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Pattern of inbreeding in thalassemia affected families resident in Tuman Leghari district Dera ghazi khan

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Abstract
The inbred marriages are highly acceptable in many populations of human beings but their prevalence and configuration vary depending on ethnicity, religious conviction, learning and socioeconomic circumstances of relevant population. Such social contracts are reported as the most important cause of enhancing the occurrence of the hereditary disorders by recessive autosomal, especially Thalassemia.
The challenges of hereditary diseases trouble in the population calls for the progress of anticipation programs. But the implementations of different means require the information about types and prevalence of hereditary diseases and family system in population. This study focuses on inbred marriages and genetic diseases in the general population of Tuman Leghari resident in district D.G. Khan, Punjab, Pakistan. Ethnically the highest positive response was found in Saraiki (other than Baloch) 47.30% than Leghari (32.26%) or Khosa (20.44%). The Saraiki other than Baloch, Khosa and Leghari families were 47.30%, 32.26%, and 20.44% respectively.
There was many differences found between the frequency of inbred and out bred marriages of total sample as well as within the ethnic groups, Leghari, and Khosa (X^2=10.87 P<0.001; X^2=47.45 P<0.001 and X^2=03.73 P<0.001 respectively.
Statistical analysis uncover the significant difference among various types of marriages in Leghari, Khosa and Saraiki other than Baloch (X^2=20.00 P<0.001). A significant difference was observed in Leghari and non-significant difference observed in Khosa and Saraiki other than Baloch with 10.87, 27.09 and 3.73 Chi values respectively. The calculated mean inbreeding coefficient (F) for the total population was 0.0287. Three groups formed on male education in order to assess the effect of education on the inbred marriages.
In total samples, representing the lower, middle and higher levels of male education comprised Leghari 114 (19.95%), Khosa 133 (34.72%) and Saraiki other than Baloch 184 (45.32%) couples, respectively. Female education found to be statistically significant in Khosa group.
The effect of socioeconomic status of male on marriages was also studied; the sample was distributed in three groups on the basis of socioeconomic status of male at the time of marriage. The total sample representing the lower, middle, and higher levels comprised Leghari 120 (29.56%), Khosa (131 (32.26%) and Saraiki other than Baloch 155 (38.18%). The statistical analysis uncovers significant results in total and Leghari ethnic groups. In order to find the impact of socioeconomic status of female on inbred marriage, the sample was divided into three groups based on female socioeconomic status at the time of marriage. The total sample representing the lower, middle, and higher levels comprised Leghari 108 (26.60%), Khosa 152 (37.44%) and Saraiki other than Baloch 146 (35.96%). The statistical analysis uncovers significant results in total sample, Leghari and Saraiki other than Baloch ethnic groups. During the survey, The number of thalassemia couples were 26 (66.67%) respectively. The affected couples with Thalassemia were found widespread in the sample. On ethnic base, 33.33%, 10.26% and 56.41% of total afflicted couples were found to be related with the Leghari, Khosa and Saraiki other than Baloch groups respectively. In the groups of afflicted couples based on genetic diseases, inbreeding was found 100% in thalassemia.
Data on children in Leghari, Khosa and Saraiki other than Baloch were statistically significant in both affected and non-affected. In case of data on number of children in Leghari, Khosa and Saraiki other than Baloch in albino were found non-significant and in thalassemia were highly significant in chi test.
Awareness about thalassemia and behavior of parents, relatives, society toward Thalassemics were found statistically significant.

Keywords: Inbreeding, outbreeding, Tuman Leghari, Khosa, Saraiki other than Baloch, thalassemia

Introduction

Inbreeding

Inbreeding marriages are described as a social contract among the individuals which have blood relations. This includes such type of relations which are termed as first cousins,

second cousins and distantly related. In a few groups, the most elevated inbreeding are come to with relational unions between double first cousins which are practiced in Arabs and uncle-niece unions are likewise by and by among South Indians [1].

Inbreeding coefficient (F) is defined as the measure of the extent of alleles with indistinguishable duplicates which are communicated in the posterity of inbreeding from both of the parents. If the inbreeding coefficient (F) is equal or more than 0.0156 then it is considered as an inbred marriage. This incorporates such kind of unions termed as first cousins, second cousins and remotely related [2].

The commonness of inbreeding and rate of inbred marriages fluctuate broadly from population to population and groups, contingent upon ethnicity, religion, society at nearby level and topographical dissemination of the populations [3].

Inbreeding relational unions likewise regularly happens among the emigrants people from profoundly inbreeding nations and locales, similar to Lebanon, Turkey, Pakistan and North Africa, which are presently occupant in Australia, North America and Europe [4-5].

Hereditary disorders

Human hereditary disease is brought on by variations in the genes from the hereditary materials of the normal people. There are four kinds of hereditary abnormalities like single-gene disorder, chromosomal disorder, multifactorial and mitochondrial disorders. Single gene disorder is caused by a single mutant gene. Such disorder can be transferred in many generations by many ways. This abnormality is brought on basically by deletion or addition of the DNA sequence in single gene [6-7].

Single gene disorder

A single gene disorder is the consequence of a single transformed allele. Single gene disorder can be gone on to resulting generations in a few ways. Genomic engraving and uniparental disomy, notwithstanding, may influence legacy designs. Two duplicates of the gene must be transformed for a man to be influenced by an autosomal recessive disorder. Illustrations of this kind of disorders are Albinism, medium-chain acetyl-CoA dehydrogenase lack, and thalassemia disorder. Certain different phenotypes, for example, wet versus dry earwax, are likewise decided in an autosomal recessive manner [8].

Thalassemia

Thalassemia is an acquired disorder portrayed by irregular and low generation of hemoglobin (Hb) and unnecessary obliteration of red blood cells (RBCs). Thalassemia causes uneven degrees of sickliness, which can broaden from massive to life-devastating. It is assessed that 1.5% of the world's population are carriers of beta-thalassemia i.e. at any rate there are 80 million to 90 million individuals with an expected 60,000 new cases being conceived every year [9-10].

In offering counseling for inbreeding couples it is essential to recognize families with a known hereditary disorders and the family without disorders can be studied by family history and developing a pedigree [11-12].

Aims of the proposed study

1. To locate and identify families with hereditary disorders.
2. To study inbreeding among thalassemia affected families.
3. Counseling of the families affected with thalassemia disorders

Material and methods

Study Area

In the present study we mean to evaluate inbreeding in thalassemia influenced families resident in Tuman Leghari District D.G KHAN located in south of the Punjab, Pakistan.

A questionnaire was planned and conveyed in the study region to gather the applicable data amid the field review The information gathering was finished in six months beginning from September 2015 to February 2016.

During the overview, 406 families were met for information accumulation. Population was isolated into three fundamental ethnic groups i.e. Leghari, Khosa, Saraiki other than Baloch.

Families Studied (Clinical Basis)

The families were found out by recognizing prob and amid the review for inbreeding. At that point the families were gone by at their places of home. The senior citizens and relatives of the families were met to get data about the thalassemia like hereditary issue and other important matters.

Statistical Analysis

Every one of the information was broke down by utilizing chi-square test as a part of a measurable programming bundle Mini Tab 17 rendition. The standard techniques and images portrayed by [13] were utilized for drawing family. What's more, Cyrillic form 2.1.3 (Cherwell experimental distributed 1997, www.cherwell.com).

Results

During information accumulation, 406 families were drawn nearer arbitrarily to concentrate on the impacts of inbreeding. Ethnically the most astounding positive reaction was found in Saraiki (other than Baloch) 47.30% than Leghari (32.26%) or Khosa (20.44%). Table .1 presents relative numbers and percent frequencies of families having a place with various ethnic groups and managerial ranges inside of the example. The Saraiki other than Baloch, Khosa and Leghari families were 47.30%, 32.26%, and 20.44%, respectively.

Table 1: Data summary on basis of tribes in Tuman Leghari Dera Ghazi Khan

Ethnicity	Number	Percentage
Leghari	131	32.26
Khosa	83	20.44
Saraiki Other than Baloch	192	47.00
Total 406		

Table 2: Statistical analysis for comparison of inbreeding and out breeding marriages between Leghari, Khosa and Saraiki other than Baloch couples from Tuman Leghari

Samples	Inbreeding	Outbreeding	Total	X^2
Leghari	126 (35.10%)	05 (10.64%)	131 (32.26%)	10.87 P < 0.001
Khosa	67 (18.66%)	16 (34.04%)	83 (20.44%)	47.45 P < 0.001
Saraiki Other than Baloch	166 (46.24%)	26 (55.32%)	192 (47.00%)	03.73 P < 0.001
	359 (88.42%)	47 (11.58%)	406	34.05 P < 0.001

Table 3: Distribution of Marriage types in Ethnic groups of Tuman Leghari Tribe.

Types of Marriages	F	Leghari	Khosa	Non Baloch	Total
FC	0.3821	49 (37.40%)	36 (43.37%)	72 (37.50%)	157 (38.67%)
SC	0.1301	37 (28.24%)	16 (19.28%)	53 (27.60%)	106 (26.11%)
DR	0.1085	40 (30.53%)	15 (18.07%)	31 (16.15%)	86 (21.18%)
NR	0	05 (3.83)	16 (19.28%)	36 (18.75%)	57 (14.04%)
Total	0.1354	131 (32.27%)	83 (20.44%)	192 (47.29%)	406

X^2= 20.00, P> 0.001

Table 4: Comparison of inbred and outbreed marriages in Leghari, Khosa and Saraiki other than Baloch

Sample	Mean F	IM	OM	Total	X^2
Leghari	0.0301	126 (35.10%)	05 (10.64%)	131 (32.27%)	10.87 P < 0.001
Khosa	0.0256	67 (18.66%)	16 (34.04%)	83 (20.44%)	47.45 P<0.001
Saraiki Other than Baloch	0.0303	166 (46.24%)	26 (55.32%)	192 (47.29%)	3.73 P < 0.001
Total	0.0287	359 (88.42%)	47 (11.58%)	406	16.160.001<**P**<0.005

X^2=16.16; 0.005< P < 0.001

IM= Inbreeding marriages, OM= Out breeding marriages

Table 5: Inbreeding coefficient (F), inbreeding and outbreeding marriages with respect to husband's education

Population	Mean F and Inbreeding	Husband's education level			Total
		Lower	Middle	Higher	
Mean Inbreeding coefficient (F)		0.0272	0.0292	0.0311	
Leghari	Inbreed	16	27	39	82
	Outbreed	11	17	21	49
	Total	27	44	60	131
	X^2= 0.33 0.90 < P< 0.75				
Mean Inbreeding coefficient F		0.0291	0.0301	0.0251	
Khosa	Inbreed	10	17	24	51
	Outbreed	07	12	13	32
	Total	17	29	37	83
	X^2= 0.26 0.90 < P< 0.75				
Mean Inbreeding coefficient F		0.0303	0.0249	0.0310	
Saraiki other than Baloch	Inbreed	22	37	48	107
	Outbreed	15	31	39	85
	Total	27	68	87	192
	X^2= 4.07 P>0.001				
Mean Inbreeding coefficient F		0.0290	0.0249	0.0271	
Total	Inbreed	48	81	111	240
	Outbreed	33	60	73	166
	Total	81	141	184	406
	X^2=0.21 P>0.001				

Table 6: Inbreeding coefficient (F), inbreeding and outbreeding marriages with respect to the Female's educational level

Population	Mean F and Marriage type	Female's education level			Total
		Lower	Middle	Higher	
Mean Inbreeding coefficient F		0.0261	0.0279	0.0301	
Leghari	Inbreed	31	18	37	86
	Outbreed	13	11	21	45
	Total	44	29	58	131
	X^2=0.64 0.90 < P< 0.75				
Mean Inbreeding coefficient F		0.0302	0.0305	0.0307	
Khosa	Inbreed	15	21	14	50
	Outbreed	07	09	17	33
	Total	22	30	31	83
	X^2=40.96 0.90 < P< 0.75				
Mean Inbreeding coefficient F		0.0280	0.0202	0.0278	
Saraiki other than Baloch	Inbreed	31	43	44	118

	Outbreed	17	31	26	74
	Total	48	74	70	192
	X^2=0.69 P>0.001				
Mean Inbreeding coefficient F		0.0265	0.0271	0.0222	
Total	Inbreed	77	82	95	254
	Outbreed	37	51	64	152
	Total	114	133	159	406
	X^2=2.61 P>0.001				

Table 7: Inbreeding coefficient (F), inbreed and outbreed marriages with respect to socioeconomic status of male.

Population	**Mean F and Marriage type**	**Male's Socioeconomic status**			**Total**
		Lower	Middle	Higher	
Mean Inbreeding coefficient F		0.0211	0.0256	0.0215	
Leghari	Inbreed	34	21	40	95
	Outbreed	17	13	06	36
	Total	51	34	46	131
	X^2=8.55 0.90 < P< 0.75				
Mean Inbreeding coefficient F		0.0311	0.0301	0.0305	
Khosa	Inbreed	13	19	17	49
	Outbreed	09	11	14	34
	Total	22	30	31	83
	X^2=1.02 0.90 < P< 0.75				
Mean Inbreeding coefficient F		0.0256	0.0298	0.0227	
Saraiki other than Baloch	Inbreed	23	37	48	108
	Outbreed	24	30	30	84
	Total	47	67	78	192
	X^2=1.67 P>0.001				
Mean Inbreeding coefficient F		0.0311	0.0305	0.0301	
Total	Inbreed	70	77	105	252
	Outbreed	50	54	50	154
	Total	120 (29.56%)	131 (32.26%)	155 (38.18%)	406
	X^2=8.32 P>0.001				

Table 8: Inbreeding coefficient (F), inbreeding and outbreeding marriages with respect to the Female's educational level.

Population	**Mean F and Marriage type**	**Female's socioeconomic status**			**Total**
		Lower	**Middle**	**Higher**	
Mean Inbreeding coefficient F		0.0231	0.0241	0.0253	
Leghari	Inbreed	27	19	39	85
	Outbreed	16	18	12	46
	Total	43	37	41	131
	X^2=9.05 0.90 < P< 0.75				
Mean Inbreeding coefficient F		0.0256	0.0271	0.0278	
Khosa	Inbreed	13	23	19	55
	Outbreed	08	11	09	28
	Total	21	34	28	83
	X^2=0.21 0.90 < P< 0.75				
Mean Inbreeding coefficient F		0.0311	0.0321	0.0325	
Saraiki other than Baloch	Inbreed	29	45	49	123
	Outbreed	15	36	18	69
	Total	44	71	67	192
	X^2=6.28 P>0.001				
Mean Inbreeding coefficient F		0.0341	0.0361	0.0357	
Total	Inbreed	69	87	107	263
	Outbreed	39	65	39	143
	Total	108 (26.60%)	152 (37.44%)	146 (35.96%)	406
	X^2= 8.4 P>0.001				

Table 9: Data on marriages in non-affected and affected families.

S. N	**Tribe**	**F.C**	**S.C**	**D.R**	**N.R**	**Total**	**X^2**
1	Leghari	44 (27.85%)	37(35.23%)	32(37.21%)	5(08.77%)	118(29.06%)	11.67
2	Khosa	33(20.88%)	15(14.28%)	15(17.46%)	16(28.07%)	79(19.45%)	03.05
3	Saraiki other than Baloch	60(37.97%)	44(41.90%)	30(34.88%)	36(63.15%)	170(04.18%)	05.70
4	Affected families	21(13.29%)	09(08.57%)	09(10.47%)	00(00.00%)	39(09.60%)	04.00
Total		158(38.91%)	105(25.86%)	86(21.18%)	57(14.04%)	406	24.42

F.C = First Cousin, S.C = Second Cousin, D.R = Daistantly related, N.R = Non-related

Table 10: Data on number of Thalassemia affected families.

S.N	Tribe	F.C	S.C	D.R	N.R	Total	X^2
1	Leghari	03 (25%)	-	08 (100%)	-	11 (42.31%)	9.66
2	Khosa	03 (25%)	01 (16.66%)	-	-	04 (15.38%)	050
3	Saraiki other than Baloch	06 (50%)	05 (83.33%)	-	-	11 (42.31%)	1.53
Total		12 (46.15%)	06 (23.08%)	08 (30.77%)	00	26	11.69

Table 11: Data on number of children in non-affected families

S.N	Tribe	Number of children in non-affected families								Total	X^2
		1st cousin		2nd cousin		Distantly related		Non-related			
		M	F	M	F	M	F	M	F		
1	Leghari	77(32.35%)	29 (38.16%)	78 (42.39%)	27 (39.13%)	50(31.85%)	34(41.97%)	15(16.48%)	05(08.77%)	315(33.05%)	25.8
2	Khosa	56(23.53%)	13(17.11%)	28 (15.22%)	13(18.84%)	28(17.83%)	08(09.88%)	30(32.96%)	22(38.6%)	198(20.77%)	24.46
3	Saraiki	105(44.12%)	34(44.73%)	78 (42.39%)	29(42.03%)	79(50.32%)	39(48.15%)	46(50.54%)	30(52.63%)	440(46.17%)	2.86
Total		238(24.97%)	76(07.97%)	184(19.30%)	69(07.24%)	157(16.47%)	81(08.5%)	91(09.55%)	57(05.98%)	953	53.12

Table 12: Data on number of children of affected families

S.N	Tribe	Number of children in Affected families								Total	X^2
		1st cousin		2nd cousin		Distantly related		Non-related			
		M	F	M	F	M	F	M	F		
1	Leghari	18(33.96%)	05(17.24%)	-	-	10(45.45%)	09(56.25%)	02(40%)	01(25%)	45(27.11%)	7.13
2	Khosa	16(30.19%)	10(34.48%)	-	-	09(40.91%)	05(31.25%)	01(20%)	01(25%)	42(25.30%)	3.72
3	Saraiki	19(35.85%)	14(48.28%)	21(100%)	16(100%)	03(13.64%)	02(12.5%)	02(40%)	02(50%)	79(47.6%)	30.94
Total		53(31.92%)	29(17.47%)	21(12.65%)	16(09.64%)	22(13.25%)	16(09.64%)	05(03.01%)	04(02.41%)	166	41.79

Table 13: Data on children of thalassemia affected families

S.N	Tribe	Number of children in Thalassaemia affected families										Total	X^2
		1st cousin		2nd cousin		Distantly related		Non-related		Alive	Dead		
		M	F	M	F	M	F	M	F				
1	Leghari	02(10.52%)	02(11.76%)	-	-	13(100%)	12(100%)	-	-	29(38.16%)	-	58(37.91%)	28.83
2	Khosa	05(26.32%)	08(47.06%)	-	-	-	-	-	-	13(17.11%)	01(100%)	26(17.00%)	14.03
3	Saraiki	12(63.16%)	07(41.18%)	11(100%)	04(100%)	-	-	-	-	34(44.73%)	-	68(44.44	10.65
Total		19(12.42%)	17(11.11%)	11(07.19%)	04(02.61	13(08.5%)	12(07.84%)	00	00	76(49.67%)	01(0.65%)	153	53.51

Table 14: Awareness about Thalassemia

Genetic	Treatable	Not treatable	Medicinal effect	Curse	Superstitious	Ignore
290 (71.43%)	37 (9.11%)	27 (6.65%)	10 (2.46%)	08 (1.97%)	04 (0.99%)	30 (7.39%)

Table 15: Behavior of the Parents, Relatives and Society

Behavior Type	Parents	Relatives	Society
Good	218 (53.69%)	191 (47.04%)	187 (46.06%)
Bad	43 (10.59%)	71 (17.49%)	72 (17.73%)
Ignore	120 (29.56%)	123 (30.29%)	127 (31.28%)
Mercy	25 (6.16%)	21 (5.17%)	20 (4.93%)
Total	406	406	406

For the study displayed here, 406 families are incorporated. In which twenty six families/couples are influenced with thalassemia.

Thalassemia Affected families

Twenty six with thalassemia were learned from various union councils of Tuman Leghari of Dera Ghazi Khan District. Eleven Families/couples has a consign with Leghari, Khosa and Eleven to Saraiki other than Baloch.

Family pedigree with Thalassemia demonstrating autosomal suppressed method of legacy

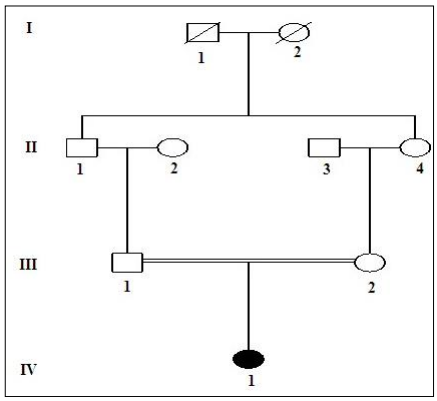

Fig 1: Some Thalassemia Affected individuals in Tuman Leghari

a)

b)

Clinical Features of Thalassemia

In above mentioned families affected with Thalassemia the symptoms observed related to growth problems – not putting on weight or growing in height. Anaemia – red blood cell deficiency, leading to tiredness, weakness and shortness of breath. Jaundice – yellowing of the skin and whites of the eyes. Regular transfusion of blood from donors.

Discussion

In this study, a questionnaire was distributed to distinguish different types of marriages, for examples, particularly the inbreeding marriages and to evaluate its effect on the population of Tuman Leghari resident of D. G. Khan District of Punjab Province In the present study, our outcomes furthermore demonstrated that 70.52% marriages in the overall population and relational unions in all inclusive community respectively 35.10%, 18.66%, and 46.24% are inbred (Table.2 and 3). Inside of the limits of inbreeding characterized by the above parameters, close inbreeding unions are particular because of a coinciding of key elements of groups and individual-level foundation essentials. This study revealed a high rate of inbreeding 88.42% with 0.0201 mean coefficients of inbreeding by and large population (Table.4) our outcomes are in accord with the results of a past study aimed at Pakistan level [14].

Some of the possible reasons of high frequency of inbreeding may be:

1. Tribalism is intensely recognized in progress account of population understudy.
2. High rate of inbreeding alongside the variables like geological conditions, antagonistic method for transportation, destitution.
3. More distant family culture presence in the range expands shot of inbreeding.

This study revealed a high rate of inbreeding in ethnic population like Leghari (35.10%). Khosa (18.66%) and Saraiki other than Baloch (46.24%) (Table4.4).These ethnic gatherings varied essentially from each other regarding inbreeding relational unions. We concentrated on the impact of guidance (both male and female), male financial status, and male occupation on predominance of inbreeding. Rate of inbreeding is as a result firmly connected with these components (Table.5 and 6).

In the present study, the impact of marriage sorts on particular gathering of hereditary disorder thalassemia was additionally examined. General inbreeding relational unions were discovered altogether most inexhaustible among burdened couples when contrasted with overall public (Table.7 and 8). (Table.9 to 10).Awareness about the hereditary disorders were requested in the study from every individual from family demonstrates the ailments were considered firmly associate to the deadly hereditary qualities allowed from solid inbreeding among families with rate of 71.43% when contrasted with treatable (9.11%), not treatable (6.65%), Medicinal impact (2.46%), curse (1.97%), superstitious (0.99%) and overlook (7.39%). Conduct of the folks, relative and society were additionally addressed from families which communicated a higher rate of good conduct with the tormented youngsters 53.69, 47.04 and 46.06 individually. Disregard of influenced youngsters was additionally high in rate among benevolence and terrible demeanors of parents, relatives and society (Table 11 to15).

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