship.

The incidence of consanguinity was expressed as the average inbreeding coefficient[6] $= \Sigma \, PiFi$.

Results

The incidence of consanguineous matings in the Egyptian people in general and in the urban, suburban, and rural areas is presented in table 1. The average consanguinity rate is 28·96%. However, it is 22·05%, 26·79%, and 39·11% in the urban,

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TABLE 1   *The incidence of consanguinity in the Egyptian population.*

Area	Total		Consanguineous parents		Double first cousins		First cousins		First cousins once removed		Second cousins		Beyond second cousins	
	No	%	No	%	No	%	No	%	No	%	No	%	No	%
(1) Urban	7646	28·77	1686	22·05	36	0·47	868	11·35	223	2·92	275	3·60	284	3·71
(2) Suburban	11 280	42 45	3022	26·79	14	0·12	1482	13·14	467	4·14	616	5·46	443	3·93
(3) Rural	7628	28·77	2984	39·11	8	0·11	1397	18·31	578	7·58	544	7·13	457	5·99
Total	26 554	99·93	7692	28·96	58	0·22	3747	14·10	1268	4·77	1435	5·40	1184	4·46
Z_1 (1 & 2)			7·507		4·137		3·709		4·538		6·160		0·776	
Z_2 (1 & 3)			23·280		4·150		12·158		12·978		9·681		6·566	
Z_3 (2 & 3)			17·671		0·2		9·534		9·652		4·586		6·288	

Significance = or > ± 1·96

TABLE 2   *Average inbreeding coefficient in the Egyptian population.*

	Total number	Double first cousins	First cousins	First cousins once removed	Second cousins
Number	26 574	58	3747	1268	1435
Proportion (Fi)		0·0022	0·14100	0·004775	0·05400
Inbreeding (Fi)		0·125	0·0625	0·0313	0·0156
PiFi		0·0003	0·0088	0·00015	0·0008

$\sum$ PiFi = 0·01005

suburban, and rural areas respectively, with a significant increase in the rural areas, and it is significantly higher in suburban compared to urban areas. The highest incidence in all areas is that of first cousin marriages, which are also significantly higher in the rural area compared to the suburban and urban areas. Furthermore, the incidences of other types of matings are significantly higher in the rural than in the other two areas, except that of double first cousins which is higher in urban areas.

Table 2 presents the average inbreeding coefficient in the Egyptian people in general, which is 0·010.

Discussion

The incidence of consanguineous marriages usually differs from area to area depending on the isolation and customs of the society and the religion and laws in such areas. In Egypt, we found the total incidence to be quite high. However, it is significantly higher in rural areas compared to suburban and urban areas. Such results could have been expected since the rural society is somewhat isolated and the family relations are stronger than in urban areas.

Uncle-niece and aunt-nephew unions occur in such places as Israel and the Far East.[1-5] However, in our country, such unions do not take place since the religion and law do not permit marriages of persons more closely related than first cousins. However, from the genetic point of view, uncle-niece and aunt-nephew matings are the same as

double first cousin matings ($R = \frac{1}{4}$ and $F = \frac{1}{8}$) which are allowed in our country. Also, a man who is in law the uncle of his half sister's daughter is genetically the same as a first cousin marriage ($R = \frac{1}{8}$ and $F = \frac{1}{16}$).

In our study, the highest incidence is that of first cousin marriages, particularly in the rural areas. However, it has long been known that, in a recessive disorder, the proportion of affected offspring of first cousin unions is higher than that of parents with fewer genes in common.[7-9]

Biological inbreeding, the effect of consanguineous matings, can be quantified by the inbreeding coefficient of a person. The average inbreeding coefficient in the Egyptian population is found to be 0·010, which is very high compared to most Western societies, where the average inbreeding coefficient is always less than 0·001.[5 6] However, in some isolated societies it may be greater than 0·04,[2 6] where it is obviously influenced by marriage customs. Our findings are in agreement with this since we found that the average inbreeding coefficient is highest in the rural areas, then the suburban areas, and lowest in the urban areas.

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