Int. J. Curr. Res. Med. Sci. (2019). 5(4): 24-30

International Journal of Current Research in Medical Sciences

ISSN: 2454-5716

P-ISJN: A4372-3064, E -ISJN: A4372-3061

www.ijcrims.com

Review Article

Volume 5, Issue 4 -2019

DOI: http://dx.doi.org/10.22192/ijcrms.2019.05.04.004

'Consanguineous marriages & Risk Factors'

Ashikujaman Syed,

Department of Pharmacy, School of Pharmacy,

China Pharmaceutical University, Nanjing, Jiangsu, China.

E-mail: *ashik@stu.cpu.edu.cn*

Abstract

Consanguinity is a deeply rooted social trend among one-fifth of the world population mostly residing in Pakistan and the Middle East. Marriage between first cousins doubles the risk of children being born with birth defects, higher than expected rates of deaths and congenital abnormalities in the babies of the Pakistani community. Marriage to a blood relative accounted for nearly a third (31%) of all birth defects in babies of Pakistani origin. Marriage between first cousins doubles the risk of birth defects.

Keywords: Consanguinity, Consanguineous marriages, Genetic Disorder, Outlook, Conclusion.

Introduction

Consanguinity

Consanguinity derives from the reduction in variation due to meiosis that occurs because of the smaller number of near ancestors. Since all humans share between 99.6% and 99.9% of their genome, consanguinity only affects a very small part of the sequence. If two siblings have a child, the child only has two rather than four grandparents. In these circumstances the probability that the child inherits two copies of a harmful recessive gene rather than one which would not have immediate effects is much increased.

Genetic consanguinity is expressed as defined 1922 by Wright with the coefficient of relationship *r*, where *r* is defined as the fraction of homozygous due to the consanguinity under discussion. Thus, a parent and child pair has a value of r=0.5 (sharing 50% of genes), siblings have a value of r=0.5, a parent's sibling has r=0.25 (25% of genes), and first cousins have r=0.125 (12,5% of genes). These are often expressed in terms of a percentage of shared DNA.

As a working definition, unions contracted between persons biologically related as second cousins or closer ($r \geq 0.03125$) are categorized as consanguineous. This arbitrary limit has been chosen because the genetic influence in marriages between couples related to a lesser degree would usually be expected to differ only slightly from that observed in the general population. Globally it is estimated that at least 8.5% of children have consanguineous parents.

In clinical genetics, consanguinity is defined as a union between two individuals who are related as second cousins or closer, with the inbreeding coefficient (F) equal or higher than 0.0156.where (F) represents the proportion of genetic loci at which the child of a consanguineous couple might inherit identical gene copies from both parents. It is common to distinguish first-degree cousins, second-degree cousins, and often also third-degree cousins. Since comparatively few people can trace their full family tree for more than four generations, the identity of fourth-degree cousins often cannot be established. Also, at a genetic level, half-fourth cousins typically do not exhibit greater genetic similarity with one another than with any other individual from the same population.

Consanguineous marriage is matrimony between individuals who are closely related. Though it may involve incest, it implies more than the sexual nature of incest. In a clinical sense, marriages between two family members who are second cousins or closer qualify as having a consanguineous marriage. This is based on the gene copies their offspring may receive. Though these unions are still prevalent in some communities, as seen across the Pakistan and Middle East region, many other populations have seen a great decline in family marriages.

Prevalence and stigma

Globally, 8.5% of children have consanguineous parents, and 20% of the human population live in communities practicing endogamy. Theories on the developments of consanguineous marriage as a taboo can be supported as being both a social, and a biological development.

Genetic Disorder

The phenomenon of inbreeding increases the level of homozygotes for autosomal genetic disorders and generally leads to a decreased biological fitness of a population known as inbreeding depression, a major objective in clinical studies. The offspring of consanguineous relationships are at greater risk of certain genetic disorders. Autosomal recessive disorders occur in individuals who are homozygous for a particular recessive gene mutation. This means that they carry two copies (alleles) of the same gene. Except in certain rare circumstances (new mutations or uniparental disomy) both parents of an individual with such a disorder will be carriers of the gene. Such carriers are not affected and will not display any signs that they are carriers, and so may be unaware that they carry the mutated gene. As relatives share a proportion of their genes, it is much more likely that related parents will be carriers of an autosomal recessive gene, and therefore their children are at a higher risk of an autosomal recessive disorder. The extent to which the risk increases depends on the degree of genetic relationship between the parents; so the risk is greater in mating relationships where the parents are close relatives, but for relationships between more distant relatives, such as second cousins, the risk is lower (although still greater than the general population).

Consanguinity in a population increases its susceptibility to infectious pathogens such as tuberculosis and hepatitis.

Effects

Inbreeding increases the chances of the expression of deleterious recessive alleles by increasing homozygosity and therefore has the potential to decrease the fitness of the offspring. With continuous inbreeding, genetic variation is lost and homozygosity is increased, enabling the expression of recessive deleterious alleles in homozygotes. The coefficient of inbreeding, a term used to describe the degree of inbreeding in an individual, is an estimate of the percent of homozygous alleles in the overall genome. The more biologically related the parents are, the greater the coefficient of inbreeding, since their genomes have many similarities already. This overall homozygosity becomes an issue when there are deleterious recessive alleles in the gene pool of the family. By pairing chromosomes of similar genomes, the chance for these recessive alleles to pair and become homozygous greatly increases, leading to offspring with autosomal recessive disorders.

Inbreeding is especially problematic in small populations where the genetic variation is already limited. By inbreeding, individuals are further decreasing genetic variation by increasing homozygosity in the genomes of their offspring. Thus, the likelihood of deleterious recessive alleles to pair is significantly higher in a small inbreeding population than in a larger inbreeding population.

The fitness consequences of consanguineous mating have been studied since their scientific recognition by Charles Darwin in 1839. Some of the most harmful effects known from such breeding includes its effects on the mortality rate as well as on the general health of the offspring. Within the past several decades, there have been many studies to support such debilitating effects on the human organism. Specifically, inbreeding has been found to decrease fertility as a direct result of increasing homozygosity of deleterious recessive alleles. Fetuses produced by inbreeding also face a greater risk of spontaneous abortions due to inherent complications in development. Among mothers who experience stillbirths and early infant deaths, those that are inbreeding have a significantly higher chance of reaching repeated results with future offspring. Additionally, consanguineous parents possess a high risk of premature birth and producing underweight and undersized infants. Viable inbred offspring are also likely to be inflicted with physical deformities and genetically inherited diseases. Studies have confirmed an increase in several genetic disorders due to inbreeding such as blindness, hearing loss, neonatal diabetes, limb malformations, disorders of sex development, Schizophrenia and several others. Moreover, there is an increased risk for congenital heart disease depending on the inbreeding coefficient (See coefficient of inbreeding) of the offspring, with significant risk accompanied by an F =.125 or higher.

Prevalence

The general negative outlook and eschewal of inbreeding that is prevalent in the Western world today holds roots from over 1500 years ago. Specifically, written documents such as the Bible illustrate that there have been laws and social customs that have called for the abstention from inbreeding. Along with cultural taboos, parental education and awareness of inbreeding consequences have played large roles in minimizing inbreeding frequencies in areas like Europe. That being so, there are less urbanized and less populated regions across the world that have shown continuity in the practice of inbreeding.

The continuity of inbreeding is often either by choice or unavoidably due to the limitations of the geographical area. When by choice, the rate of consanguinity is highly dependent on religion and culture. In the Western world some Anabaptist groups are highly inbred because they originate from small founder populations and until today marriage outside the groups is not allowed for members. Especially the Redenbacher Old Order Mennonites and the hutterites stem from very small founder populations. The same is true for some Haredi Jewish groups.

Of the practicing regions, Middle Eastern and northern Africa territories show the greatest frequencies of consanguinity. The link between the high frequency and the region is primarily due to the dominance of Islamic populations, who have historically engaged in family line relations.

Among these populations with high levels of inbreeding, researchers have found several disorders prevalent among inbred offspring. Specifically, in Lebanon, Saudi Arabia, Egypt, and in Israel, it has been discovered that offspring of consanguineous relationships have an increased risk of congenital malformations, congenital heart defects, congenital hydrocephalus and neural tube defects. Furthermore, among inbred children in Palestine and Lebanon, there is a positive association between consanguinity and reported cleft lip/palate cases. Historically, populations of Qatar have engaged in consanguineous relationships of all kinds, leading to high risk of inheriting genetic diseases. As of 2014, around 5% of the Qatari population suffered from hereditary hearing loss; most were descendants of a consanguineous relationship.

Out Look

Marriage between first cousins doubles risk of birth defects. Study of 13,500 babies born in Bradford concludes cultural practice in Pakistani community outweighs effects of deprivation. Marriage between first cousins doubles the risk of children being born with birth defects, according to a study seeking answers to the higher than expected rates of deaths and congenital abnormalities in the babies of the Pakistani community. Researchers have concluded that the cultural practice of marriage between first cousins is a bigger factor than any other – outweighing the effects of deprivation in parts of Bradford, where the study was carried out. Marriage to a blood relative accounted for nearly a third (31%) of all birth defects in babies of Pakistani origin. The risk of having a baby with birth defects – usually heart or nervous system problems which can sometimes be fatal – is still small, but it rises from 3% in the general Pakistani population to 6% among those married to blood relatives. The researchers also found a doubling of the risk in the babies of white British women who were over the age of 34. That increased risk, rising from 2% to 4%, is already known. Every year there are about 90 more baby deaths than would be expected in the Pakistani community in England and Wales because of birth defects. But the issue is highly sensitive because marriage within families is an established cultural tradition. Previous studies have caused controversy but the lead author of the paper, Dr Eamonn Sheridan from Leeds University, said there has been strong community involvement in the Born in Bradford study, which has been following the health of 13,500 babies delivered in the Bradford Royal Infirmary between 2007 and 2011. "The issue is incredibly sensitive," said Sheridan. "There has been a terrific amount of community engagement in the Born in Bradford study from the word go. The community has not been surprised by the findings." Local health professionals received training in raising the issues with people in the Pakistani community, so that it became an acceptable topic for discussion. The Muslim clerical community was also involved. In the multi-ethnic study, published in the Lancet, the researchers looked at a range of factors that might play a part in birth defects, including deprivation, obesity and smoking in mothers.

Socioeconomic status did not explain the birth defects, even though two-thirds of the babies came from the most deprived fifth of the UK population. Maternal smoking, alcohol use and obesity were not found to be risk factors in this population. Greater education in mothers was a protective factor in all ethnicities.

Professor Neil Small from the University of Bradford, who co-led the research, said: "This is the first study that has been able to explore all causes of congenital anomaly in a population where there are sufficient numbers in both consanguineous [related by blood] and non-consanguineous groups to come to reliable conclusions.

"Clear and accessible information on these small but significant avoidable risks should be widely disseminated to local communities and be included as part of antenatal counselling and in the planning of healthcare services."

It is difficult to advocate changes in other people's cultural traditions, but Sheridan said a shift in practice that would save babies' lives was not without hope. "The only other big cohort study is of the Pakistani community in Norway. The incidence of first-cousin union in that community is now declining," he said.

Partly that would be Partly that would be because of gradual adaptation to Norwegian culture, but since 2009 when the study was published, there had been a health education campaign to inform people of the risks.

Conclusion

Primary health care providers can counsel for consanguinity provided they possess the recommended education and training. Education of the public in general and of primary health personnel in particular is an important pillar in clarifying the health and social effects of consanguineous marriages. Minimal knowledge

and training of primary health care providers for counseling on consanguinity. New technologies including next generation sequencing could eventually help in diagnosing patients affected by conditions known to be genetically heterogeneous. Such technologies could also diagnose if both couple carry the same autosomal recessive gene that causes a severe disorder and thus facilitating counseling on consanguinity. Congenital anomalies in this family are: death within first month of birth mostly because of malformation of gastro-intestinal system while some were unrecognized, hearing deficit, mental retardation, cerebral palsy, and kyphosis. Several studies have also shown the existence of a relationship of above conditions and defects with consanguineous parents.

Acknowledgements

The author wishes to thank Sayed Asaduzzaman Anik , Studying Bachelor of Social Science at National University Bangladesh; Md Abu Sayem, Md Abu Sayed, Md Masum Rana, Alamin Bin Golam , Studying at Jiangsu Agri-Animal Husbandry Vocational College China.

Financial support and sponsorship: None

Conflict of interest: The authors declare no conflict of interest.

References

1. Al-Allawi NA, Al-Dousky AA. Frequency of haemoglobin opathies at premarital health screening in Dohuk, Iraq: implications for a regional prevention programme. East Mediterr Health J. 2010;16:381–385.
2. Modell B, Darr A. Science and society: genetic counselling and customary consanguineous marriage. Nat Rev Genet. 2002; 3:225–229. doi: 10.1038/nrg754.
3. Zlotogora J, Shalev SA. The consequences of consanguinity on the rates of malformations and major medical conditions at birth and in early childhood in inbred populations. Am J Med Genet A. 2010;152A:2023–2028. doi: 10.1002/ajmg.a.33537.
4. Ashikujaman Syed. (2019). Up Dated Concepts of Cirrhosis'. Int. J. Adv. Res. Biol. Sci. 6(3): 7-10. DOI: http://dx.doi.org/10.22192/ijarbs.2019.06.03.002
5. Zlotogora J. What is the birth defect risk associated with consanguineous marriages? Am J Med Genet. 2002;109:70–71. doi: 10.1002/ajmg.10311
6. Ashikujaman Syed. (2018). Nipah Virus outbreak in the World. Int. J. Adv. Res. Biol. Sci. 5(9): 131-138. DOI: http://dx.doi.org/10.22192/ijarbs.2018.05.09.013
7. Elderen T, Mutlu D, Karstanje J, Passchier J, Tibben A, Duivenvoorden HJ. Turkish female immigrants' intentions to participate in preconception carrier screening for hemoglobinopathies in the Netherlands: an empirical study. Public Health Genomics. 2010;13:415–423. doi: 10.1159/000314643
8. Ashikujaman Syed, Saptarshi Panigrahi , Somnath Surai.(2019). 'Body Check up in Diabetes Patients'. Int. J. Curr. Res. Biol. Med. 4(3): 5-22. DOI: http://dx.doi.org/10.22192/ijcrbm.2019.04.03.002
9. Alwan A, Modell B. Community control of genetic and congenital disorders. EMRO Technical Publication Series 24: WHO Regional Office for the Eastern Mediterranean Region, Egypt. 1997
10. World Health Organization. Community genetics services: report of a WHO consultation on community genetics in low- and middle-income countries.http://whqlibdoc.who.int/publications/2011/9789241501149_eng.pdf. 2010
11. Teebi A. Genetic Diversity among the Arabs, Genetic Disorders among Arab Populations 2010. Springer.
12. Bell CJ, Dinwiddie DL, Miller NA, Hateley SL, Ganusova EE, Mudge J, Langley RJ, Zhang L, Lee CC, Schilkey FD, Sheth V, Woodward JE, Peckham HE, Schroth GP, Kim RW, Kingsmore SF (2011) Carrier testing for severe childhood recessive diseases by next-generation sequencing. Sci Transl Med 3:65ra4

13. Bennett RL, Hudgins L, Smith CO, Motulsky AG (1999) Inconsistencies in genetic counseling and screening for consanguineous couples and their offspring: the need for practice guidelines. Genet Med 1:286–292
14. Ashikujaman Syed. (2018). Chikungunya Virus: An Infectious Disease. Int. J. Curr. Res. Biol. Med. 3(10):20-30. DOI: http://dx.doi.org/10.22192/ijcrbm.2018.03.10.003
15. Bittles AH (2009) Commentary: the background and outcomes of the first-cousin marriage controversy in Great Britain. Int J Epidemiol38:1453–1458
16. Ashikujaman Syed. (2018). Mixed Connective Tissue Disease (MCTD)' in the World. Int. J. Curr. Res. Biol. Med. 3(10): 48-54. DOI: http://dx.doi.org/10.22192/ijcrbm.2018.03.10.006
17. Bittles A. The global prevalence of consanguinity. http://www.consang.net accessed June 2011. 10-12-2011
18. Ashikujaman Syed. (2018). Jaundice it is not a disease, it is a symptom of several possible underlying illnesses. Int. J. Curr. Res. Med. Sci. 4(11): 16-26. DOI:http://dx.doi.org/10.22192/ijcrms.2018.04.11.002
19. Bittles AH, Black ML (2010a) Evolution in health and medicine Sackler colloquium: consanguinity, human evolution, and complex diseases. Proc Natl Acad Sci U S A 107(Suppl 1):1779–1786
20. Bittles AH, Black ML (2010b) The impact of consanguinity on neonatal and infant health. Early Hum Dev 86:737–741
21. Ashikujaman Syed. (2019). 'Snake Bites Problem in over the world' . Int. J. Curr. Res. Med. Sci. 5(2): 16-19 DOI: http://dx.doi.org/10.22192/ijcrms.2019.05.02.003
22. Fuster V, Colantonio SE. Socioeconomic, demographic, and geographic variables affecting the diverse degree of consanguineous marriage in Spain. Hum Bio 2004; 76: 1-14.
23. Md Rashedul Islam Rashed, Ashikujaman Syed, Md Al Sabah, Mia Md Momin. (2018). Review of diabetes types and Care. Int. J. Curr. Res. Med. Sci. 4(11): 27-32. DOI:http://dx.doi.org/10.22192/ijcrms.2018.04.11.003
24. Bittles A, Hamamy H (2010) Endogamy and consanguineous marriage in Arab populations. In: Teebi A (ed) Genetic disorders among Arab populations, 2nd edn. Springer, Heidelberg
25. Imaizumi Y, Shinozaki N. Frequency of consanguineous marriages in Japan: geographical variations. Jpn J Hum Genet 1984; 29: 381-385.
26. Ashikujaman Syed. (2019). Ebola Virus Disease. Int. J. Curr. Res. Med. Sci. 5(3): 18-23. DOI: http://dx.doi.org/10.22192/ijcrms.2019.05.03.004
27. Sueyoshi S, Ohtsuka R. Effects of polygyny and consanguinity on high fertility in the rural Arab population in South Jordan. J Bio Soc Sci 2003; 35: 513-526.
28. Farag TI, Al-Awadi SA, El-Badramary MH, Aref MA, Kasrawi B, Krishna Murthy DS. Disease proile of 400 institutionalized mentally retarded patients in Kuwait. Clin Genet 1993; 44: 329-334.
29. Ashikujaman Syed. (2019). 'A review of Filariasis'. Int. J. Curr. Res. Med. Sci. 5(2): 26-30. DOI: http://dx.doi.org/10.22192/ijcrms.2019.05.02.005
29. Ahmed AH. Consanguinity and schizophrenia in Sudan. Br J Psychiat 1979; 134: 65-636. 30. Ashikujaman Syed. (2018). Alzheimer Disease Research. Int. J. Curr. Res. Med. Sci. 4(11): 40-46. DOI: http://dx.doi.org/10.22192/ijcrms.2018.04.11.006
31. Grant JC, Bittles AH. The comparative role of consanguinity in infant and childhood mortality in Pakistan. Ann Hum Genet 1997; 61: 143-149
32. Cnattingius YM, Jalil S, Zaman F, Iselius S, Gustavson K. Risk factors for mortality in young children living under various socio-economic conditions in Lahore, Pakistan: with particular reference to inbreeding. Clin Genet 1998; 54: 426-434.

33. Puri RK, Verma IC, Bhargava I. Effects of consanguinity in a community in Pondicherry. In: Verma IC (eds.). Med Genet India, Pondicherry 1978.
34. Devi ARR, Rao NA, Bittles AH. Inbreeding and the incidence of childhood genetic disorders in Karnataka, South India. J Med Genet 1987; 24: 362-365.
35. Rajech S, Athamny E, Khatib M, Sheikh-Muhammad A, Azem A, et al. Consanguinity and Its Effect on Morbidity and Congenital Disorders Among Arabs in Israel. Human Genetic Diseases 2011; 267-276.
36. Bittles AH. Consanguineous marriage and childhood health. Dev Med Child Neurol 2003; 45: 571-576.
37. Tandon A, Sengupta S, Shukla V, Danda S. Risk Factors for Congenital Heart Disease (CHD) in Vellore, India. Current Res J Bio Sci 2010; 2: 253-258.
38. Ayesh SK, Suheir M, Nassar WA, Al-Sharef BY, Abu-Libdeh H.Genetic screening of familial Mediterranean fever mutations in the Palestinian population. Saudi Med J 2005; 26: 732-737.
39. Kupka K. International classification of disease: ninth revision. WHO chronical 1978; 32: 219-225
40. Sueyoshi S, Ohtsuka R. Effects of polygyny and consanguinity on high fertility in the rural Arab population in South Jordan. J Bio Soc Sci 2003; 35: 513-526.
41. Mokhtar MM, Abdel-Fattah M. Major birth defects among infants with Down syndrome in Alexandria, Egypt (1995-2000): trends and risk factors. East Mediterr Health J 2001; 7: 441-451.
42. Imaizumi Y, Shinozaki N. Frequency of consanguineous marriages in Japan: geographical variations. Jpn J Hum Genet 1984; 29: 381-385.

Access this Article in Online	
Quick Response Code	Website: www.ijcrims.com
	Subject: Medical Sciences

How to cite this article:
Ashikujaman Syed. (2019). 'Consanguineous marriages & Risk Factors'. Int. J. Curr. Res. Med. Sci. 5(4): 24-30.
DOI: http://dx.doi.org/10.22192/ijcrms.2019.05.04.004