

## The Arab World

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The overall total population of the Arab nations in the world is estimated to be approximately 315 million (estimates; World Almanac, 2004). Arab populations encompass a vast geographical region that extends from Iraq in the east to Morocco in the west. They occupy the whole of Mesopotamia, Middle East, Arabian Gulf, North Africa, as well as some parts of East and West Africa. Arab populations are distributed on 23 different countries, namely: Algeria, Bahrain, Comoros, Djibouti, Egypt, Eritrea, Iraq, Jordan, Kuwait, Lebanon, Libya, Mauritania, Morocco, Oman, Palestine, Qatar, Saudi Arabia, Somalia, Sudan, Syria, Tunisia, United Arab Emirates, and Yemen (*Fig. 1a*). Arabs do not homogeneously populate this geographical area and tend to concentrate highly in narrow locations such as the Nile, Euphrates, and Tigris valleys, the coastal regions of North Africa, the Gulf, and Western Asia (*Fig. 1b*).

### Arab Diasporas in the World

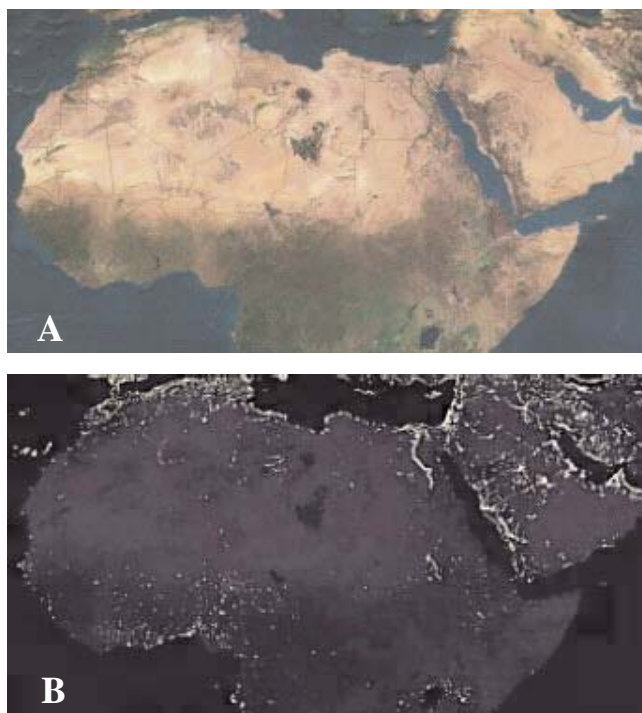
Throughout history, Arab emigrants formed many Diasporas in continents of the world. The main countries of emigration are, in order of percentage:

- Yemen, Jordan, and Lebanon (over 20% of the population).
- Egypt and Syria (10-20%).
- Morocco, Algeria, Tunisia, Mauritania, and Sudan (3-10%).

The main countries of immigration in the Arab World are countries of the Gulf Cooperation Council and Libya, hosting more than 2 million Arabs. The immigrants in these countries make up more than 50% of their population.

Outside the Arab World, the largest Arab communities live in Europe and North America. Arabs in the United Kingdom, Europe, and the United States total some 12 million people many with respectable professions and establishments.

In Europe, the history of Arab immigrations started as early as 1898 with the arrivals of the Somali and Yemeni communities in the United Kingdom.



*Fig. 1: The Arab World. (a) Day view. (b) Night view.*

However, the European country with the largest number of Arab immigrants is France with approximately 7 million Arab speakers, mostly from North Africa and Lebanon. The region with the largest Arab community in France is Île de France (Paris). On the other hand, the number of Arab immigrants in Germany is between 280,000-350,000 while the United Kingdom hosts 210,000 Arabs and Belgium hosts approximately 150,000. Other European countries with significant Arab communities include Spain, Italy, Denmark, the Netherlands, Sweden, Belarus, Romania, Bulgaria, and Turkey.

In North America, Arabs arrived in several waves of immigrations from countries of southwestern Asia and North Africa since the 1880s. In the United States, the Arab American Institute recorded the presence of 3.7 million people of Arab descent (Zogby International, 2000). According to the United States Census Bureau (2000), Lebanese Americans constitute a greater part of the total number of Arab Americans residing in most states (37%), except New Jersey, where Egyptian Americans are the largest Arab group (12% of all Arab Americans). Americans of Syrian descent make up the

majority of Arab Americans in Rhode Island (12% of all Arab Americans), while the largest Palestinian and Iraqi populations are in Illinois (6% and 3% of all Arab Americans, respectively). Other Arab groups residing in the United States come from Jordan, Morocco, Yemen, Algeria, Saudi Arabia, Tunisia, and Libya. In year 2000, 27% of the Arab population lived in the Northeast, while 26% lived in the South, 24% in the Midwest, and 22% in the West. Approximately, 70,000 people of Arab ancestry live in New York, making it the city with the largest number of Arabs, followed by Los Angeles, Chicago, Houston, Detroit, and San Diego (The U.S. Census Bureau, 2000). In Canada, the Arab population lives mostly in Quebec (42%) and Ontario (42%). Arab Diasporas in Canada are highly urban. Of the Arab population in Canada, 69% live in Toronto, Montreal, and Ottawa-Hull alone. Arabs in Canada mainly come from Lebanon (400,000 people), Morocco, Algeria, Egypt, Syria, Palestine, and others (The Canadian Arab Federation, 1999).

In Latin America and the Caribbean, statistics compiled by the Arab Federation of Latin America indicates the presence of 16 million people of Arab descent. Argentina and Brazil boast substantial Arab populations. In Brazil, the Arab community started arriving over one hundred years ago. At present, the number of people in Brazil with Arab ancestries is approximately 12 million (7% of the population). The Arab community in Brazil consists of Syrians, Lebanese, and immigrants from other Arab countries. In Brazil, there are more than 5 million people from Lebanese descent. This is by far larger than the Lebanese population living in Lebanon itself (approximately 3.7 million)! In Argentina, Arabs, mostly from Lebanon and Syria, migrated in the first decades of the 20th century. At present, 400,000 people in Argentina are from Lebanese descent alone. In Mexico, approximately 250,000 people are from Lebanese background. In addition, Columbia, Venezuela, Cuba, and Chile host significant Arab communities mainly from Lebanon, Syria, and Palestine.

In Australia, the 2001 Australian Census indicates the presence of 213,940 people from Arab countries. Some estimates place the number of Australians of Arab origin at almost one million from which more than 500,000 are from Lebanese descent. Of the Arabs

who have settled in Australia, the Lebanese and Egyptian communities are generally the most established, followed by the Iraqi and Syrian communities (Australian Government, 2003). On the other hand, Arab Diasporas are also noted in Africa especially those from Lebanese descent residing in several countries in Central and West Africa. For example, a recent estimate indicated the presence of about 90,000 people of Lebanese descent in the Ivory Coast alone.

### **Demographic Characteristics of Arab Populations**

Arabs are a large and heterogeneous group that resulted from the admixture with many other populations throughout history. Certain cultural and geographic considerations markedly affect the prevalence and natural history of genetic diseases in the Arab World. Some of these characteristics include:

1. The presence of isolates (e.g., Armenians, Bedouins, Druzes, Jews, Kurds, Nubians, and others).
2. Marriage at young age (sometimes even less than 15 years of age; El-Hazmi and Warsy, 1996).
3. High birth rate (16-43 births/1000 people).
4. High infant mortality rate (10-76 deaths/1000 live births; World Almanac, 2004).
5. Child bearing in older maternal age until menopause.
6. Lack of public health measures directed at the control and prevention of congenital and genetically determined disorders (El-Hazmi and Warsy, 1996).
7. Large family size because of high fertility rate (2-7 children born/woman).
8. High rate of inbreeding or consanguineous marriage, which is usually a common traditional practice followed within the same tribe, village or social unit.

### **Consanguinity in Arab People**

Literally, the term consanguineous marriage is defined as marriage between blood relatives. Besides, geneticists usually classify unions between biologically related persons such as second cousins or closer as consanguineous. The genetic risk for less closely related couples differs only marginally from that in non-consanguineous unions.

In many parts of the world, consanguinity is highly prevalent. In 1994, the combined population of countries where 10% of marriages are consanguineous was

732 million, excluding the populations of China and Indonesia (Alwan and Modell, 1997). Furthermore, 1,468 million live in Latin America, parts of Central Africa, Northern India, Japan, and Spain where consanguinity rates vary from 1% to 10% (Liascovich et al., 2001).

Throughout the Arab World, consanguineous marriage is traditionally common. Overall, around 40-50% of marriages in the Arab World are consanguineous (Fig. 2). The specific types of consanguineous marriage vary between and within countries. First cousin marriages are the most common consanguineous bonds in the Arab World. Estimates indicate that the percentage of first cousin marriages is approximately 11.4% in Egypt, 21% in Bahrain, 29% in Iraq, 30% in Kuwait, 31% in Saudi Arabia, and 32% in Jordan.

Besides religion, cultural and historical factors are also important in maintaining this practice. Arabs probably practiced consanguinity since ancient times before the introduction of Islam in the 7<sup>th</sup> century.

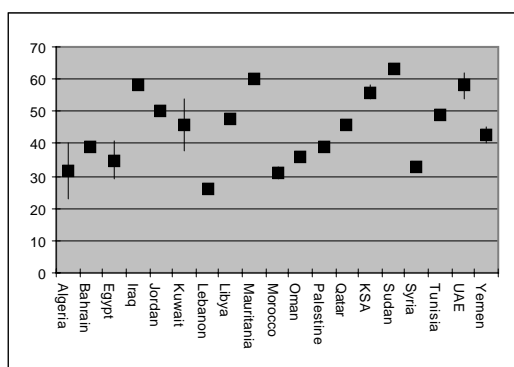


Fig. 2: Percentage of consanguineous unions of total marriages in Arab countries. Adapted from: Benallegue and Kedji, 1984 (Algeria); ENAF, 1992 (Algeria); Al-Arrayed, 1999 (Bahrain); Hafez et al., 1983 (Egypt); ENPC, 1989 (Egypt); Al-Hamamy et al., 1986 (Iraq); Khoury and Massad, 1992 (Jordan); Al-Nasser et al., 1989 (Kuwait); Al-Awadi et al., 1985 (Kuwait); Klat and Khudr, 1986 (Lebanon); Broadhead and Sehgal, 1981 (Libya); National Statistical Office, 1992 (Mauritania); Azelmat et al., 1987 (Morocco); Azelmat et al., 1992 (Morocco); Rajab and Patton, 2000 (Oman); Jaber et al., 1992 (Palestine); Ministry of Health, 1999 (Qatar); Wong and Anokute, 1990 (Saudi Arabia); El-Hazmi et al., 1995 (Saudi Arabia); Saha et al., 1990 (Sudan); Prothro and Diab, 1974 (Syria); Aloui et al., 1988 (Tunisia); Fahmy et al., 1993 (UAE); Al-Gazali et al., 1995 (UAE); Jurdi and Saxena, 2003 (Yemen); Gunaid et al., 2004 (Yemen).

Unlike what is widely thought, Islam does not advocate or encourage consanguineous marriages. The holy sermons of the Prophet Mohammad Hadith state that "close marriages will often produce weak children." On the other hand, marriage outside the social unit results in the propagation of influence in a bigger population.

In the Arab World, the custom of consanguineous marriage results from cultural and historical, rather than religious reasons. Mistakenly, the preference for consanguineous marriage is thought to be restricted to Islamic Arab communities. In some Christian communities (e.g., Lebanon) consanguinity is also common.

The Arabian culture and history as well as the geographical concentration of many population groups in small and isolated areas promoted the tradition of consanguineous marriages. Many families consider the choice of consanguineous marriage between close relatives as a way to maintain the unity of family assets. Marriage with a relative is also preferred because of the comparative ease with which premarital negotiations can be conducted and the greater stability of consanguineous union due to the advanced relationship between the female partner and her in-laws (Khlat et al., 1986).

Studies indicate that several factors influence consanguinity rates in Arabs. These factors include urban-rural residence ratios of families, education levels, and time trend. Studies in Jordan (Khoury and Massad, 1992), Egypt, Lebanon, Oman, and Tunisia demonstrated a higher tendency of unions among rural than urban inhabitants (reviewed in Jurdi and Saxena, 2003).

In some Arab countries, it is evident that the higher the level of education of the female partner, the lower the consanguinity rate (Khoury and Massad, 1992). On the contrary, in some societies, highly educated men are more likely to be married to cousins (Jurdi and Saxena, 2003). A plausible explanation is that since a son with higher education becomes a more valuable asset, he is pressured to remain within the family (Khoury and Massad, 1992).

While a declining trend of consanguineous marriages has been documented in Bahrain, Lebanon, Kuwait, and Syria, a stable trend has been reported in Jordan



and Oman (reviewed in Jurdi and Saxena, 2003). Surprisingly, consanguineous marriages in Algeria and Yemen are increasing in the present generations compared to previous generations (Zaoui and Biemont, 2002; Jurdi and Saxena, 2003). The reason for the rising trend in consanguinity can be attributed to the increase in the availability of cousins due to high fertility (Jurdi and Saxena, 2003).

### Consanguinity and Reproductive Health

While the concept of inheritance is not clear in the minds of lay people, consanguinity is linked to high incidences of congenital malformations, mental retardation, and disability (Fig. 3). Studies indicate that in

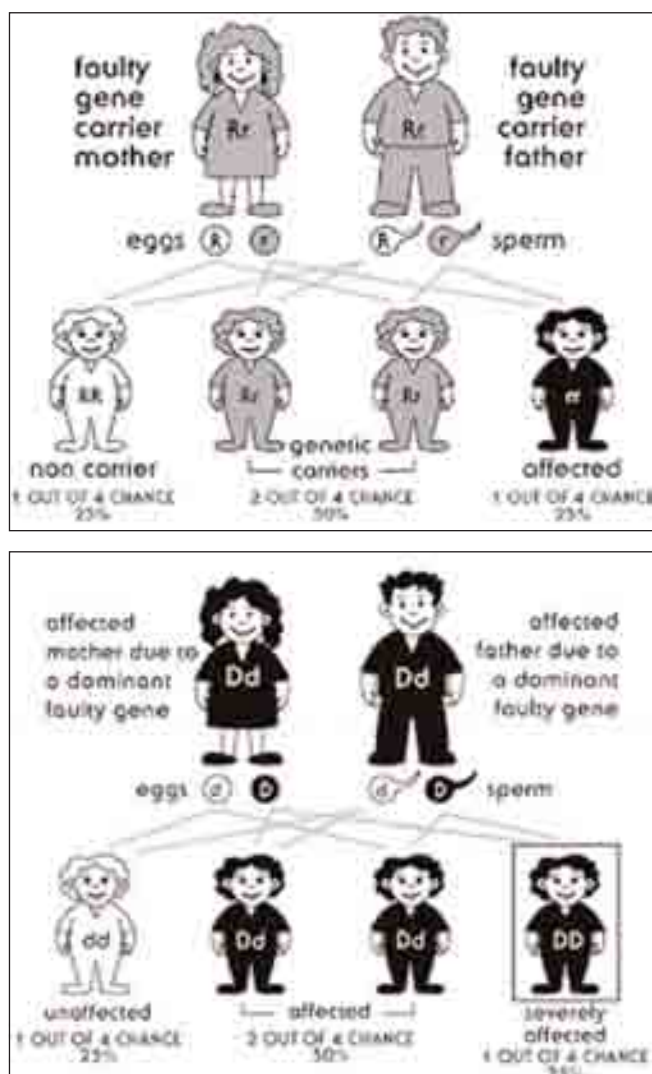


Fig. 3: Mechanisms of recessive (a) and dominant (d) inheritance in the case of consanguineous couples where parents are both carriers of a faulty gene.

populations where the practice of inbred marriages is high, the frequency of homozygosity for autosomal conditions and the incidence of congenital anomalies, abortions, stillbirths, and early childhood deaths are expected to rise (Hoodfar and Teebi, 1996; El-Hazmi and Warsy, 1996). The reason behind this observation is that the more closely two people are related, the more genes they share. A marriage between first cousins increases the risk of having a child with a severe congenital or genetic disorder by 2.5 times since parents share one-eighth of their genes. An average of 30% first cousin marriage in a population would increase the birth prevalence of many conditions by 5-15 times and their collective frequency by 5.5 times. Frequent consanguineous marriage increases the incidence of autosomal recessive disorders by 5-10 times at the population level. When first cousin marriage is considered, the risk of recessively inherited disorders is multiplied by 15-30 times; hence, doubling the total frequency of congenital and genetic disorders (Alwan and Modell, 1997).

The genetic disadvantages associated with consanguineous marriage are often overestimated. While the incidence of recessively inherited disorders increases because of the trend of consanguineous marriages, no effects occur in autosomal dominant or X-linked conditions. Autosomal dominant conditions result from just one copy of a deleterious mutation. Thus, having two parents with the same autosomal dominant mutation does not make an individual more susceptible than someone with only one affected parent. Similarly, just one copy of a deleterious X-linked recessive mutation will result in disease in males. Hence, having related parents does not increase the risk of a male with X-linked recessive disease.

### Arab Family Structure and Transmission Genetics

The extended family structure, commonly present in Arab societies and mostly associated with consanguinity, tends to display peculiar distribution patterns for genetic diseases not present in many other societies (Fig. 4). A major model that explains this concept is the vertical dissemination of a genetic mutation in an Arab or in a Western family. In the Western family, mutation carriers are usually scattered through the general population after a few generations and, as their relationship to each other is usually unrecognized by

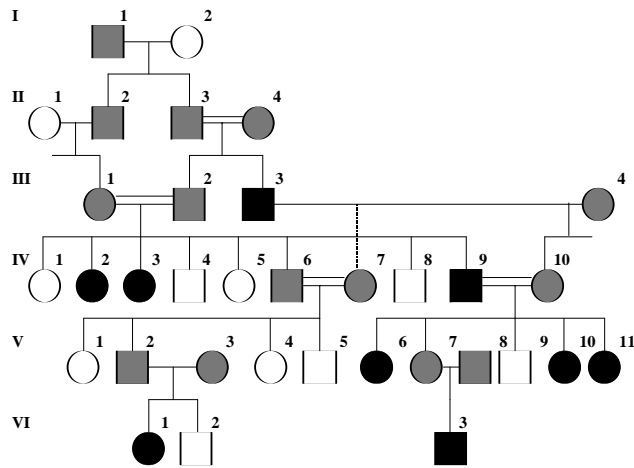


Fig. 4: Pattern of inheritance of a faulty gene in an extended and highly consanguineous family. Clear icons refer to normal members, gray icons indicate carrier members, and dark icons designate affected members. Double horizontal lines designate a consanguineous marriage.

this time, the family history suggesting a genetic basis for their disease predisposition is easily missed. On the contrary, in an Arab society mutation carriers mostly remain concentrated within the extended family, and the genetic nature of their disease predisposition may be obvious.