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Inbreeding and its Relevance to Early and Pre-reproductive Mortality Rates in Iran, an Ecological Study

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Abstract

Consanguinity has been a long-standing social habit among Iranians. The effect of consanguinity on early death (stillbirth plus infant death) and pre-reproductive mortality (death before age 15 years) was studied in an ecological study in 10 provinces of Iran (including, Boosheher, Chaharmahal-O-Bakhtiari, East Azarbaijan, Ilam, Fars, Kashan, Kerman, Kermanshah, Markazi, Semnan, and Yazd). The rates of early death and pre-reproductive mortality of the study populations were derived from the data from 20th March 2000 to 19th March 2001. Statistical analysis showed that there were significant correlation coefficients between mean of inbreeding coefficients of provinces and either early death (r=+0.611, t=2.32, df=9, *P*=0.046) or pre-reproductive mortality (r=+0.627, t=2.41, df=9, *P*=0.039) rates. When consider the frequency of consanguinity in terms of individual city of the study provinces, statistical analysis showed that early death (r=+0.324, t=3.18, df =86, *P*=0.002) was significantly correlated with the mean of inbreeding coefficients of populations.

Keywords: *Consanguinity, Early death, Pre-reproductive mortality, Iran*

Introduction

Marriage between biological relatives is a social custom with a long history in many parts of the world. More than 2 billion people, of various religious and ethnic backgrounds, live in countries where a large proportion of marriages are contracted between blood relatives (1). The reasons most commonly given for the popularity of consanguineous marriage can be summarized as: a strong family tradition of consanguineous unions; the maintenance of family structure and property, and the strengthening of family ties; financial advantages relating to dowry or bride-wealth payments; the ease of marital arrangements and a closer relationship between the wife and her in-laws; and greater marriage stability and durability (2, 3). Consanguineous marriages are strongly favoured in the Iranian populations. The prevalence rate of consanguineous marriages in Iran is 58.2 percent with an average inbreeding coefficient of 0.0185, which is high as compared with many other countries (4, 5). Consanguineous marriages are promoting family stability, having significant social and economic advantages (2, 3). However, several studies revealed that the risks of stillbirth and infant death as well as pre-reproductive mortality are higher for offspring of consanguineous marriages as compared with offspring of unrelated parents (4, 6-14). To evaluate the public health impact of inbreeding on mortality, effects of inbreeding on early death (stillbirth plus infant death) and pre-reproductive mortality (death before age 15 years) were investigated in an ecological study conducted in Iran.

Materials and Methods

Provinces included in the present study were Boosheher, Chaharmahal-O-Bakhtiari, East Azarbaijan, Ilam, Fars, Kashan, Kerman, Kermanshah, Markazi, Semnan, and Yazd. The rates of early death and pre-reproductive mortality of the study populations were derived from the data from 20th March 2000 to 19th March 2001 published by the Iranian Ministry of Health and Medical Education (15). The averages of inbreeding coefficients (α) for study populations were obtained from published data of Survey of Consanguinity in Iran (5). For statistical analysis the Pearson's and Spearman's correlation coefficient tests were used. A probability of $P<0.05$ was considered as statistically significant.

Results

Table 1 shows the rates of early and pre-reproductive mortalities and mean of inbreeding coefficient for the study populations. The population of Boosheher province had the highest level of inbreeding coefficient (α = 0.0263) and early death rate (41.1/1000). The populations of Kerman and Kermanshah have the highest rate of pre-reproductive mortality (22.7/10,000). Statistical analysis showed that early death (r=+0.611, t=2.32, df =9, *P*=0.046) and pre-reproductive mortality (r=+0.627, t=2.41, df=9, *P*=0.039) were significantly correlated with the mean of inbreeding coefficients of populations. When consider the frequency of consanguinity in terms of individual city of the studied provinces, Genaveh locating in Boosheher province (south of Iran) with 74.6% (α = 0.0406) and Arak in Markazi province with 24.5% (α = 0.0110) had the highest and lowest level of

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consanguinity, respectively (data not shown). Statistical analysis using Pearson's correlation coefficient test showed that early death (r=+0.324, t=3.18, df =86, *P*=0.002) was significantly correlated with the mean of inbreeding coefficients of populations.

Table 1: Early death, pre-reproductive mortality rates, and inbreeding coefficient in studied populations.

Population	Early Death	Pre-reproductive Mortality	Inbreeding Coefficient
Boosheher	41.1	21.0	0.0263
Chaharmahal-O-Bakhtiari	28.2	16.2	0.0162
East Azarbaijan	28.5	16.5	0.0195
Ilam	27.9	20.7	0.0192
Fars	21.5	20.1	0.0190
Kashan	28.9	16.5	0.0177
Kerman	21.9	22.7	0.0218
Kermanshah	35.2	22.7	0.0210
Markazi	24.7	16.5	0.0143
Semana	26.3	18.1	0.0174
Yazd	28.9	16.5	0.0177

Discussion

There are inconsistent reports about fertility in consanguineous couples (11, 16-20). It is reported that fertility may be lower in consanguineous couples (16). Additionally, there is a strong possibility that greater fertility may be observed in consanguineous unions as a compensatory mechanism for infant and childhood losses (11, 17-20). Generally, it is showed in plants, animals, and human that inbreeding is associated with loss of biological fitness (21). It is reported that the progeny of consanguineous couples indicate morbidity and mortality levels higher than in the offspring of unrelated couples (22, 23). Among the major populations so far studied, the highest rates of consanguineous marriage have been associated with low socioeconomic status, illiteracy, and rural residence (2, 3). It should be noted that the consanguinity interacts with a range of socio-demographic variables in determining rates of mortality during infancy and early childhood. But, even after controlling for factors such as maternal illiteracy, maternal age at birth of less than 20 years, and a birth interval of less than 18 months, progeny of consanguinity marriages had statistically significant odds ratios for neonatal, post-neonatal, and infant mortality compared to progeny of unrelated couples (8). The result of present study strongly suggests that consanguinity may play a major role as far high rates of prenatal, infant, and pre-reproductive mortality and they must be taken into account for genetic counseling in Iran. Consanguinity should be discouraged through health education of the public by explaining the adverse effects of interrelated marriage. As a result of improving socioeconomic conditions in most developing countries, such as ours, the incidence of primarily "environmental" disease is declining, largely because of better basic public health measures and the introduction of vaccination programs for lethal childhood infectious diseases. Thus the genetic disorders now account for an increasing proportion of morbidity and death. In this situation, health-care providers, obstetricians, family physicians, and pediatricians, need to be aware of the possible impact of consanguinity on pregnancy outcomes, so that the best possible genetic and antenatal care could be provided, sympathetically and non-judgmentally, and the best possible results obtained.

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