Mintage Journal of Pharmaceutical & Medical Sciences
RESEARCH ARTICLE

OCCURRENCE OF CONSANGUINEOUS MARRIAGE IN BAJAUR AGENCY, FEDERALLY ADMINISTERED TRIBAL AREAS, KHYBER PAKHTUNKHWA, PAKISTAN

Farzana Perveen

Department of Zoology, Shaheed Benazir Bhutto University (SBBU), Main Campus, Sheringal, Khyber Pakhtunkhwa, Pakistan
Email - farzana_san@hotmail.com

Received -22-12-12; Reviewed and accepted -27-12-12

ABSTRACT

In consanguineous marriage, the genetic and medical disorders are increased in the offspring with passage of time. It is a big challenge for our society to get complete information of their prevalence, their risk factors and to control these disorders. The present survey was conducted during January-March 2012 in different areas of the Bajaur Agency, Federally Administered Tribal Areas (FATA), Khyber Pakhtunkhwa (KP), Pakistan including Alijan, Anatkali, Chamerkand, Gandaw, Loisam, Manudera, Nawagai, Nawaikali, Raghagan and Sadiqabad where they are dominant. Data were collected from 123 consanguineous married couples through questionnaire comprised of information about complete history and risk factors of the medical and genetic disorders. During cousin marriages, the couples' parents were married to their 1st cousin 52% while married to their 2nd cousin 49%. The couples participated themselves were 1st cousin 87% while 2nd cousin 13%. They were obese 34%, weak 48%, and normal 18% while age was minimum 14 and maximum 30 years, however, maximum marriages were observed at the age of 20 year. The couples having genetic disorders like anemia, obesity and thalassemia were 20, 23 and 20%, respectively; however, non-genetic disorders, bone diseases, depressive illness and respiratory diseases were 21, 20 and 25 %, respectively. Such communities may require comprehensive genetic education and premarital genetic counseling programs for awareness and education.

Key words: *Bajaur Agency, blood-relation, prevalence of cousin-marriage, malformation of offspring, medical and genetic disorders.*

INTRODUCTION

Marriage is a more or less durable connection between male and female lasting beyond the mere act of propagation till after the birth of the offspring (Edverd, 1921). It is organized by both families after looking at their family background, potentials, social status, caste, wealth and a lot more. Usually, marriage in Pakistan is arranged between the expanded family members like cousins or relatives. The wedding will be decided by both parents and relatives. Wedding that gets arranged by the parents and people will be performed as a grand celebration depending upon their ability and potentials (Mansoor, 2010). As in Pakistan mostly arrange marriages are held especially between cousins (Perveen and Rehman, 2012).

A union between the couples who are blood relatives, may be marry paternal or maternal uncle's and aunt's daughter/son, is referred as consanguineous marriage (Bittles and Makov, 1988; Perveen and Rehman, 2012). It is popular worldwide and performed in different ratios. The current data indicate that 20% of marriages are between first cousins and 10.4% are to second cousins in all over the word. It is more dominant in some parts of Middle East, Africa and Asia and Saudi Arabia (Bittles and Neel, 1994; Perveen and Rehman, 2012). They are very common in Pakistan, about 60% of the marriages are reported to be consanguineous among them 80% are between first cousins (Abdulkareem et al., 2004; Perveen and Rehman, 2012).

The consanguineous marriage has several advantages according to social and economic point of views. In many communities, those who cannot afford a sizeable dowry may choose to marry within the family to save themselves from the cost. Some families who have the tremendous inheritance and are wanted to restrict them within the family, therefore, they choose cousin marriage for their children (Mansoor, 2010; Alwan and Modell, 1997; Perveen and Rehman, 2012). As everyone is familiar within the families about couple and their history, therefore, it strengthens the family ties. It was very common in the most of the cultures in past and still practices in many communities at the present (Rao et al., 2009; Perveen and Rehman, 2012).

The consanguineous marriage has many disadvantages according to genetic and medical point of views. Consanguinity means sharing of the genetic materials, i.e., identical DNA. First cousins have four times the consanguinity of second cousins. First cousins once removed half the shared DNA as full first cousins. Half-fourth cousins sometimes cannot be detected at the DNA level. Finally, double first cousins share twice the consanguinity as first cousins and are as related as half-siblings. Parental consanguinity increases the autosomal recessive conditions through the expression of recessive deleterious alleles, especially, in the offspring of first cousins. Parental consanguinity has been associated with increased risk of pediatric disorders including: blood disorders (e.g., hemophilia, thalassemia), chronic renal failure, congenital birth defect, cystic fibrosis, mental retardation, neonatal diabetes mellitus, perinatal mortality, stillbirth and other congenital malformations (Tunçbilek and Koç, 1994; Perveen and Rehman, 2012).

The genetic and medical researches have shown that consanguineous marriage should be avoided because children born from such marriages are adversely affected. They have an increased risk of being physically or mentally retarded or to be affiliated by defects like asthma, blindness, deafness, eczema, epilepsy, sickle cell disease, specific cancers and squint eyes (Temtamy et al., 1998; Perveen and Rehman, 2012). It is important to prepare ourselves to accept the challenges regarding the prevalence of disorders, congenital malformations and risk factors due to such marriages may require to get their complete information, comprehensive genetic education and premarital genetic counseling programs for preventions and awareness (Shami et al., 2001; Perveen and Rehman, 2012).

Bajaur Agency is located 34°41-71°30′ northeast latitude, 34.683-71.500° north latitude, 34°41-71°30′ northeast latitude and 34.683-71.500° northeast latitude in the Federally Administered Tribal Areas (FATA), Khyber Pakhtunkhwa (KP), Pakistan. The total population of Bajaur Agency is 595, 227 with annual growth rate 4.33. Mostly, the people are farmers and tenants with very low literacy rate. However, some people are government servants and laborers. Their religion is Islam with sect sunni, race pathan and conservative in their customs and traditions. Culturally, they are revengers, therefore, live and die for their honours and dignity. The Jirga system and hospitality are their famous norms (Hussain, 1999; Perveen and Rehman, 2012; Figure 1).

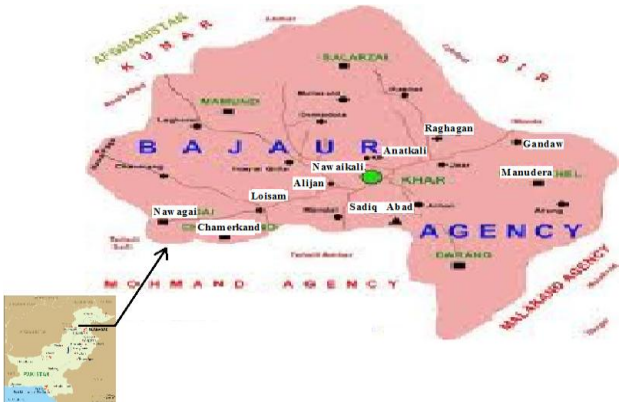

Figure 1: Map of Bajaur Agency, Federally Administered Tribal Areas (FATA), Khyber Pakhtunkhwa (KP), Pakistan (Hussain, 1999) where questionnaires were filled by consanguineous married couples visited to Ar-Rehman General Hospital during January-March 2010

Recently, the avoiding trend of consanguineous marriage has been developed among people of the Jordan, Lebanon, Morocco, Mauritania and Palestinian. However, an increasing trend is reported in the Qatar, United Arab Emirates and Yemen. Moreover, in South America, North India and Japan, it was 1-10%; further, in North America, Europe, Russia and Australia the same was less than 1%. Furthermore, 20-50% of consanguinity was calculated in Arab countries, Turkey, Iran, Pakistan and south India (Bittles, 2008; Teebi, 2009; Perveen and Rehman, 2012). The objective of the present survey is to determine the prevalence of cousin marriages in Bajaur Agency, FATA, KP, Pakistan.

Materials and methods

The questionnaire was used to collect the data which consists of fifteen (15) different items related to the cousin marriage. It was designed in such a way to get complete history of family in which it was held. This research is a small effort towards guidance of the people of Bajaur Agency to prevent later harmful effects of cousin marriages. One partner of 123 consanguineous couples had filled the questionnaire from different areas of the Bajaur Agency, FATA, KP, Pakistan including Alijan, Anatkali, Chamerkand, Gandaw, Loisam, Manudera, Nawagai, Nawaikali, Raghagan and Sadiqabad (Figure 1) where cousin marriages are predominant to Ar-Rehman General Hospital during January-March 2010. The questionnaires were filled by the help of the local doctor because the people of Bajaur Agency are mostly illiterate. Firstly, the purpose of the survey was explained to the patients' couples who were the local residents and visiting the local hospital of Bajaur Agency frequently; and they were requested to cooperate in filling the questionnaires. The Microsoft Excel Computer Program (MECP) has been used for data analysis (Perveen and Hussain, 2012).

Results

The couples who were participated in the present survey, their parents belong to their 1st cousin were more than 2nd cousin (1st cousin > 2nd cousin; Table 1), similarly, couples themselves involved in survey belong to their 1st cousin were more than 2nd cousin (1st cousin > 2nd cousin; Figure 2).

Table 1: The consanguineous marriage in couple parents in the present survey during January-March 2010 in Bajaur Agency, Federally Administered Tribal Areas (FATA), Khyber Pakhtunkhwa (KP), Pakistan

SNo	Statement	n[1]	No of couples	%[1]
1.	1st cousin marriage in parents[2]	123	64	52
2.	2nd cousin marriage in parents[3]	123	59	48

[1]%: percentage of couples having consanguineous parents; n: questionnaires were filled by one partner of 123 consanguineous married couples from different areas of Bajaur, [2]Couples having cousin marriage in parents, [3]Couples not having cousin marriage in parents

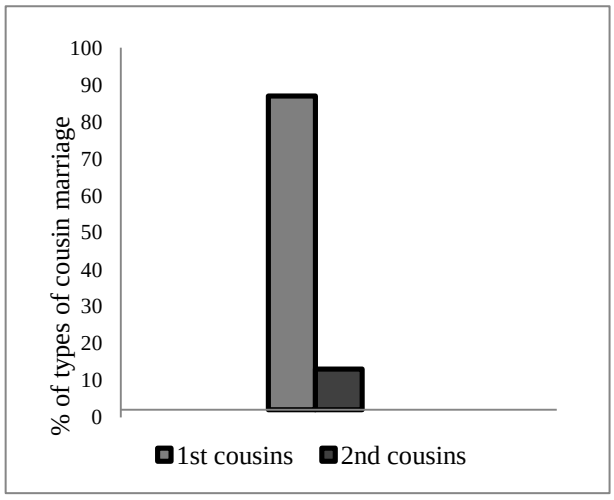

Figure 2: The blood relation of couples participated in the present survey during January-March 2010, : they shared grandparents but have different parents (1st cousin); ■: they shared grand-grandparents but have different grandparents (2nd cousin); %: percentage; n: questionnaires were filled by 123 one partner of consanguineous married couples from different areas of Bajaur Agency, Federally Administered Tribal Areas (FATA), Khyber Pakhtunkhwa (KP), Pakistan

When health conditions of couples were determined during the present survey, it was found that normal couples were more than weak ones, while 10% couples were obese during marriage (weak > obese > normal; Table 2).

Table 2: The health conditions of the couples of consanguineous marriage in the present survey during January-March 2010 in Bajaur Agency, Federally Administered Tribal Areas (FATA), Khyber Pakhtunkhwa (KP), Pakistan

SNo	Health condition	n*	No of individuals	%*
1.	Weak	123	59	48
2.	Obese	123	42	34
3.	Normal	123	22	18

***%: percentage of health conditions; n: questionnaires were filled by one partner of 123 consanguineous married couples from different areas of Bajaur**

During the present survey, it was found that individuals were married at different ages. The highest to the lowest numbers of individuals were found married are given here in descending order: Age 20 years: 46 individuals/123 couples > Age 25 years: 34 individuals/123 couples > Age 24 years: 31 individuals/123 couples > Age 18 years: 21 individuals/123 couples > Age 16 years: 18 individuals/123 couples > Age 15 years: 14 individuals/123 couples > Age 22 years: 13 individuals/123 couples > Age 14 and 19 years: each 12 individuals/123 couples

> Age 17 and 28 years: each 10 individuals/123 couples > Age 30 years: 9 individuals/123 couples > Age 23 and 26 years: each 8 individuals/123 couples (Table 3).

During the present survey, it was found that consanguineous married one partner/couples were suffering from different disease are given here in descending order: haemoglobinopathy: 30 > respiratory diseases: each 25% > blood pressure, diabetes, obesity and: each 23% > asthma and bone diseases: each 21 > anemia, depressive illness, muscular disorder and thalassemia: each 20 (Table 4).

Table 3: The age at the time of consanguineous marriage found in the present survey done during January-March 2010 in Bajaur Agency, Federally Administered Tribal Areas (FATA), Khyber Pakhtunkhwa (KP), Pakistan

SNo	Age at the time of marriage*	n*	n[2]	No of individuals	%*
1	14	123	246	12	4.9
2	15	123	246	14	5.7
3	16	123	246	18	7.3
4	17	123	246	10	4.1
5	18	123	246	21	8.5
6	19	123	246	12	4.9
7	20	123	246	46	18.7
8	22	123	246	13	5.3
9	23	123	246	8	3.3
10	24	123	246	31	12.6
11	25	123	246	34	13.8
12	26	123	246	8	3.3
13	28	123	246	10	4.1
14	30	123	246	9	3.7

*Age at the time of cousin marriage; %: percentage of different age couples; n: questionnaires were filled by 123 consanguineous married couples from different areas of Bajaur

Table 4: The couples were suffering from diseases found in consanguineous marriages in the present survey during January-March 2010 in Bajaur Agency, Federally Administered Tribal Areas (FATA), Khyber Pakhtunkhwa (KP), Pakistan

SNo	Genetic diseases	n[3]	n[2]	No of individuals	%[4]
1.	Anemia[1]	123	246	20	8.1
2.	Asthma[1]	123	246	21	8.5
3.	Blood pressure[1]	123	246	23	9.6
4.	Bone diseases[2]	123	246	21	8.5
5.	Depressive illness[2]	123	246	20	8.1
6.	Diabetes[1]	123	246	23	9.3
7.	Haemoglobinopathy[1]	123	246	30	12.2
8.	Muscular disorder[1]	123	246	20	8.1
9.	Obesity[1]	123	246	23	9.3
10.	Respiratory diseases[2]	123	246	25	10.2
11.	Thalassemia[1]	123	246	20	8.1

[1]Genetic disorders in consanguineous married couples,[2]Not genetic disorders but diseases present in consanguineous married couples,[3]n: questionnaires were filled by 123 consanguineous married couples from different areas of Bajaur ,[4]%: percentage of different age couples

The present survey was conducted in the following different localities of Bajaur agency: Alijan, Anatkali, Chamerkand, Gandaw, Loisam, Manudera, Nawagai, Nawaikali, Raghagan and Sadiqabad where cousin marriages were performed with different percentages (n=123; Figure 3; Perveen and Rehman, 2012).

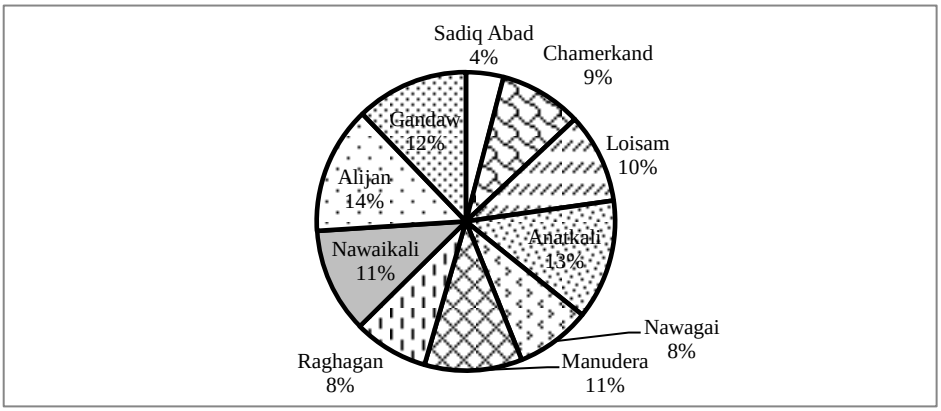

Figure 3: The prevalence of consanguineous marriage in different localities of Bajaur Agency, Federally Administered Tribal Areas (FATA), Khyber Pakhtunkhwa (KP), Pakistan in the present survey during January-March 2010; Alijan, Anatkali, Chamerkand, Gandaw, Loisam, Manudera, Nawagai, Nawaikali, Raghagan and Sadiqabad; n= questionnaires were filled by 123 consanguineous couples from different areas of Bajaur (Perveen and Rehman, 2012)

DISCUSSION

Consanguineous marriage occurs among Muslims, Christians and Hindus to a varying degree within the sub-groups of each religion. Consanguineous unions are strongly preferred in much of the west and south Asia and also have both social and economic impacts on the population groups that practice this type of marriage (Saliternik et al., 2002). Generally, it is widely favored in a large majority of the word's Islamic populations, like Pakistan, Middle East and India (Hussain and Bittles, 1998). However, it attracts considerable attention as a causative factor in the prevalence of genetic and medical disorders (Alwan and Modell, 1997). It increased the prevalence of fetal/infant death in parents with exceptional children rather than in parents with normal children compared with non-consanguineous marriage in rural and urban areas of Iran (Mohammadi et al., 2012). In Pakistan mostly arrange marriages are held especially between cousins and the list of diseases related to consanguineous marriage is very long, therefore, it is very important to make people aware of it and prevent such marriage to control genetic and medical disorders.

The present research conducted in different areas of the Bajaur Agency participated 123 consanguineous married couples. One partner filled questionnaires in a local clinic, Ar-Rehman General Hospital. The questionnaire was designed in such a way to get complete history of family in which cousin marriage was held. It has been reported that the frequency of consanguineous marriage in the population of the Sikh community of Swat, NWFP, Pakistan was 21%, among them 20.3% were 1st cousin, however, marriage contracted between distant relatives were 29.4 % (Wahab and Ahmad, 2005**)**. Donbak (2004) reported that the prevalence of the same was 30.6% in Kahramanmaras city, Turkey with 1st cousin (22.6%) and 2nd cousin 8%. In the present study out of 123 couples 87% were 1st cousin (n=107) while 13% were 2nd cousin (n=16). Therefore, the present results showed higher frequency than mentioned reports.

The present day study showed that 52% couples' parents were married to their cousin while 48% couple's parents were not which is comparable to other studies, e.g., the frequency of consanguineous marriage in parents was 1st cousin 72%, 2nd cousin 5% (Bardis, 1959). According to published results of the same study (Perveen and Rehman, 2012), 35.7% abortions and 21.1% still births were noted. While Brent (2004) stated that the World Health Organization (WHO) estimated that 15% of all clinically recognizable pregnancies end in an abortion. Rehmani et al. (2010) reported that there was a positive history of abortions which has significant correlation with congenital malformations. Among 373 couples (278 abortions and 95 stillbirths), fetal losses rate was significantly higher in related couples. According to Brent (2004) rate of abortion was 15%. On the other hand in Rehmani studies this rate was 74% while in the published results of the same study the rate of abortion was 35.7% and the rate of stillbirths was 21.1% (Perveen and Rehman, 2012) while according to Rehmani (2010) it was 25%. The higher frequency was found in the Rehmani study.

The risk of non-random marriages increased with the degree of consanguinity due to expression of various autosomal recessive disorders in the off springs because both parents may be the carriers of the same deleterious gene. As a result such marriage has a significant implication for recessive diseases, congenital malformations and decreased reproductivity. They also have both social and economic impact in the population groups that practice this type of marriage (Motulsky and Vogel., 1982). With regards to the effect of consanguinity on reproductivity, several authors have reported a significant increase in sterility, abortions, stillbirths, prenatal losses and neonatal deaths in consanguineous families (Hancioglu et al., 1992). It was also reported that consanguinity has either no or only a slight statistically non-significant effect on these parameters (Hussain, 1999). Therefore, the present results are in line with Hussain (1999) who showed that consanguinity and inbreeding have profound effect on perinatal mortality in Karachi, Pakistan. The malformations which have been found to be most common were cardiovascular, ophthalmic, skeletal, cutaneous and multiple malformations as recorded by Basaran et al. (1989) in Turkish population. In the present survey, it was reported that hemoglobinopathies in 12.2%, muscular disorder in 8.1% and obesity in 9.3%, however, among different genetic disorders diabetes was 9.3% in off springs as compared to other genetic disorders, which do not match with the results of Basaran et al. (1989).

Bajaur Agency is a hilly locality in KP province. It is comprised of many small villages including study areas, i.e., Alijan, Anatkali, Chamerkand, Gandaw, Loisam, Manudera, Nawagai, Nawaikali, Raghagan and Sadiqabad. Each area has slightly different traditions and family structures, which have some influences on the prevalence of inbreeding in Pakistan (Qidwai et al., 2001). Various factors were found to be responsible for having high incidence of consanguineous marriage in Pakistan. One of the main factors is the lack of suitable mates outside the family. This is due to geographic localization like in rural areas or cultural isolation, therefore, marriage to a relative may be the only possibility. Most of the consanguineous couples more frequently live in smaller villages and extended family environment. Another important reason is the preservation of property, especially the land and the desire to keep it within the family. A third reason is the popular belief that intra-familial marriage offers advantages in term of compatibility of the bride with her husband's family, where the bride finds it reassuring to marry into a known family background. Family pressure and falling in love are the other reasons for consanguineous marriage. Tradition of arrange marriages are the major causes stated for consanguinity in the present study which may be due to lack of social contacts and low level of education. Alper et al. (2004) and Yüksel et al. (2009) suggested that consanguinity is a social concern for the wellbeing of the family and daughter. It may have several other causes depending upon the geographical location of the study areas. In some areas family pressure and arrange marriage is the major cause but in other areas its major cause may be culture, economy, social, illiteracy and parental mentality. There is need to educate the people and create awareness about genetics and medical prospects of consanguineous marriages are prime important in reducing them.

CONCLUSIONS

Cousin marriages remain culturally and socially favored and respected in many countries, mostly in Arab countries, Iran, Pakistan, Turkey and parts of India. The risks of cousin marriage are the highest among families with severe segregating autosomal recessive conditions. These data suggest that premarital genetic, social counseling and mass media efforts are needed to increase public awareness about genetic risks associated with cousin marriage. Those female whose age is below 20 years should not get married because according to Hamamy (2010) younger female age at marriage leading to increased maternal reproductive span and congenital malformation. The frequency of consanguineous marriages correlates with an increase in recessively transmitted diseases, congenital malformations and infant mortality. First cousin marriage in inbred families carries an even higher risk for autosomal recessive genetic diseases than first cousin marriage in non-inbred family.

ACKNOWLEDGEMENT

The author is grateful Doctors and Employees, Ar-Rehman General Hospital, Bajaur Agency FATA, Khyber Pakhtunkhwa, Pakistan for cooperation in the present research. The experiments comply with the current laws of the country in which they were performed. We also attest that any human and /or animal studies undertaken as part of the research from which this manuscript was derived are in compliance with regulation of our institution(s) and with generally accepted guidelines governing such work.

REFERENCES

1. Abdulkareem A, Al-Abdulkareem A, Seifeddin G, et al., Consanguineous marriage in an urban area of Saudi Arabia: Rates and adverse health effects on the offspring. J Commu Health 2004; 23: 75-83.
2. Alper OM, Erengin H, Manguoglu AE, Bilgen T, Cetin Z, Dedeoglu N, et al., Consanguineous marriages in the

province of Antalya, Turkey. Ann Genet 2004; 47(2): 129-38.
3. Alwan A, Modell B, Disorders EMRO and community control of genetic and congenital Eastern Mediterranean region Egypt. Technical publication Series 24. WHO Regional Office, New York, USA, 1997, 1-40.
4. Bardis PD, Marriage and family living. A Fami Scale 1959; 21(4): 340-341.
5. Basaran N, Hassa H, Basaran A, Artan S, Stevenson JD, Sayli BS, The effect of consanguinity on the reproductive wastage in the Turkish population. Clin Genet 1989 36: 168–173 .
6. Bener, A, Hussain R, Teebi AS, Consanguineous marriages and their effects on common adult disease: Studies from an endogamous population. Med Princ Pract 2007; 16: 262–267.
7. Bittles AH, Makov E, In human mating patterns, inbreeding in human populations: An assessment of the costs. Edited by Tyalor, MCGN and Boyce, A. Cambridge University Press, Cambridge, UK, 1988, 153–167.
8. Bittles AH, Neel JV, The costs of human inbreeding and their implications for variation at the DNA level. Nat Gene 1994; 8: 117-121.
9. Bittles AHA, Community genetics perspective on consanguineous marriage. Commu Gen 2008; 11: 324–330.
10. Bittles AH, Hamamy HA, In genetic disorders among Arab populations, consanguinity and endogamy in Arab countries. Edited by Teebi, A. Springer, Heidelberg , UK 2nd Edition,2009; 1–130.Brent RL, Environmental causes of human congenital malformations: The pediatrician's role in dealing with these complex clinical problems caused by a multiplicity of environmental and genetic factors. Pediat 2004; 113: 957-968.
11. Donbak L, Consanguinity in Kahramanmaras city, Turkey and its medical impact. Sau Med J 2004; 25(12): 1991-1994.
12. Hancioglu A, Akadli B, Ergoçmen T, Some social aspects of Turkish marital unions and their relationship with early age mortality. Nüfus Bil Derg 14: 3–25.
13. Hamamy HA, Masri AT, Al-Hadidy AM, et al., Consanguinity and genetic disorders. Profile from Jordan Sau Med J 2007; 28: 1015-1017.
14. Hijazi, Z, Haider, MZ, Influence of consanguinity and Ig E receptor genotypes on clinical manifestations of asthma in Kuwaiti children. J Tropic Pediat 2001; 47: 13-6.
15. Hussain R, Community perceptions of reasons for preference for consanguineous marriages in Pakistan. J Bios Sci 1999; 31: 449-461.
16. Hussain R, Bittles AH, The prevalence and demographic characteristics of consanguineous marriages in Pakistan. J Biosoc Sci 1998; 30: 261–75.
17. Labayen I, Ruiz JR, Ortega FB, et al., Intergenerational cardiovascular disease risk factors involve both maternal and paternal BMI. Diab J Org 2010; 33: 4-36.
18. Mansoor H, Types of marriages in Pakistan. 2010; Online: http://EzineArticles.com/?expert =Hayi_Mansoor (Accessed: 12/01/2012).
19. Modell B, Darr A, Genetic counseling and customary consanguineous marriage. Nat Rev Gene 2002; 3: 225–229.
20. Mohammadi MM, Hooman HA, Afrooz GA, Daramadi PS, The relationship between consanguineous marriage and death in fetus and infants. J Res Med Sci 2012; 17(5): 448-451.
21. Motulsky AG, Vogel F, Human genetics, problems and approaches. Springer- Verlag, Berlin, Germany 1982; 1-134.
22. Perveen F, Rehman S, Consanguineous Marriages and the Malformation in their F_1 Generation. Asia J Pharma Heal Sci 2012; 2(3): 406-411.
23. Perveen F, Hussain Z, Use of statistical techniques in analysis of biological data. Bas Res J Agri Sci Rev 2012; 1(1): 01-10; http://www.basicresearchjournals.org/agric/pdf/Farzana%20and%20Zahid.pdf.
24. Qidwai W, Iqbal AS, Faisal MK, Prevalence and perceptions about consanguineous marriages among patients presenting to family physians, at a Teaching Hospital in Karachi, Pakistan. J Med 2001; 2:27-31.
25. Rahmani SA, Aboualsoltani F, Pourbarghi M, et al., The frequency of consanguineous marriages and their effects on offspring's in Tabriz City. Shi Med J 2010; 11: 1–2.
26. Rao TS, Prabhakar AK, Jagannatha R, Relationship between consanguinity and depression in a South Indian population. Ind J Psych 2009; 51(1): 50-2.
27. Shami SA, Qaisar R, Bittles AH, Consanguinity and adult morbidity in Pakistan. Lance 1991; 338: 954–955.
28. Teebi A, WCMC-Q physician explores the social and health implications of cousin marriage.Wie Cor Med Col QR; 2009; 1–55.Temtamy SA, Meguid AN, Mazen I, et al., A genetic epidemiological study of malformations at birth in Egypt. East Medit Heal J 1998; 4 (2): 252-259.
29. Tunçbilek E, Koç I, Consanguineous marriage in Turkey and its impact on fertility and mortality. Ann Hum Gene 1994; 58: 321-329.
30. Saliternik VR, Friedlander Y, Cohen T, Consanguinity in a population sample of Israeli Muslim Arabs, Christian Arabs and Druze. Ann Hum Biol 2002; 29: 422–431.
31. Wahab A, Ahmad M, Consanguineous marriages in the Sikh community of Swat, NWFP,Pakistan. J Soc Sci 2005; 10(3): 153-157.
32. Weiss JL, Malone, FD, Emig D, Obesity, obstetric complications and cesarean delivery rate a population based screening study. Amer J Obst Gyne 2004; 190: 1091–7.
33. Yüksel S, Kutlubay A, Karaoðlu L, Yoloðlu S, The Prevalence of consanguineous marriages in the city of Malatya, Turkey. Turk J Med Sci 2009; 39 (1): 133-137.