Original

THE FREQUENCY OF CONSANGUINEOUS MARRIAGES IN THE STATE OF BAHRAIN

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Historically consanguineous marriages have been practised by different classes among Bahrainis for a long time. Accordingly we decided to study the rate of consanguineous marriages in Bahrain. The study was also designed to see if the frequency of cousin marriages is changing with time, and to ascertain the prevalence of genetic diseases. Standard proformas were completed by 500 young married Bahraini women. The questionnaire included an enquiry about the family relationship of the husband and wife and also the relationship of their parents. This was completed by 500 couples from the recent generation. It also gives information about 100 couples from the previous generation (grand parents). We found that the rate of cousin marriages is 39.4% in the present generation, and 45.5% in the previous generation. This shows a high rate of consanguinity which has decreased significantly with time. We also found that 53% were in favour of consanguineous marriages, 62% agree that it can cause genetic diseases, and 47.8% agree that it can cause social problems.

The incidence of consanguinity varies from one population to another due to variation in the population structure, the social, cultural, ethnic, religious and economic features (Table 1). A recent study by Bittles shows that at least 20% of the world population favours consanguineous marriages[1]. Many investigators claimed significant effects of inbreeding on reproductive wastage[2-6], while many others have reported little effect[7-9]. These studies found that consanguinity had no effect on the risks of chromosomal abnormality, X linked, or autosomal dominant conditions unless the couple concerned actually have the condition or carry the gene concerned. Autosomal recessive inheritance provides the main problem[10,11]. Diseases with an autosomal recessive mode of inheritance, such as Sanfilippo disease, mucopolysaccharidosis, homocystinuria, cystic fibrosis or deaf mutism were found among these children. It is also likely that the risk is increased for polygenic disorders even though this is difficult to estimate. Schull et al followed the offspring of first cousin marriages in Japan for a period of 10 years[13-15]. They showed a 3% increase in mortality over those with unrelated parents, but only a small increase in severe malformations of 1.7%, compared with 1.0%[12-16].

Table 1
The consanguinity rate in different countries [6,18,32-34]

Country	*Time*	*% consanguinity marriage*
France	1956-58	0.67
Ireland	1959-68	0.53
Italy	1956-60	1.90
Spain	1960-64	10.63
D. Gindal Rodrigo Canada Catholic pop.	1959	1.51
USA Catholic pop	1958	0.11
Mormons	1950	9.92
India: Bombay	1955	11.39
Southern India	1950	39.37
Israel	1955-1957	9.68
Egypt Nobic Pop.	1967-1968	75.76
Kuwait	1980-1985	54.3
Egypt	1985	29
Jordan	1984	40
Saudi Arabia	1990	54.3
Iraq	1986	57.9

A study from Kuwait in 1985 showed that the rate of cousin marriages was 54.3% and that there was no significant difference in both prenatal and neonatal losses among consanguineous marriages as compared to non-consanguineous ones[17].

Table 1 shows the consanguinity rate in different countries with low rates in Europe and America (<1%), and high rates in Asia and Africa[17-20].

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A high frequency of first cousin marriages had already been noticed among Bahrainis. We investigated this in our study.

METHODS

A questionnaire was sent and completed by 500 young married Bahraini women. It covers information including the age of couples, the relationship between spouses, the degree of relationship between parents of both husband and wife, her opinion on cousin marriages, her knowledge of the resulting genetic risk and its relationship to social problems; the respondents were 200 women of various social classes attending the outpatient department at Salmaniya Medical Centre, Bahrain for various reasons; two hundred women teachers in schools, and 100 female students at Bahrain university. Most of the respondents were young (mean age 28 years old), and all of them were Muslims. The study covers 500 young families (present generation) and 1000 old families (previous generation), a total of 1500 families.

RESULTS

Table 2 shows comparison in consanguinity rate between two generations, "the present" and "the past" in Bahrain.

Table 2
Prevalence of consanguineous marriage in Bahrain in the present and past generation

Relation	*Present generation (n= 500)*	*Past generation (n= 1000)*
Not related	60.6%	45.5%
Related	39.4%	45.5%
First cousins	21.0%	24.5%
2nd cousins	7.8%	7.9%
First cousin once removed	3.0%	3.6%
Distant relative	6.8%	7.1%

The proportion of loci at which a person has inherited two copies of a gene from a common ancestor (proportion of genes homozygous by descent) is called Coefficient of inbreeding.

Table 3 shows the common types of consanguineous marriages that is allowed in Bahrain and in any Muslim country and the coefficient of inbreeding in the offsprings.

Table 3
The common types of consanguineous marriages in Bahrain and the corresponding coefficient of inbreeding in the offspring

Relationship of parents	*Proportion of genes shared*	*Chance homozygosity*	*Coefficient of inbreed*
1st cousins	1/8	1/16	0.0625
1st cousins once removed	1/16	1/32	0.0315
2nd cousins	1/32	1/64	0.0156
3rd cousins	1/64	1/128	0.0078

Table 4 and 5 shows the attitude of young Bahraini women toward marriage between relatives. 53% were in favour and 45.5% say that they will advise their sons and daughters to marry a cousin, while 62% agreed that this marriage can cause genetic problems in the offsprings and 47% say that it can cause social problems.

Table 4
Opinion of Bahraini women regarding cousin marriage

Agree	53%
Do not agree	45%
Do not know	2%

Table 5
Advice to son to marry cousin

Yes	45.5%
No	42.5%
Do not know	2.0%

Table 6 shows the respondents awareness of the genetic or social problems consanguineous marriages can cause.

Table 6
Problems due to cousin marriage

It can cause	*Genetic disease*	*Social problems*
Yes	62.0%	47.8%
No	36.4%	50.4%
Do not know	1.6%	1.8%

Table 7 shows the prevalence of genetic diseases among these families and Table 8 shows the type of genetic diseases among these families. Of the 1500 families questioned, 42.8% reported the presence of a genetic disease, 19% of these families have sickle cell disease, 17.2% have glucose 6 phosphate dehydrogenase deficiency, 1.8% thalassaemia and 10.2% mention other genetic problems such as diabetes, hypertension, deaf mutism, and mental retardation.

Table 7
Prevalence of genetic disease in families studied

	Wife family	Husband family
Yes	42.8%	42.8%
No	52.6%	52.0%
Do not know	4.6%	5.2%

Table 8
Prevalence of blood disease among families studied

Sickle cell disease	19.0%
Thalassaemia	1.8%
G6PD	17.2%
Others	10.2%
None	49.4%

DISCUSSION

The Bahraini population is currently about 500,000 and it has young age structure as nearly 86% are below the age of 45 years. The birth rate is 30/1000 giving about 13,500 births per year. The infant mortality rate has fallen during the last 10 years from 32/1000 in 1980 to 18.1/1000 in 1990. The genetic effect due to consanguinity on the infant mortality rate is difficult to be measured[21].

In this study we found a high consanguinity rate among the Bahrainis, both in the present and the past generation (39.4% and 45.5% respectively), but that it has fallen with time as there is a significant difference between the rates ($P < 0.05$). The first cousin marriage rate is 21% in the present generation compared to 24.5% in the past generation. One in eight of first cousins have their genes in common having received them from the same source namely one or other of their common grand parents.

Parental consanguinity has genetic effects because it increases homozygosity and decreases heterozygosity in the offsprings.

It was found that two variables are important in deciding the effect of consanguinity. First, the frequency of the abnormality in the population, and the second is the frequency of cousin marriages[10,19]. When a recessive gene is common in a given population, a carrier has a relatively high risk of marrying another carrier however they chose their partners, and the risk is approximately doubled in a first cousin marriages. Many studies have shown that in the offspring of first cousin marriages there are added risks of 3% for abnormality or death in early childhood, which means a total risk of 5%, about double the general population risk. Viewed the otherway round, couples of first cousins are considered to have over a 90% chance of a completely physically and mentally normal baby in each pregnancy, as against the general population chance of 94%-95%[19]. It seems that the risk is less for populations with a long tradition of cousin marriages as those marriages are not likely to increase, and may well decrease the frequency of abnormal genes. In such populations the prevalence of recessive lethal genes should fall with time, because of the natural selection against them. The proportion of births of affected individuals, who do not reproduce, is increased and when they die two abnormal genes disappear from the population's gene pool that would not have disappeared if they had been transmitted into heterozygotes[22-26].

A recent study in India has shown no clear difference in malformations or prenatal loss between a consanguineous and non-consanguineous marriages[27].

In lesser degrees of consanguinity than that of first cousin marriages the proportion of genes in common falls off rapidly as relationships become more remote. Second cousins, who are the children of first cousins are separated from each other by further steps, so they have 1/32 of their genes in common. Third cousins share only 1 in 128 of their genes[11,18]. Many studies show no difference in prenatal death rate and malformations among off-springs in these marriages.

It was also found in some studies that there was no clear evidence for a significant effect of consanguinity on intelligence in first cousins, or more distantly related marriages[28]. Other studies showed that the risk of mental retardation increased with consanguineous marriages, but clear figure is not available.

Inspite of the problems that may result in the offspring from the expression of deleterious recessive alleles, the persistence of this habit continues to be favoured by strong social and economic benefits. Anthropologists found that the main achievement of consanguineous marriage is the maintenance of family structure and property. Meanwhile a study from Lebanon emphasized the social benefits derived from this type of marriage eg. the protection of women, strengthening of family ties, and improved relationship with inlaws[28].

CONCLUSION

The high rate of consanguineous marriage in Bahrain is falling with time. Because of its social benefits and its traditional history we conclude that it should not be discouraged but that supportive measures such as genetic counselling service, carrier detection, premarital counselling and prenatal diagnosis should be provided on a wide basis.

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