ISONYMY AND INBREEDING IN THE POPULATION OF JHELUM (PUNJAB)

Pages with reference to book, From 249 To 255

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Abstract

Eighteen isonymic groups were investigated for this study. Minhas, Awan and Rajpoot surnames commonly occur in the population of Jhelum. Mean coefficients of inbreeding vary between 0.01682 - 0.03422. Khokhar, Carpenter and Jat indicate the highest mean coefficients of inbreeding. An association between prenatal deaths and mean F in first cousin offspring was not observed. However, a non-significant association was seen between prenatal deaths and mean F in bradari - bradari distant relations offspring. Lethal equivalents carried heterozygously per person range between 0.8064 - 10.0928 (JPMA 36: 249, 1986).

INTRODUCTION

Marriage pattern in Pakistan indicates that people tend to marry a partner bearing the same surname. Marriages between isonymic groups are, however, not prohibited. These isonymic groups which are called “Bradari” here, constitute many Bradari systems in a population.

Crow and Mange[1] measured inbreeding from marriages within isonymic groups under certain conditions. This methodology was further applied on Peru[2] and Swiss[3] populations. The conditions under which Crow and Mange[1] methodology is applicable, are not fulfilled by thispopulation. The present study was carried out with a view to investigate the degree of consanguinity among various isonymic groups in the Jhelum population. Studies on the subject have aheady been made by Shami and Co-workers[4-7] on other populations of Punjab, Pakistan indicating intercity variation in the distribution of surnames, preference to marriage types and degree of consanguinity.

MATERIALS AND METHODS

The present investigation was carried out on sample population collected from Jhelum city (Punjab) for the study of consanguineous and non consanguineous marriages. The details of this population .are refered by Shami and Minhas.[8] In this report proportions of parental relationships, of offspring mortality with mean F were analysed among various isonymic groups. Wright’s method[9] was used for the calculation of mean coefficients of inbreeding. In this analysis only those isonymic groups were included which contained at least ten married couples.

RESULTS

The proportions of parental relationships in various family surnames are shown in Table 1.

TABLE – I

Proportions of Parental Relationships in Isonymic Groups of Jhelum Population.

Family Surname	Parental Relationships						
	D1C	1C	1½C	D2C	BDR	B	U
Arain	–	24	2	–	1	18	20
	–	36.92	3.07	–	1.54	27.69	30.77
Awan	–	48	6	3	2	19	50
	–	37.50	4.69	2.34	1.56	14.84	39.06
Bhatti	–	35	2	1	6	15	29
	–	42.68	2.44	1.22	–	18.29	35.36
Butt	–	13	–	–	3	6	14
	–	36.11	–	–	8.33	16.67	38.89
Carpenter	–	7	–	–	1	3	3
	–	50.00	–	–	7.14	21.43	21.43
Damyal	–	8	–	1	–	5	8
	–	36.36	–	4.54	–	22.73	36.36
Gondal	–	9	–	1	–	5	12
	–	33.33	–	3.70	–	18.52	44.44
Janjua	–	22	1	–	–	12	18
	–	41.51	1.88	–	–	22.64	33.96
Jat	–	14	–	2	1	5	10
	–	43.75	–	6.25	3.12	15.62	31.25
Khokhar	1	9	1	–	–	5	5
	4.76	42.86	4.76	–	–	23.81	23.81
Malah	–	3	–	1	1	4	4
	–	23.07	–	7.69	7.69	30.77	30.77
Minhas	–	93	13	1	3	43	70
	0.45	41.52	5.80	0.45	1.34	19.19	31.25
Mughal	–	4	1	1	1	2	4
	–	30.77	7.69	7.69	7.69	15.38	30.77
Qureshi	–	3	–	–	–	2	5
	–	30.00	–	–	–	20.00	50.00
Rajput	–	43	3	1	3	29	34
	–	38.05	2.65	0.88	2.65	25.66	30.09
Sahi	1	22	4	–	1	18	20
	1.54	33.84	6.15	–	1.54	27.69	30.77
Syed	–	7	–	–	4	4	5
	–	35.00	–	–	20.00	20.00	25.00
Tarer	–	8	2	1	–	5	12
	–	28.57	7.14	3.57	–	17.86	42.86

D1C. double first cousin., 1C. first cousin., 1½C. first cousin once removed., BDR. bradari distant relation., B. bradari U. unrelated.

Khokhar have the highest and Minhas have the lowest proportions of double first cousins. First cousin marriages are the highest among Carpenter, Jat and Bhatti, and the lowest in Malah and Tarer isonymic groups. Mughal and Tarer surnames indicate the highest marriages among first cousin once removed and the lowest marriages of this relationship are in Janjua and Bhatti. The highest representation of

double second cousin marriages is in Malah, Mughal and Jat but Minhas, Rajput and Bhatti showed the lowest proportion of marriages in this relationship. Marriages among bradari distant relations are the highest in Syed, Butt, Carpenter surnames, but the lowest in Minhas, Arain and Sahi. Bradari marriages are the highest in Malah, Arain and Rajput, but the lowest in Awan, Mughal and Jat. Unrelated marriages have the highest proportions in Qureshi, Gondal and Awan surnames, however, Carpenter, Khokhar and Syed have the lowest representation of unrelated marriages.

The parental relationships are represented as 16.67% double first cousins, 100% first cousins, 55.56% first cousins once removed. 50.00% double second cousins, 61.11% bradari distant relations, 100% bradari relations and 100% unrelated relations. Percentage representation of each isonymic group in descending order is Minhas 21.81; Awan, 1246% ; Rajput, 11.00; Bhatti, 7.98; Arain, 6.33; Sahi, 6.33; Janjua, 5.16; Butt, 3.51; Jat, 3.12;Tarer, 2.73; Gondal, 2.63; Damyal, 2.14; Khokhar, 2.04; Syed, 1.95; Carpenter, 1.36; Malah, 1.26; Mughal 1.26; Qureshi, 0.97. Total number of individuals in each isonymic group were divided,.by the sample size to calculate percentage representation of each surname.

Mean coefficients of inbreeding (F) for each isonymic group were calculated followin Wright's method (1922), which are shown Syed, 0.02187; Gondal, 0.02199; Butt, 0.02256; Arain, 0.022404; Mughal, 0.02404; Damyal, 0.02414; Rajpoot, 0.02489; Sahi, 0.02499;Awan,0.02563; Janjua, 0.026453; Bhatti, 0B278; Minhas, 0.02846; Jat, 0.02929; Carpenter, 0.03125; Khokhar, 0.03422.

Consanguinity effects in the isonymic groups studied here are shown in Table II.

TABLE – II

Percentage Distribution of Prenatal Deaths (PL), Postnatal Deaths (PD), Total Deaths (TD), Livebirths (LB), Total surviving (TS), and Total Pregnancies (TP) in Parental Relationships of various Isonymic Groups.

Surname		Parental Relationships IC		AC		B–BDR		U	
Arain	1.PL	40.00	(8)	5.00	(1)	25.00	(5)	30.00	(6)
	2.PD	37.50	(3)	12.50	(1)	37.50	(3)	12.50	(1)
	3.TD	39.28	(3)	7.14	(2)	28.57	(8)	25.00	(7)
	4.LB	34.57	(93)	2.97	(8)	34.20	(92)	28.25	(76)
	5.TS	34.48	(90)	2.68	(7)	33.08	(89)	28.73	(75)
	6.TP	34.95	(101)	3.11	(9)	33.56	(97)	28.37	(82)
Awan	1.	66.67	(20)	10.00	(3)	10.00	(3)	13.33	(4)
	2.	23.53	(4)	5.88	(3)	23.53	(4)	47.06	(8)
	3.	51.06	(24)	8.51	(4)	14.89	(7)	25.53	(12)
	4.	38.50	(216)	6.95	(39)	14.44	(81)	40.11	(225)
	5.	38.97	(212)	6.98	(38)	14.15	(77)	39.89	(217)
	6.	39.93	(236)	7.11	(42)	14.21	(84)	38.75	(229)
Bhatti	1.	54.54	(18)	9.09	(3)	15.15	(5)	21.21	(7)
	2.	47.83	(11)	0.00	(0)	30.43	(7)	21.74	(5)
	3.	51.78	(29)	5.36	(3)	21.43	(12)	21.43	(12)
	4.	46.33	(164)	4.52	(16)	18.36	(65)	30.79	(109)
	5.	46.22	(153)	4.83	(16)	17.52	(58)	31.42	(104)
	6.	47.03	(182)	4.91	(19)	18.08	(70)	29.97	(116)
Butt	1.	10.00	(1)	—	—	30.00	(3)	60.00	(6)
	2.	36.36	(4)	—	—	9.09	(1)	54.54	(6)
	3.	23.81	(5)	—	—	19.05	(4)	57.14	(12)
	4.	29.63	(48)	—	—	29.01	(47)	41.36	(67)
	5.	29.14	(44)	—	—	30.46	(46)	40.39	(61)
	6.	28.49	(49)	—	—	29.00	(50)	42.44	(73)
Carpenter	1.	100.00	(2)	—	—	0.00	(0)	0.00	(0)
	2.	0.00	(0)	—	—	0.00	(0)	0.00	(0)
	3.	100.00	(2)	—	—	0.00	(0)	0.00	(0)
	4.	50.94	(27)	—	—	28.30	(15)	20.75	(11)
	5.	50.94	(27)	—	—	28.30	(15)	20.75	(11)
	6.	52.73	(29)	—	—	27.27	(15)	20.00	(11)
Damyal	1.	18.18	(2)	27.27	(3)	9.09	(1)	45.45	(5)
	2.	53.84	(7)	0.00	(0)	7.69	(1)	38.46	(5)
	3.	37.50	(9)	12.50	(3)	8.33	(2)	41.67	(10)
	4.	47.22	(45)	0.00	(0)	20.62	(20)	31.96	(31)
	5.	46.43	(39)	0.00	(0)	22.62	(19)	30.95	(26)
	6.	44.44	(48)	2.78	(3)	19.44	(21)	33.33	(36)
Gondal	1.	92.31	(12)	7.69	(1)	0.00	(0)	0.00	(0)
	2.	75.00	(3)	0.00	(0)	0.00	(0)	25.00	(1)
	3.	88.23	(15)	5.88	(1)	0.00	(0)	5.88	(1)
	4.	30.25	(36)	5.04	(6)	17.65	(21)	47.06	(56)
	5.	28.69	(33)	5.22	(6)	18.26	(21)	47.82	(55)
	6.	36.36	(48)	5.30	(7)	15.91	(21)	42.42	(56)
Janjua	1.	50.00	(10)	10.00	(2)	10.00	(2)	30.00	(6)
	2.	62.50	(5)	0.00	(0)	25.00	(2)	12.50	(1)
	3.	53.57	(15)	7.14	(2)	14.28	(4)	25.00	(7)
	4.	39.07	(84)	1.39	(3)	25.58	(55)	33.95	(73)
	5.	38.16	(79)	1.45	(3)	25.60	(53)	34.78	(72)
	6.	40.00	(94)	2.13	(5)	24.25	(57)	33.62	(79)
Jat	1.	88.89	(8)	11.11	(1)	0.00	(0)	0.00	(0)
	2.	25.00	(1)	0.00	(0)	0.00	(0)	75.00	(3)
	3.	69.23	(9)	7.69	(1)	0.00	(0)	23.07	(3)
	4.	40.60	(54)	5.26	(7)	21.05	(28)	33.08	(44)
	5.	41.08	(53)	5.43	(7)	21.70	(28)	31.78	(41)
	6.	43.66	(62)	5.63	(8)	19.72	(28)	30.98	(44)
Khokhar	1.	66.67	(6)	0.00	(0)	11.11	(1)	22.22	(2)
	2.	70.00	(7)	20.00	(2)	0.00	(0)	10.00	(1)
	3.	68.42	(13)	10.52	(2)	5.26	(1)	15.79	(3)
	4.	46.87	(45)	5.21	(5)	19.79	(19)	28.12	(27)
	5.	44.18	(38)	3.49	(3)	22.09	(19)	27.08	(26)
	6.	48.57	(51)	4.76	(5)	19.05	(20)	27.62	(29)
Malah	1.	0.00	(0)	0.00	(0)	100.00	(1)	0.00	(0)
	2.	100.00	(2)	0.00	(0)	0.00	(0)	0.00	(0)
	3.	66.67	(2)	0.00	(0)	33.33	(1)	0.00	(0)
	4.	27.87	(17)	6.56	(4)	34.43	(21)	31.15	(19)
	5.	25.47	(15)	6.78	(4)	35.59	(21)	32.20	(19)
	6.	27.42	(17)	6.45	(4)	35.48	(22)	30.64	(19)
Mughal	1.	0.00	(0)	38.87	(8)	11.11	(1)	0.00	(0)
	2.	50.00	(1)	0.00	(0)	0.00	(0)	50.00	(1)
	3.	9.09	(1)	72.73	(8)	9.09	(1)	9.09	(1)
	4.	36.54	(19)	7.69	(4)	30.77	(16)	25.00	(13)
	5.	36.00	(18)	8.00	(4)	32.00	(16)	24.00	(12)
	6.	31.15	(19)	19.67	(12)	27.87	(17)	21.31	(13)
Qureshi	1.	66.67	(2)	—	—	33.33	(1)	0.00	(0)
	2.	100.00	(1)	—	—	0.00	(0)	0.00	(0)
	3.	75.00	(3)	—	—	25.00	(3)	0.00	(0)
	4.	24.39	(10)	—	—	31.70	(13)	43.90	(18)
	5.	22.50	(9)	—	—	32.50	(13)	45.00	(18)
	6.	27.27	(12)	—	—	31.82	(14)	40.91	(18)
Rajpoot	1.	51.35	(19)	2.70	(1)	40.54	(15)	5.40	(2)
	2.	38.89	(14)	0.00	(0)	52.78	(19)	8.33	(3)
	3.	45.20	(33)	1.37	(1)	46.57	(34)	6.85	(5)
	4.	39.28	(196)	2.40	(12)	27.85	(138)	30.66	(153)
	5.	39.31	(182)	2.59	(12)	25.70	(119)	32.39	(150)
	6.	40.11	(215)	2.42	(13)	28.54	(153)	28.92	(155)
Sahi	1.	76.00	(19)	0.00	(0)	12.00	(3)	12.00	(3)
	2.	41.67	(19)	4.17	(1)	41.67	(10)	12.50	(3)
	3.	59.18	(29)	2.04	(1)	26.53	(13)	12.24	(6)
	4.	44.39	(95)	7.94	(17)	27.10	(58)	20.56	(44)
	5.	44.73	(85)	8.42	(16)	25.26	(48)	21.58	(41)
	6.	47.70	(114)	7.11	(17)	25.52	(61)	19.66	(47)
Syed	1.	66.67	(6)	—	—	11.11	(1)	22.22	(2)
	2.	0.00	(0)	—	—	85.71	(6)	14.28	(1)
	3.	37.50	(6)	—	—	43.75	(7)	18.75	(3)
	4.	25.58	(22)	—	—	50.00	(43)	24.42	(21)
	5.	27.85	(22)	—	—	46.83	(37)	25.32	(20)
	6.	29.47	(28)	—	—	46.31	(44)	24.21	(23)
Tarer	1.	41.67	(5)	25.00	(3)	16.67	(2)	16.67	(2)
	2.	25.00	(1)	0.00	(0)	0.00	(0)	75.00	(3)
	3.	37.50	(6)	18.75	(3)	12.50	(2)	31.25	(5)
	4.	30.00	(36)	8.33	(10)	18.33	(22)	42.33	(52)
	5.	30.17	(35)	8.62	(10)	18.96	(22)	42.24	(49)
	6.	31.06	(41)	9.85	(13)	18.18	(24)	40.91	(54)

Prenatal deaths; Gondal, Jat, Sahi show the highest, and Butt, Damyal the lowest percentage of prenatal deaths in first cousin marriages (IC). All cousins category (AC) indicates the highest prenatal deaths in Mughal, Damyal, Tarer surnames, but the lowest in Rajpoot., Minhas and Arain. Rajpoot, Qureshi and Butt have the highest prenatal deaths in Bradari + Bradari distant relations (B+BDR), but the lowest

percentage is seen in Minhas, Damyal and Awan. Among unrelated (U) parental relationships the highest percentage of prenatal deaths is in Butt, Damyal, Minhas surnames, and the lowest in Rajpoot, Sahi and Tarer.

Postnatal deaths: The highest postnatal deaths in IC are seen in Gondal, Khokhar, Janjua and the lowest in Tarer, Rajpoot and Sahi surnames. Khokhar, Arain show the highest, and Sahi, Awan have the lowest postnatal deaths in AC. Syed, Rajpoot, Sahi (B+BDR); Jat, Tarer, Butt (U) show the highest and Damyal, Minhas, Butt (B+BDR); Rajpoot, Khokhar (U) indicate the lowest postnatal deaths in respective parental relations.

Total deaths: Total deaths are seen in the highest percentage in Gondal, Qureshi, Jat (IC); Mughal, Damyal, Khokhar (AC); Rajpoot, Syed, Malah (B+BDR) and Butt, Damyal, Tarer (U) surnames. Mughal, Butt, Syed (IC); Rajpoot, Sahi, Bhatti (AC); Khokhar, Damyal, Butt (B+BDR) and Gondal, Rajpoot, Mughal (U) isonymic groups show the lowest total deaths.

Livebirths: First cousin parental relationships of Carpenter, Khokhar, Sahi show the highest hvebirths, but these are the lowest in Butt, Gondal and Malah surnames. The highest livebirths are seen in Mughal, Tarer (AC); Syed, Malah, Mughal (B+BDR) and Gondal, Qureshi, Tarer (U) but the lowest in Janjua, Arain, Bhatti (AC); Gondal, Tarer (B+BDR) and Carpenter, Syed (U) isonymic groups.

Total surviving: Percentage total surviving is the highest in Carpenter, Damyal, Khokhar (IC); Sahi, Tarer (AC); Arain, Malah, Syed (B+BDR), and the lowest in Malah, Qureshi (IC); Janjua, Arain, Bhatti (AC); Gondal, Awan, Tarer(B+BDR). Total pregnancies: Carpenter, Bhatti, Khokhar show the highest total pregnancies in first cousin marriages. In other parental relations, the highest total pregnancies are in Mughal, Tarer, Sahi (AC); Malah, Syed, Qureshi (B+BDR), and Bhatti, Gondal, Qureshi (U) surnames. The lowest total pregnancies are in Syed, Tarer, Butt (IC); Arain, Bhatti, Damyal (AC); Awan, Tarer, Gondal Q3+BDR) and Sahi, Mughal, Carpenter (U) isonymic groups.

Simple and partial correlations were carried out to see relationship between prenatal loss and mean F in the first cousin category (Table III)

TABLE – III

Simple and partial Correlations in Relation to Prenatal Loss (first cousins) and Mean F in Different Isonymic Groups.

Factors	Simple correlation	Corrected for	Partial correlation
Family surname and prenatal loss	–0.9710	–	–0.9633
Family surname and mean F	–0.4591	Prenatal loss	+0.0128
Prenatal loss and mean F	+0.4756	family surname	+0.1403

and bradari + bradari distant relations category (Table IV).

TABLE – IV

Simple and Partial Correlations in Relation to Prenatal loss (BDR – B) and Mean F in Different Isonymic groups.

Factors	Simple correlation	Corrected for	Partial correlation
Family surname and prenatal loss	– 0.7622	–	– 0.6572
Family surname and mean F	+ 0.5210	Prenatal loss	+ 0.1145
Prenatal loss and mean F	+ 0.6073	Family surname	– 0.3795

In the first cousin category a positive simple and partial correlation is observed, but in bradari + bradari distant relations significant negative simple correlation ($P< 0.01$) and nonsignificant negative partial correlation ($P> 0.10$) is seen. This indicates that increase in mean F value does not show an increase in prenatal loss in first cousin marriages, however, in bradari + bradari distant relations such a relationship exists.

DISCUSSION

The isonymic groups which commonly occur in this population are Minhas, Awan and Rajpoot. Surnames are variously distributed in the cities of Punjab Province, Pakistan. Popular surnames in the city of Lahore are Arain and Sheikh,[4]
Rajpoot, Gujjar and Arain in Rawalpindi[7] and Syed and Gujjar in Gujrat.[5]
Preferred marriage types in the present isonymic groups are that of first cousins, bradari and unrelated relations. In other cities of Punjab, first cousin and bradari marriages are popular except in Rawalpindi, where unrelated and first cousin marriages are common (loc cit).
Average mean F calculated for Jhelum isonymic groups (0.0249) is the lowest compared to Gujrat (0.03 16), Sahiwal (0.0309), Rawalpindi (0.0271) and Lahore (0.0269). In terms of heterozygosity, Jhelum population is less homozygous by 19.16%, 21.21%, 8.12% and 7.14% compared to Sahiwal, Gujrat, Rawalpindi and Lahore popula tions respectively (loc cit).
Surnames in the first cousin marriages do not show association between consanguinity effects on mortality and mean coefficients of inbreeding. However, a non-significant association between these two variables exists in bradari + bradari distant relations.

TABLE – V

Lethal equivalents and added Risk of Mortality in various Isonymic Groups of Jhelum Population.

Family Surname	Lethal equi-valent	Added risk %	Family Surname	Lethal Equi-valent	Added risk %
Arain	0.8064	0.8064	Khokhar	5.3536	16.7300
Awan	1.6064	5.0200	Malah	3.7647	11.7600
Bhatti	1.7632	5.5100	Minhas	4.9888	15.5900
Carpenter	2.2048	6.8900	Qureshi	8.5344	26.6700
Gondal	10.0928	31.5500	Rajpoot	4.0736	12.7300
Janjua	2.4416	7.6300	Sahi	4.4768	13.990
Jat	2.5376	7.9300	Syed	2.5526	7.9800
			Tarer	1.7600	5.5000

Table V shows average lethal equivalents carried by a person. These were calculated following Slatis, Reis and Hoene method[10] because in each family mainly first cousin and unrelated parental marriages are observed. The highest value of lethal equivalents is seen in Gondal (10.0928) and Qureshi (8.5344) surnames. The same is true in these two surnames for added risk of mortality among first cousin progeny compared to that of outbred categories (31.55% and 26.67% respectively). Slatis[11] calculated a value of eight as the average number of abnormal recessive genes carried heterozygously per person. However, in a later study on Chicago region Slatis et al10 observed 4.49 lethal equivalents per person with an added risk of 12% deaths in consanguineous marriages compared to nonconsanguineous marriages.

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11. Slatis, H.M. A method of estimating the frequency of abnormal recessive genes in man. Am. J. Hum. Genet., 1954; 6: 412. able V shows average lethal equivalents carried by a person. These were calculated following Slatis, Reis and Hoene method[10] because in each family mainly first cousin and unrelated parental marriages are observed. The highest value of lethal equivalents is seen in Gondal (10.0928) and Qureshi (8.5344) surnames. The same is true in these two surnames for added risk of mortality among first cousin progeny compared to that of outbred categories (31.55% and 26.67% respectively). Slatis[11] calculated a value of eight as the average number of abnormal recessive genes carried heterozygously per person. However, in a later study on Chicago region Slatis et al10 observed 4.49 lethal equivalents per person with an added risk of 12% deaths in consanguineous marriages compared to nonconsanguineous marriages.