Consanguineous Marriages: Effects on Pregnancy Outcomes in Pakistan

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ABSTRACT

Being a traditional and close-knit society, Pakistan has a substantial portion of the population who have consanguineous marriages. The purpose of this study is to investigate the socioeconomic and demographic factors behind consanguineous marriages and their effects on pregnancy outcomes. Secondary data of 13,558 married women, as provided in the Pakistan Demographic and Health Survey (2012-13), was utilised to conduct this research. The results demonstrate that women who are poor, uneducated and belong to the least developed regions of the country, are significantly more likely to be in consanguineous marriages. There is a higher prevalence of miscarriages, abortions and stillbirths in such marriages as compared to non-consanguineous ones. Therefore, there is a need to create public awareness on the adverse health impacts of consanguineous marriages.

Key words: Consanguineous, fertility, abortion, miscarriage, stillbirth, Multinomial Logistic Regression, Pakistan.

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1. INTRODUCTION

Consanguineous marriages constitute a marital union between a man and a woman who are blood relatives. Such marriages are prevalent in various countries and cultures across the globe. In particular, consanguineous unions are exceedingly common in Muslim countries in the Middle East, Asia and Africa (Riaz et al. 2016). Not only are cousin marriages widely perceived as fortifying familial ties and stability due to greater compatibility, they are also seen as a means to keep property within the parental families because of lower bridal dowry (Hamamy 2012; Hussain 1999).

Pakistan's rate of cousin marriages is estimated to be particularly high at approximately 65%, India 55%, Saudi Arabia 50%, Afghanistan 40%, Iran 30%, and Egypt and Turkey 20% (Hamamy 2012; Pellissier 2012; Ullah 2015). There are often adverse health impacts of such marriages between first and second cousins such as disproportionately higher pregnancy losses, with the offspring being at a greater risk of inheriting harmful conditions caused by homozygous recessive genes and genetic disorders (Bokhari et al. 2015; Kuntla et al. 2013; Naibkhil and Chitkara 2016; Shamshad et al. 2016). There is vast body of literature affirming the link between consanguineous marriages and non-live birth outcomes (Assaf & Khawaja 2009; Mokhtar & Abdel-Fattah 2001; Tadmouri et al. 2009). Research has also revealed that for every incidence of parental consanguinity, the risk of a child with congenital heart diseases increases (Ullah et al. 2018). Women, in the consanguineous marriage group, in their past obstetrical history also have higher rates of intrauterine deaths (Younis et al. 2018). Hence, rates of abortion, termination and stillbirths are found to be higher among females having consanguineous marriages (Omer et al. 2016). Trend analysis of past Pakistan Demographic and Health Surveys (PDHSs) have also found significant positive relation between consanguineous marriages and poor pregnancy outcomes. Marriages between blood relatives may also occur disproportionately within certain demographics and socioeconomic classes, and can have substantial negative health impacts (Omer et al. 2016; Sthanadar et al. 2016). The highest rates of cousin marriages in Turkey have been recurrently associated with low socioeconomic status, illiteracy and rural residence (Koc 2008). Nevertheless, most earlier studies on Pakistan have had a gap in knowledge on the socioeconomic variations in consanguineous marriages. There is also a need to quantify their effects on pregnancy outcomes across demographic and socioeconomic characteristics by applying various statistical models and tests for data analysis. This study aims to fill this gap by answering the following research questions:

1. What is the historical trend of consanguineous marriages in Pakistan?
2. What is the current prevalence of consanguineous marriages in Pakistan?
3. How are consanguineous marriages related to negative pregnancy outcomes, such as miscarriages, abortions and stillbirths?

2. METHODOLOGY

This is a cross-sectional quantitative study.

2.1. Data

This study explores the socioeconomic and demographic variations of consanguineous marriages and their effect on pregnancy outcomes by employing micro-level data from Pakistan's Demographic and Health Survey (PDHS) 2012-13. PDHS is based on a two-stage stratified provincial sample design (Punjab, Sindh, Khyber Pakhtunkhwa, Balochistan, Gilgit-Baltistan and Islamabad Capital Territory [ICT]). PDHS is tasked with collecting information regarding a wide array of demographic and socioeconomic indicators. This research study selectively chose the relevant indicators pertaining to consanguineous marriages as well as maternal and infant health from a sample of 13,558 ever married women, aged 15-49 years. Table 1 is a summary of samples drawn after removing the records of 7 women (0.05%) due to insufficient information:

Table 1: Respondents' Marital Status

Marital Status	Sample Size
Ever married women	13558
Non-consanguineous marriages	4700
Consanguineous marriages	8851
Married to paternal first cousins	3816
Married to maternal first cousins	2761
Married to relatives other than first paternal/maternal cousins	2274

Source: NIPS and ICF International 2013, 'Pakistan Demographic and Health Survey (2012-13)'.

According to the descriptive statistics shown in Table 2, the average age of the respondents in the sample was 33 years. These women were married approximately at 19 years of age, and the average duration of their marriage was 13 years.

Table 2: Descriptive Statistics of Ever Married Women

Attributes	Minimum	Maximum	Mean	Sample
Age of women (years)	15	49	33	13558
Women's age at marriage (years)	10	49	19	13558
Marital duration (years)	0	37	13	13558

Source: NIPS and ICF International 2013, 'Pakistan Demographic and Health Survey (2012-13)'.

The current study also includes the number of times a woman became pregnant and the duration of the pregnancy was also recorded, along with their respective pregnancy

outcomes. These outcomes refer to and include live births, stillbirths/non-live births, miscarriages, and abortions. Thus, in order to obtain this information, the PDHS (2012-13) included questions regarding these multiple outcomes (NIPS and ICF International 2013). Pregnancies lost indicate the magnitude of pregnancies which have been wasted (Aziz & Manzoor 2016). Live births measure the number of infants who are able to breathe after being born, while, non-live births constitute those infants who were delivered and were born dead. Conversely, abortion is a state which is induced to prevent the birth of an infant. Table 3 provides descriptive statistics of the total number of pregnancy terminations, age of women at the time of termination of pregnancy, magnitude of pregnancies lost and duration of pregnancies lost:

Table 3: Summary of Pregnancy History

	Min	Max	Mean	Sample
Total number of pregnancies	1	18	4	14350
Age of women at time of pregnancy dissolution (years)	13	49	27	14350
Number of pregnancy losses	0	13	1	14350
Duration of pregnancy lost (months)	1	10	4	2372

Source: NIPS and ICF International 2013, 'Pakistan Demographic and Health Survey (2012-13)'.

While women, who were part of the sample, had an average of four pregnancies, the minimum number of pregnancy losses were reported to be zero, while, on average, a woman had lost at least one pregnancy. The mean age of the women at the time of dissolution of a pregnancy was reported to be 27 years, with their pregnancies ending within a time-span of four months.

2.2. Data Limitations

The data showed limited access or permission to have medical consultation in consanguineous marriages as most of the respondents did not even fulfill the standard criteria of antenatal visits during pregnancy. Moreover, due to the illegality of abortion in Pakistan, there is ambiguity regarding the number of abortions which either may have been reported as miscarriages or not reported at all by the respondent. Another limitation of this study is the primary data and its accuracy pertaining to what the women have called a 'stillbirth', 'abortion' and 'miscarriage'. As mentioned earlier, the number of abortions could be far greater, but due to the social stigma and illegal practice, they could be greatly under-reported.

2.3. Definitions

Data on the type of marriages was extracted from the questionnaires of individual women 'Section 1: Respondent's Background' of the PDHS (2012-13). In this section, two

questions were asked about the type of marriage of a woman i.e., *Is/was there a blood relationship between you and your husband?* To further examine the nature of the previous relationship with the husband, the next question asked was, *What type of relationship (is/was) it?* The first question had a binary response, as '0' was used if there was no consanguineous relationship and '1' was used if there was one, prior to the marriage of the couple (Saleem et al. 2016). The second question is in multinomial categories defined as: '0' if unrelated; '1' if paternal first cousin; '2' if maternal first cousin; '3' if second cousin or other relative (Koc 2008). Details of the variables are provided in Annexure I.

2.4. Statistical Analysis

PDHS data allowed analysis of the type of marriages by the socioeconomic and demographic characteristics of the female respondents. Thus, these linkages were examined through the use of descriptive statistics, cross- tabulation and chi-square association to test the presence of any statistical association between the nature of marriage and reproductive outcomes.

The year of marriage was estimated from the micro data of PDHS (2012-13), and not collected from multiple data sources. Women, who provided the information about when marriage occurred, are presented through a line graph as a summary of prevalence of consanguineous marriages in Pakistan.

The factors on which the prevalence of consanguineous marriages is contingent were calculated through bivariate percentage distributions. The net effect of predictors on the response variable was estimated through Binary Logistic Regression since it assumes that the outcome is in binary form, and estimates the ratio of the consanguineous marriages versus non-consanguineous marriages (Riaz et al. 2016). The net effect of independent factors was estimated through Multinomial Logistic Regression Model since it assumes that the outcome is in multinomial forms that are independent of each other (Hosmer et al. 2013).

3. RESULTS

The trend analysis of the data depicts that non-consanguineous marriages have become increasingly prevalent in Pakistan. Consanguinity was found to be widely practiced (80% in 1980) in Pakistan. However, there was a secular decline from 80% (1980) to 65% (2013). Similar decrease was found with paternal-sided cousins, while marriages with maternal cousins rose in 2011-13 (Figure 1):

Figure 1: Trends in Marriages by Types (1975-2013)
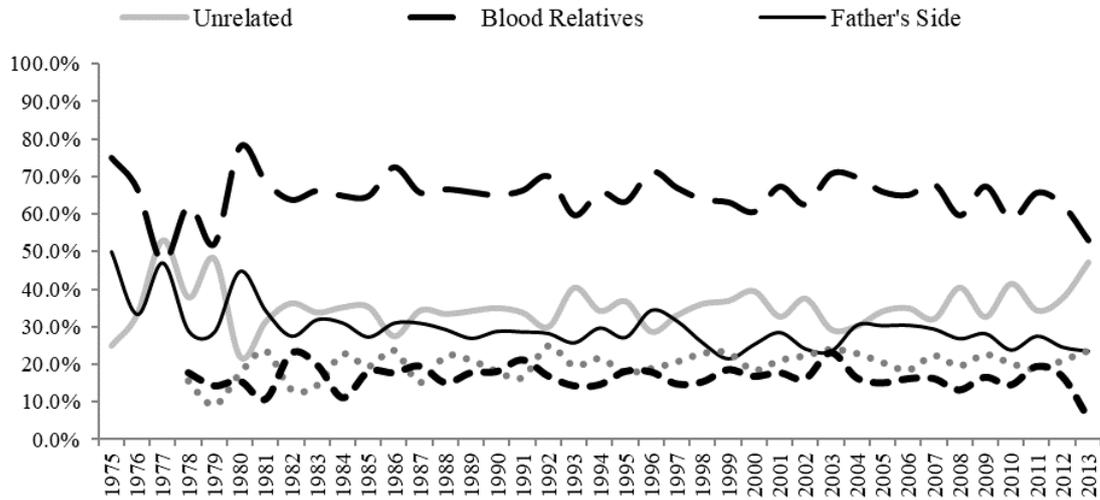
Evidence of the pervasiveness of conventional norms and traditions is indicated by the high rate (65%) of the total marriages being consanguineous in nature (Figure 2):

Figure 2: Distribution of Ever Married Women (15-49 Years) by Type of Marriage (%)
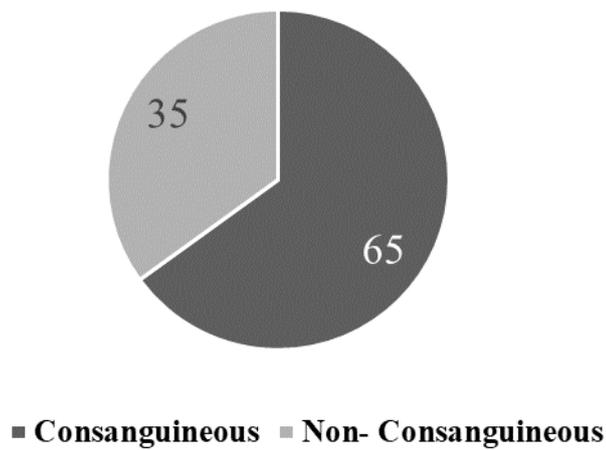
Figure 3: Female Consent about Marriages
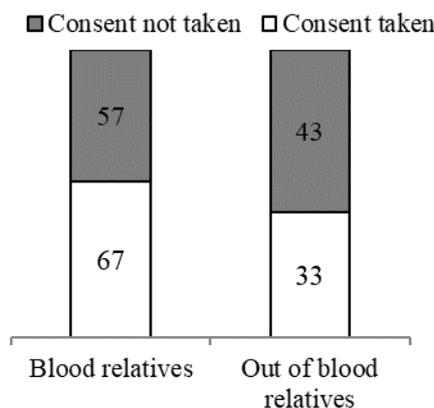
■Consent not taken □Consent taken

Source: NIPS and ICF International 2013, 'Pakistan Demographic and Health Survey (2012-13)'.

While, 57% of those who were married to their blood relatives were not asked for their consent, 67% were asked for their consent (Figure 3). Often, the marriage proposals came from paternal relatives (43%), quite a few came from maternal relatives (31%), and the rest came from relatives (26%) (Figure 4):

Figure 4: Percentage Distribution of Ever Married Women (15-49 Years) Married to

Blood Relatives by Type of Relation with Husband

Consanguineous Marriages
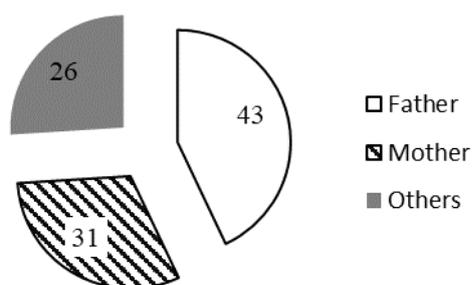
Source: NIPS and ICF International 2013, 'Pakistan Demographic and Health Survey (2012-13)'.

3.1. Reasons behind Consanguineous Marriages

All the aforementioned factors (see column 1 Table 4) are found to be statistically associated with type of marriages on a significant basis (chi-square $p \leq 0.000$). For instance, consanguineous marriages (65%) tend to occur more among women who marry after turning 19. Of them, almost 40% were with paternal first cousins, and 35% with maternal cousins (Table 4). Although the proportion of consanguineous marriages is similarly high in the rural areas of almost all the provinces, Sindh and rural Punjab have

the highest prevalence of consanguineous marriages, with 82% and 72% of all marriages, constituting such unions, respectively. Conversely, Khyber Pakhtunkhwa has the least prevalence of cousin marriages which are 55% and 61% of the total in urban and rural areas, respectively.

Table 4: Distribution of Ever Married Women (15-49 Years) Reporting Consanguineous Marriage by Type of Blood Relationship with their Husband before Marriage and Background Characteristics (%)

Indicators	Levels	Consanguinity				
		Overall	Type of Relatives			
			Father	Mother	Others	n†
Woman's age at first marriage	less than 19	59.8 (7288)	45.6	28.6	25.8	5109
	19 and above	65.3 (6259)	39.7	34.7	25.6	3742
Current age of woman	15-24	71.1 (2707)	45.0	30.2	24.7	1924
	25-34	63.7 (5249)	40.8	33.1	26.0	3340
	35-45	64.2 (5594)	44.2	29.9	25.9	3590
Regions	Punjab (urban)	53.8 (2526)	33.9	36.9	29.1	1359
	Punjab (rural)	71.5 (5261)	40.9	32.3	26.8	3761
	Sindh (urban)	52.4 (1521)	42.3	27.2	30.5	797
	Sindh (rural)	82.4 (1612)	58.2	24.4	17.4	1328
	Khyber Pakhtunkhwa (urban)	54.5 (321)	42.3	28.0	29.7	175
	Khyber Pakhtunkhwa (rural)	60.7 (1586)	45.6	31.0	23.4	962
	Balochistan (urban)	66.7 (114)	44.7	31.6	23.7	76
	Balochistan (rural)	69.7 (452)	40.3	33.3	26.3	315
	Gilgit-Baltistan	48.9 (94)	43.5	39.1	17.4	46
	Islamabad	56.3 (64)	38.9	30.6	30.6	36
Ethnicity of woman (maternal languages)	Urdu	47.8 (1301)	34.7	29.7	35.5	622
	Punjabi	61.5 (5214)	38.4	35.9	25.7	3205
	Sindhi	81.9 (1202)	56.8	24.0	19.2	984
	Pashto	59.0 (1796)	42.2	32.8	25.0	1059
	Balochi	91.9 (541)	60.0	20.9	19.1	497
	Siraiki	83.2 (2074)	41.9	30.0	28.1	1725
	Miscellaneous	53.5 (1416)	44.9	29.6	25.5	757

Education of woman	No education	70.9 (7734)	46.0	29.4	24.6	5480
	Primary	66.4 (2153)	40.3	32.0	27.8	1430
	Middle to Secondary	56.1 (2401)	38.8	34.9	26.3	1347
	Higher	47.1 (1260)	33.3	37.4	29.3	594
Current working status of woman	Not working	62.3 (9613)	42.4	31.9	25.7	5987
	Currently working	72.8 (3935)	44.5	29.9	25.7	2864
Marriage Consent	No	57.2 (2718)	45.2	24.9	29.9	1556
	Yes	67.4 (10826)	42.7	32.6	24.8	7294
Education of husband	No education	66.9 (4449)	44.8	28.9	26.3	2977
	Primary	69.5 (2196)	46.3	29.2	24.5	1527
	Middle to Secondary	64.8 (4569)	40.9	33.9	25.2	2962
	Higher	59.3 (2287)	41.0	32.6	26.5	1357
Economic status of woman	Poor	75.0 (5263)	48.0	28.7	23.3	3946
	Middle class	65.8 (2698)	40.7	32.5	26.8	1776
	Richer	56.0 (5587)	38.3	33.7	28.1	3129
Total Sample	Percentage	65.3††	43.1	31.2	25.7	8851
	No. of women	13551	3816	2761	2274	

Source: NIPS and ICF International 2013, 'Pakistan Demographic and Health Survey (2012-13)'. *Key:*
( ) in parenthesis is denominator.
(†) is sample from all ever married women (15-49 years) who are married within blood relations.
(††)   is sample from total ever married women (15-49 years) successfully interviewed.
Note: Due to removal of users' missing values and lack of knowledge about categories from all indicators, the individual sum of samples between indicators may differ from total sample († and ††).

Among all ethnic groups, the dominance of consanguineous marriages is significant among the women (aged 15-49) who are either Baloch (92%), or Siraiki (83%), or Sindhi speaking (82%). As opposed to this, the ethnic group of Urdu speakers had the lowest prevalence of consanguineous marriages at 48% of the total. Table 4 also indicates that nearly 70% of uneducated women were married to blood relatives; whereas this proportion drops to 47% for highly educated mothers. Interestingly, 73% of working women were in consanguineous marriages. As expected, poor women tend to have the highest prevalence of consanguineous marriages (75%), of which a high proportion (48%) were married in the paternal side of the family.

3.2. Factors Affecting Consanguineous Marriages

In the absence of all predictors, it is observed that, women are 1.6 times more likely to be married to their blood relatives as opposed to those who marry outside their blood relatives (intercept 1.647; 1% level of significance) (see Table 5). Women in consanguineous marriages are 1.6 times (OR 1.604; p≤0.001; 95% CI: 1.5-1.8) more likely to have had their consent obtained at the time of marriage as compared to those who did not give their consent for it. Women who had given their consent to marry in blood relations were 1.95 times (OR 1.950; p≤0.001; 95% CI: 1.7-2.2) more likely to marry their maternal relatives as opposed to the women who were married to non-blood relatives (Table 5):

Table 5: Odds of Consanguine Marriages by Background Characteristics

Indicators	Levels	Model 1	Model 2 (Non-Consanguineous)		
		Consanguinity	Type of Relatives		
			Fatherð	Motherð	Othersð
Regions	Punjab	Reference	Reference	Reference	Reference
	Sindh	0.906 (0.785-1.046)	1.189* (0.998-1.415)	0.760** (0.628-0.92)	0.745** (0.614-0.906)
	Khyber Pakhtunkhwa	1.036 (0.87-1.233)	1.361** (1.099-1.686)	0.843 (0.667-1.065)	0.890 (0.699-1.134)
	Balochistan	1.01 (0.851-1.2)	1.137 (0.924-1.399)	1.012 (0.809-1.266)	0.87 (0.688-1.099)
	Gilgit-Baltistan	0.522*** (0.429-0.635)	0.621*** (0.486-0.793)	0.558*** (0.427-0.73)	0.378*** (0.282-0.506)
	Islamabad	1.053 (0.898-1.235)	1.258** (1.027-1.542)	0.913 (0.734-1.134)	0.969 (0.772-1.216)
Ethnicity of woman (maternal languages)	Urdu	Reference	Reference	Reference	Reference
	Punjabi	1.360*** (1.162-1.591)	1.586*** (1.286-1.955)	1.644*** (1.318-2.052)	0.906 (0.728-1.128)
	Sindhi	2.653*** (2.204-3.194)	3.552*** (2.834-4.452)	2.485*** (1.919-3.217)	1.709*** (1.32-2.214)
	Pashto	1.013 (0.841-1.221)	1.030 (0.81-1.309)	1.234 (0.948-1.605)	0.821 (0.631-1.068)
	Balochi	3.376*** (2.602-4.38)	4.349*** (3.209-5.895)	3.464*** (2.477-4.844)	2.222*** (1.571-3.143)
	Siraiki	3.230*** (2.669-3.907)	3.942*** (3.121-4.979)	3.302*** (2.561-4.256)	2.421*** (1.884-3.111)
	Miscellaneous	1.187*** (1.004-1.404)	1.354** (1.089-1.683)	1.193 (0.936-1.521)	1.001 (0.792-1.267)
Education of woman	No Education	Reference	Reference	Reference	Reference
	Primary	0.989 (0.88-1.113)	0.907 (0.787-1.046)	1.028 (0.881-1.2)	1.078 (0.916-1.269)
	Middle to Secondary	0.770*** (0.687-0.863)	0.702*** (0.609-0.809)	0.850** (0.729-0.991)	0.787** (0.667-0.929)
	Higher	0.594*** (0.513-0.689)	0.495*** (0.409-0.599)	0.702*** (0.573-0.859)	0.636*** (0.513-0.788)
Working status of woman	Not working	Reference	Reference	Reference	Reference
	Currently working	1.13 (1.03-1.24)	1.074 (0.956-1.207)	1.123** (0.989-1.274)	1.243*** (1.089-1.42)
Education of husbands	No Education	Reference	Reference	Reference	Reference
	Primary	1.156** (1.023-1.306)	1.232** (1.065-1.425)	1.157* (0.986-1.359)	1.026 (0.862-1.221)
	Middle to Secondary	1.289*** (1.166-1.427)	1.367*** (1.21-1.544)	1.305*** (1.142-1.491)	1.155** (1.001-1.333)

	Higher	1.282*** (1.133-1.452)	1.349*** (1.159-1.57)	1.209** (1.023-1.429)	1.270** (1.065-1.514)
Wealth status of woman	Poor	Reference	Reference	Reference	Reference
	Middle class	0.853** (0.765-0.951)	0.833** (0.731-0.948)	0.827** (0.717-0.953)	0.934 (0.801-1.09)
	Richer	0.756*** (0.678-0.842)	0.717*** (0.629-0.817)	0.723*** (0.626-0.835)	0.877* (0.752-1.023)
Age at marriage	Continuous	0.970*** (0.96-0.979)	0.967*** (0.955-0.979)	0.972*** (0.959-0.985)	0.971*** (0.957-0.985)
Marriage consent	No	Reference	Reference	Reference	Reference
	Yes	1.604*** (1.46-1.762)	1.546*** (1.377-1.736)	1.950*** (1.705-2.23)	1.377*** (1.204-1.574)
Intercept		1.647***	-0.518 **	-0.884 ***	-0.449 **
Sample		13486	3627	2594	2115

Source: NIPS and ICF International 2013, 'Pakistan Demographic and Health Survey (2012-13)'.

Note:
Ranges in parenthesis ( ) are 95% confidence interval.
(δ) Reference Category is 'Marriages out of blood relations'.
Significance of co-efficients is tested at: 10% level of significance denoted by (*) single asterisk.
5% level of significance denoted by (**) double asterisks.
1% level of significance denoted by (***) triple asterisks.

The multivariate analysis predicts the negative odds for women who do not marry at younger ages. Chances of such events are 0.97 (OR 0.970; p≤0.001; 95% CI: 0.96-0.98) times less than older ages. Table 5 shows that as soon as women start marrying at older ages, the chances or their preference to marry in blood relatives decreases.

Regional variations indicate that the least likelihood of consanguineous marriages exist in Gilgit-Baltistan (OR 0.522; p≤0.001; 95% CI: 0.43-0.64) as compared to Punjab. The likelihood of marriage in paternal blood relatives were 1.2 times (OR 1.19; p≤0.001; 95% CI: 0.99-1.42) higher as compared to those who married in non-blood relatives in Sindh relative to Punjab. The odds of consanguineous marriages are high in Khyber Pakhtunkhwa (OR 1.04; p>0.100; 95% CI: 0.96-0.98) followed by Balochistan (OR 1.01; p>0.100; 95% CI: 0.85-1.20) as compared to Punjab. It is statistically significant that probability of such marriages are 1.4 times (OR 1.361; p≤0.05; 95% CI: 1.099-1.686) higher for women who marry paternal-sided relatives as compared to those who marry to non-blood relatives from Khyber Pakhtunkhwa relatives to Punjab (Table 5).

Consanguineous marriages were found to be dominant among all ethnic groups of ever married women (15-49 years). Balochi women, recognised as locals of Balochistan, emerged with 3.4 times (OR 3.376; p≤0.05; 95% CI: 2.6-4.4) more likely to engage in consanguineous marriages, and majority of them to paternal-sided relations (OR 4.35; p≤0.05; 95% CI: 3.2-5.9) as compared to non-consanguineous marriages in Balochi ethnic women relative to Urdu ethnic ones. After Balochi, Saraiki women were 3.2 times

more likely (OR 1.361; p≤0.05; 95% CI: 1.099-1.686) to engage in consanguineous marriages, and like Balochi women more likely to marry in paternal blood relatives compared to non-blood family relatives to Urdu ethnic women (Table 5).

The data shows that there is almost 1.03 times more likelihood of primary educated women marrying paternal-sided relatives as compared to uneducated ones. Working women are 1.12 times more likely to marry their maternal-sided relatives as compared to marrying non-blood relatives (OR 1.123; p≤0.001; 95% CI: 0.99-1.27).

4. CONSEQUENCES

Almost 46% pregnancies were lost at least once in consanguineous marriages; and 40% of similar pregnancies were registered by mothers in non-consanguineous unions. Loss of at least one pregnancy emerged more often for mothers in consanguineous who married in their early ages [less than 20 years] (47%). Highest prevalence of at least one pregnancy loss was found for consanguineous mothers (54%) who lost it at a mature age (at least 30 years); and 50% from non-consanguineous in the similar age group (Annexure II). High extent of pregnancy losses were highlighted by mothers in consanguineous marriages from Balochistan (49%), rural areas (46%), and having Siraiki ethnicity (51%). Highly educated and socioeconomically non-poor mothers in consanguineous marriages showed least prevalence of at least one pregnancy wastage in their pregnancy history (Annexure II). Impact of type of marriages on adverse pregnancy outcomes is outlined in Figure 5:

Figure 5: Distribution of Pregnancies Ending in Non-Live Births in Five Years Preceding the Survey (2009-13) by Type of Wastage and Marriages (%)
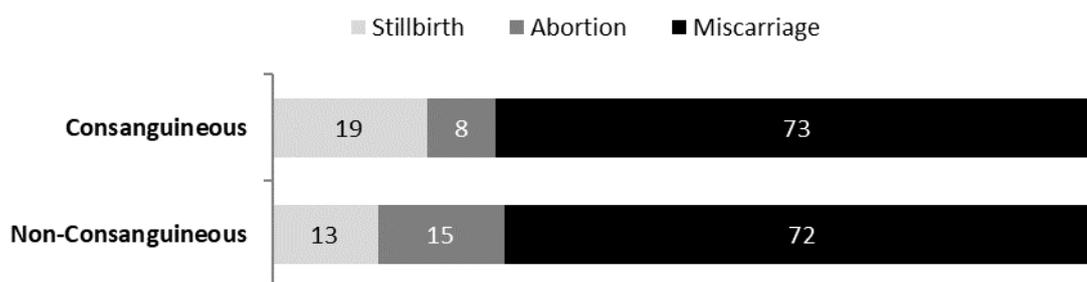
Source: NIPS and ICF International 2013, 'Pakistan Demographic and Health Survey (2012-13)'.

Results show the high prevalence of stillbirths (19%) among consanguineous unions; abortions were registered at 15% by mothers in non-consanguineous marriages; and nearly 73% miscarriages were reported by women married to blood relatives.

4.1. Miscarriages

Miscarriages were highest among consanguineous mothers (74%) who married in early ages (less than 20 years), and was almost 79% for non-consanguineous mothers aged 25 years and above. The prevalence of miscarriages was high (78%) among consanguineous mothers aged between 20-24 years than non-consanguineous ones (76%) (see Table 6).

Urban areas had a higher prevalence of miscarriages among consanguineous mothers (79%) as compared to non-consanguineous ones (70%). Highest prevalence of miscarriages was among consanguineous mothers belonging to Balochistan (82%) and Sindh (78%), whereas it was highest among non-consanguineous mothers from Khyber Pakhtunkhwa (82%). Almost 79% of Urdu-speaking consanguineous mothers had endured miscarriages, almost close to those for non-consanguineous mothers (81%). The data shows that highly educated consanguineous mothers had a high prevalence of miscarriages [76%] (Table 6). Low prevalence of miscarriages was found for the richest class (66% in the fifth quintile) because at low level of wealth (75% of the second quintile) higher prevalence of consanguineous marriages were recorded.

Table 6: Distribution of Pregnancies Ending in Miscarriages in Five Years Preceding the Survey (2009-13) by Background Characteristics according to Type of Pregnancy Wastage and Marriages

Indicators	Levels	Type of Marriages	
		Non-Consanguineous	Consanguineous
Age at first marriage	Less than 20	72.1	73.8
	20-24	67.7	73.5
	25 and above	78.8	66.4
Age at pregnancy loss	Less than 20	72.6	74.3
	20-24	75.6	77.8
	25 and above	70.6	70.7
Province	Punjab	67.5	69.3
	Sindh	79.1	78.0
	Khyber Pakhtunkhwa	81.6	75.1
	Balochistan	71.4	81.9
	Islamabad (ICT)	75.0	71.4
Area of residence	Urban	69.6	79.3
	Rural	73.6	71.2
Ethnicity of woman (maternal languages)	Urdu	81.4	78.7
	Punjabi	62.9	68.8
	Sindhi	77.1	77.5

	Pashto	80.9	73.6
	Balochi	29.2	70.8
	Siraiki	66.2	72.6
	Miscellaneous	80.2	79.8
Education of woman	No education	72.2	71.9
	Primary	71.4	73.2
	Middle to Secondary	64.9	76.6
	Higher	84.8	76.8
Economic status of woman	Poorest	75.2	74.8
	Poor	72.7	75.3
	Middle	74.8	63.4
	Rich	75.0	73.1
	Richest	65.7	78.9
Total Sample	Percentage	72.0	73.2
	N	754	1616

Source: NIPS and ICF International 2013, 'Pakistan Demographic and Health Survey (2012-13)'.

Key:

(ICT) Islamabad Capital Territory. Ages are measures in completed years and educational attainment is the completed grades of education. (NA) is not applicable/calculated.

Empty cells indicate insufficient sample size for the calculation of respective subgroup of population.

Note: Due to removal of user missing values and lack of knowledge categories from all indicators, the individual sum of samples for pregnancy losses may differ from cumulative total sample (N) of miscarriage. Data was not enough for calculating the rates for Gilgit-Baltistan Territory.

4.2. Abortions

Abortions were higher (15%) among women in non-consanguineous unions as compared to consanguineous unions (8%).

Table 7: Distribution of Pregnancies Ending in Abortions in Five Years Preceding the Survey (2009-13) by Background Characteristics according to Type of Pregnancy Wastage and Marriages (%)

Indicators	Levels	Type of Marriages	
		Non-Consanguineous	Consanguineous
Age at first marriage	Less than 20	13.8	9.0
	20-24	21.4	5.1
	25 and above	7.6	12.1
Age at pregnancy loss	Less than 20	5.5	8.0
	20-24	8.3	3.7
	25 and above	18.6	10.4
Province	Punjab	20.2	11.8
	Sindh	10.4	2.1
	Khyber Pakhtunkhwa	5.3	8.3
	Balochistan		1.0
	Islamabad (ICT)	25.0	14.3
Area of residence	Urban	19.6	9.5
	Rural	11.8	7.8
Ethnicity of woman (maternal languages)	Urdu	11.5	8.5
	Punjabi	22.5	13.0
	Sindhi	8.6	.5
	Pashto	5.2	10.4
	Balochi		
	Siraiki	21.5	8.1
	Miscellaneous	6.6	4.8
Education of woman	No education	11.7	6.9
	Primary	12.8	10.3
	Middle to Secondary	25.3	10.9
	Higher	10.5	8.4
Economic status of woman	Poorest	5.7	.7
	Poor	6.4	5.9
	Middle	14.6	16.0

	Rich	14.0	11.2
	Richest	25.9	12.9
Total Sample	Percentage	15.3	8.1
	N	754	1616

Source: NIPS and ICF International 2013, 'Pakistan Demographic and Health Survey (2012-13)'.
Key:
(ICT) Islamabad Capital Territory. Ages are measures in completed years and educational attainment is the completed grades of education. (NA) is not applicable/calculated.
Empty cells indicate insufficient sample size for the calculation of respective subgroup of population.
Note: Due to removal of user missing values and lack of knowledge categories from all indicators, the individual sum of samples for pregnancy losses may differ from cumulative total sample (N) of abortions. Data was not enough for calculating the rates for Gilgit-Baltistan Territory.

Abortions were the highest for consanguineous mothers (12%) who married after 24 years of age as compared to non-consanguineous mothers (8%). Almost 10% of abortions occurred for mothers in consanguineous unions who lost their pregnancies at ages greater than 25 years, lower than mothers in non-consanguineous unions [19%] (Table 7). Prevalence of abortion was highest in Islamabad (the capital of Pakistan). In Khyber Pakhtunkhwa, the prevalence of abortions was higher for consanguineous mothers (8%) than non-consanguineous mothers (5%). Consanguineous mothers in the Urdu and Pashto ethnic groups (9% and 10%, respectively) had higher rates of abortion as compared to non-consanguineous mothers. Middle class consanguineous and richest non-consanguineous mothers had particularly high abortion rates [16% and 26%, respectively] (see Table 7).

4.3. Stillbirths

Table 8 indicates that stillbirths occur more often in consanguineous unions. It is evident that the prevalence of such births was high among consanguineous mothers who married after 24 years of ages (22%); and conversely, it was highest for non-consanguineous mothers (14%) who married in early ages (less than 20 years). Most of the women in consanguineous marriages (19%) lost their pregnancies due to stillbirth when they were above 24 years of age, whereas for non-consanguineous mothers this happened at an earlier age (less than 20 years of age). Furthermore, rural women in consanguineous marriages were at higher risk (21%) than non-consanguineous (15%) of suffering a stillbirth (Sines et al. 2007; Subramanian et al. 2008).

Table 8: Distribution of Pregnancies Ending in Stillbirth in Five Years Preceding the Survey (2009-13) by Background Characteristics according to Type of Pregnancy Wastage and Marriages (%)

Indicators	Levels	Type of Marriages	
		Non-Consanguineous	Consanguineous
Age at first marriage	Less than 20	14.1	17.2
	20-24	10.9	21.3
	25 and above	13.6	21.6
Age at pregnancy loss	Less than 20	21.9	17.7
	20-24	16.0	18.5
	25 and above	10.8	18.9
Province	Punjab	12.3	18.9
	Sindh	10.4	19.9
	Khyber Pakhtunkhwa	13.2	16.6
	Balochistan	28.6	17.1
	Islamabad (ICT)		14.3
Area of residence	Urban	10.8	11.1
	Rural	14.6	21.0
Ethnicity of woman (maternal languages)	Urdu	7.1	12.8
	Punjabi	14.6	18.1
	Sindhi	14.3	22.0
	Pashto	13.9	16.0
	Balochi		29.2
	Siraiki	12.3	19.3
	Miscellaneous	13.2	15.5
Education of woman	No education	16.0	21.3
	Primary	15.8	16.5
	Middle to Secondary	9.8	12.5
	Higher	4.8	14.7
Economic status of woman	Poorest	19.0	24.5
	Poor	20.9	18.8
	Middle	10.6	20.6

	Rich	11.0	15.7
	Richest	8.3	8.2
Total Sample	Percentage	12.7	18.7
	N	754	1616

Key:
(ICT) Islamabad Capital Territory. Ages are measures in completed years and educational attainment is the completed grades of education. (NA) is not applicable/calculated.
Empty cells indicate insufficient sample size for the calculation of respective subgroup of population.
Note: Due to removal of user missing values and lack of knowledge categories from all indicators, the individual sum of samples for pregnancy losses may differ from cumulative total sample (N) of stillbirths, abortions and miscarriages. Data was not enough for calculating the rates for Gilgit-Baltistan Territory.

Balochi (29%) and Sindhi (22%) women in consanguineous marriages experienced the highest number of stillbirths when compared to the women in non-consanguineous unions of the same ethnicity. Similarly, consanguineous mothers, who were better educated (14.7%) and richer (8.2%) had lower chances of suffering a stillbirth (Table 8).

5. ANALYSIS

Non-consanguineous marriages have become increasingly prevalent in Pakistan. All the aforementioned indicators (see column 1 Table 5) were found to be statistically associated with type of marriages on a significant basis (chi-square p≤0.000). This finding is consistent with Alper et al. (2004). Regional variation in prevalence of consanguineous marriages significantly provides that it is rural Punjab and Sindh where rates of consanguineous marriages are high in Pakistan. Besides these regional variations, ethnicity indicates Balochi- speaking women mostly have consanguine unions. These results correlate with those observed by Riaz et al. (2016).

In concurrence with findings of other studies (Afzal et al. 1994; Ahmad et al. 2016; Riaz et al. 2016), it is observed that uneducated women are more likely to be in consanguineous marriages as compared to educated ones. Interestingly, the chances of educated women having consanguineous marriage are less than educated men as compared to uneducated ones. This is indicative of the traditional nature of Pakistan's society where educated males prefer such marriages more as compared to educated females. Moreover, working women are more likely to be in consanguineous marriages as compared to non-working women. In addition, women from rich households are less likely to opt for consanguineous than non-consanguineous marriages. Shami et al. (1994) found similar results.

Although, some regions of Pakistan are conservative which hinders female empowerment and often supresses them under cultural norms, the data and analysis of

this study shows some different trends in consanguineous marriages. The analysis of PDHS data (2012-13) shows that consanguineous marriages are usually marriages of consent rather than being non-consensual.

Most of the literature found the stillbirths, miscarriages and infant mortality rate are slightly higher, while abortion rate is not different in consanguineous marriages (Bennett et al. 2002; Hamamy 2012; Tadmouri et al. 2009). In Pakistan's context, due to the illegality of abortion in the entire country, there is ambiguity regarding the number of abortions which either may have been reported as miscarriages or not reported at all. Unlike miscarriages, abortions occurred more often in urban areas than rural areas, but mothers in non-consanguineous marriages had a greater incidence of abortion. Punjabi women had a greater prevalence of abortion as opposed to others. When socioeconomic status is taken into account, events of abortion were more frequent in case of women with primary and secondary level education. Stillbirths occurred more often in consanguineous unions than non-consanguineous ones. This finding is similar to the results obtained by Saleem et al. (2016) and Stoltenberg et al. (1999). A vast body of literature regarding the pervasiveness of marriage with blood relatives shows that amongst women of similar socioeconomic standing, the prevalence of stillbirth is higher than those who aren't. These observations are consistent with other studies (Assaf & Khawaja 2009; Hamamy 2012; Omer 2016; Pellissier 2012).

6. CONCLUSION

This study involved a concerted effort to examine and evaluate the impact of consanguineous marriages using national data and employing robust statistical methods to assess their prevalence and effect on pregnancy outcomes in Pakistan. The analysis indicates preference for cousin marriages as the overall prevalence of consanguinity was found to be 65% in Pakistan. This study found that, although, 43% cousin marriages occurred among paternal relatives, 31% occurred between maternal relatives, and almost 26% were with distant relatives. Moreover, the proportion of women married to their blood relatives was found to be higher in rural areas than in urban areas of Punjab, Sindh, Balochistan and Khyber Pakhtunkhwa.

The occurrence of consanguineous marriages varied across different socioeconomic groups. Education was observed to play an important role in the pervasiveness of consanguineous marriages. The proportion of women in consanguineous marriage decreased with a corresponding increase in their education level. A large proportion of lesser educated women, i.e., not educated or those only with primary education (70% and 66%, respectively) were married to their blood relatives as opposed to those women with higher education (47%). Similarly, women from poor economic status showed a higher predilection for consanguineous unions in comparison to women belonging to the middle

and elite classes (75%, 65% and 56%, respectively). Further disaggregation of the data showed that of the 75% of poor women married to their blood relatives, 48% were married to their paternal relatives.

The results demonstrate that there is a significant association between consanguineous marriages and adverse pregnancy outcomes in Pakistan. All types of adverse pregnancy outcomes, which are assessed in this study, show a greater prevalence among consanguineous mothers compared to non-consanguineous mothers. Even among women of similar socioeconomic standing, the rate of miscarriages and stillbirths was higher for women in consanguineous marriages. Miscarriages most frequently occurred (82%) at the end of pregnancy among women in consanguineous marriages with distant relatives; with nearly 23% abortions in women married to their paternal relatives. The data shows that stillbirths occurred in at least 15% of the women who married non-relatives.

The findings of the research also show that consanguineous marriages are significantly associated with a woman's age, her level of education and her economic status. Moreover, as there is a significant association between consanguineous marriages and adverse pregnancy outcomes in Pakistan, there is pertinent need to educate people about the health risks associated with them. Increasing public awareness about consanguinity can be achieved by providing proper education and training to primary healthcare workers on the health and social issues related to consanguinity.

In order to understand the linkage of consanguineous marriages and their impact on fertility outcomes, there is need to further explore what factors determine these outcomes in general to enhance the implications of consanguineous marriages and their correlates.

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Annexure I

Variable Definitions

No.	Variables	Construction
Background Indicators		
1	Regions	1) Punjab; 2) Sindh; 3) Khyber Pakhtunkhwa; 4) Balochistan; 5) Gilgit-Baltistan; 6) Islamabad (ICT)
		1) Punjab urban; 2) Punjab rural; 3) Sindh urban; 4) Sindh rural; 5) Khyber Pakhtunkhwa urban; 6) Khyber Pakhtunkhwa rural; 7) Balochistan urban; 8) Balochistan rural; 9) Gilgit-Baltistan; 10) Islamabad (ICT)
2	Residence	1) Urban; 2) Rural
3	Ethnicity	1) Urdu; 2) Punjabi; 3) Sindhi; 4) Pashto; 5) Balochi; 6) Siraiki and 7) Others
Socioeconomic Indicators		
4	Education of woman	0) Uneducated (less than 1 grade); 1) Primary (1-5 grades completed); 2) Middle to Secondary (6 to 10 grades completed); and 3) Higher (completed education above 10 grades).
5	Education of husband	0) Uneducated (less than 1 grade); 1) Primary (1-5 grades completed); 2) Middle to Secondary (6 to 10 grades completed); and 3) Higher (completed education above 10 grades).
6	Current working status of woman	0) Woman not engaged in any job/profession during last 12 months; 1) woman engaged in some job/profession during last 12 months.
7	Socioeconomic status	1) Poorest (first quintile); 2) Poor (second quintile); 3) Middle (third quintile); 4) Rich (fourth quintile) and 5) Richest (fifth quintile)
8	Consent while getting married	1) Yes 2) No
Demographic Indicators		
9	Current age of woman (years)	1) 15-24; 2) 25-34; 3) 35-45.
10	Age of mother at first marriage (Years)	1) Less than 19; 2) 19 and above. 1) Less than 20; 2) 20-24; 3) 25 and above. 1) Less than 20; 2) 20-24; 3) 25-29; 4) 30 and above.
11	Age at pregnancy loss (years)	1) Less than 20; 2) 20-24; 3) 25-29; 4) 30 and above. 1) Less than 20; 2) 20-24; 3) 25 and above.

Source: Calculations from NIPS and ICF International 2013, 'Pakistan Demographic and Health Survey (2012-13)'.

Annexure II

Distribution of Pregnancies Ending in Five Years Preceding the Survey by Background Characteristics according to Extent of Pregnancy Wastage and Type of Marriages (%)

Indicators	Levels	At least 1 Pregnancy Lost	
		Non-Consanguineous	**Consanguineous**
Age at first marriage	Less than 20	41.4 (39.5 - 43.3)	47.2 (45.4 - 49.0)
	20-24	37.2 (34.8 - 39.6)	43.1 (40.2 - 46.1)
	25-29	44.1 (39.9 - 48.3)	39.0 (32.6 - 45.3)
	30 and above	47.5 (36.6 - 58.4)	43.3 (25.3 - 61.3)
Age at pregnancy loss	Less than 20	29.5 (25.0 - 34.1)	32.6 (27.3 - 37.8)
	20-24	34.6 (32.0 - 37.2)	40.0 (37.3 - 42.8)
	25-29	38.5 (36.1 - 40.9)	47.8 (45.1 - 50.5)
	30 and above	49.8 (47.4 - 52.3)	53.8 (51.2 - 56.3)
Province	Punjab	41.7 (39.9 - 43.5)	45.4 (43.4 - 47.4)
	Sindh	36.5 (33.4 - 39.6)	48.4 (45.5 - 51.3)
	Khyber Pakhtunkhwa	41.3 (37.8 - 44.8)	39.5 (35.0 - 43.9)
	Balochistan	38.8 (32.2 - 45.4)	49.3 (43.2 - 55.5)
	Gilgit-Baltistan	25.0 (12.2 - 37.8)	37.7 (16.5 - 59.0)
	Islamabad (ICT)	43.5 (23.2 - 63.7)	48.6 (24.8 - 72.3)
Regions	Urban	40.2 (38.0 - 42.4)	45.4 (42.4 - 48.5)
	Rural	40.5 (38.8 - 42.3)	45.7 (44.0 - 47.4)
Ethnicity of woman (maternal languages)	Urdu	42.3 (38.3 - 46.3)	42.4 (36.3 - 48.6)
	Punjabi	39.6 (37.5 - 41.7)	43.2 (40.6 - 45.8)
	Sindhi	37.8 (31.6 - 44.1)	49.0 (44.9 - 53.0)
	Pashto	42.0 (38.5 - 45.5)	38.0 (33.4 - 42.7)
	Balochi	30.2 (17.8 - 42.5)	46.4 (40.8 - 52.0)
	Siraiki	43.3 (38.6 - 48.0)	51.2 (48.1 - 54.2)
	Miscellaneous	39.2 (35.5 - 42.8)	47.5 (42.7 - 52.3)
Education of woman	No education	40.8 (38.8 - 42.8)	47.9 (46.1 - 49.8)
	Primary	43.8 (40.4 - 47.3)	41.7 (38.1 - 45.4)
	Middle to Secondary	40.6 (37.7 - 43.4)	43.9 (40.0 - 47.8)

	Higher	34.1 (30.4 - 37.9)	37.2 (30.6 - 43.8)
Economic status of woman	Poorest	41.5 (37.9 - 45.0)	47.2 (44.5 - 50.0)
	Poor	38.9 (35.6 - 42.3)	48.3 (45.3 - 51.3)
	Middle	34.1 (31.0 - 37.1)	41.6 (38.0 - 45.1)
	Rich	43.1 (40.3 - 45.8)	43.5 (39.8 - 47.3)
	Richest	43.3 (40.3 - 46.2)	45.8 (41.8 - 49.9)
Total Sample	Percentage	40.4 (39.0 - 41.8)	45.8 (44.1 - 47.1)
	N	4823	9523

Source: Calculations from NIPS and ICF International 2013, 'Pakistan Demographic and Health Survey (2012-13)'.

Key:
(ICT) Islamabad Capital Territory. Ages are measures in completed years and educational attainment is the completed grades of education. (NA) is not applicable/calculated.
Empty cells indicate insufficient sample size for the calculation of respective subgroup of population.
Note: Due to removal of user missing values and lack of knowledge categories from all indicators, the individual sum of samples for pregnancy losses may differ from cumulative total sample (N) of stillbirths, abortions and miscarriages. Data was not enough for calculating the rates for Gilgit-Baltistan Territory.