Pakistan Journal of Applied Economics, Vol.30 No.2, (181-201), Winter 2020

WOMEN EMPOWERMENT AND INFANT MORTALITY IN PAKISTAN: Micro Data Evidence

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Abstract

Women empowerment has its significance for the economic and social development of countries; specifically, women empowerment is rendered important for child health. Child health being part of sustainable development goals (2030) can be traced through reduced infant and child mortality rates. Owing to the importance of women empowerment for the infant mortality, the present study is an attempt to analyze the impact of women empowerment on infant mortality in Pakistan, utilizing the data from Demographic and Health Survey (DHS-VI) of United States Agency for International Development (USAID). The sample consists of 24,201 individuals. Principal Component Analysis (PCA) has been employed to measure the women empowerment using education level, employment status, asset holdings and decision-making power. Besides women empowerment, other socio-economic, demographic and biological variables have been included as regressors. Logit model has been employed for the estimation of the determinants of the infant mortality. The results show that women empowerment significantly reduces the infant mortality. The study recommends that policy makers ought to introduce broad socio-economic interventions aiming at the wellbeing of both women and their infants.

Keywords: Women Empowerment, Infant Mortality, Principal Component Analysis, Logit Model.
JEL Classification: I10; I12; O15.

I. Introduction

The Infant mortality rate is a strong predictor of the health of a country's population. It is defined as a number of deaths in babies less than one year of age per 1000 live births, in a given period [Desai, et al. (1983)]. Being part of the Sustainable Development Goals (SDG) 2030, it is regarded as a significant factor to analyze the wellbeing of a nation [Newland (1982)]. According to the World Development Report (1993) an initial index of child health is infant mortality rate and is taken to be a highly significant

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predictor of country's economic performance. Over the past decades, different countries of the world have experienced varying rates of child and infant mortalities. These health outcomes varied across countries and regions mainly because of income growth, improvements in medical and technological public health facilities and spread of knowledge [Shehzad (2004)]. Millennium Development Goal-IV (MDG-IV) also focused on a two-third reduction of infant mortality rates by 2015,but unfortunately developing nations are still lagging far behind to achieve this goal [Stuckler, et al. (2010)].

Apart from a number of socio-economic, demographic and health related factors, the role of women may be specified as a significant predictor of infants' health [Suwal (2001)]. Women's strong position in society is perceived to reduce the infant and child mortality rates [Koenen, et al. (2006)]. Women autonomy can be viewed as having four major dimensions, namely, literacy rate, decision-making power, freedom of movement and employment level. All these factors are considered important for determining the infant mortality rates [Brunson, et al. (2009), Hossain (2015)]. According to Eswaaren (2002), women empowerment improves the bargaining power of wives relative to their husbands and hence leads to a decrease in infant mortality. As highlighted in the 2006 Report of United Nations International Children Emergency Fund (UNICEF), Kofi A. Annan, the Secretary-General of the UN, emphasized that Eliminating Gender discrimination and empowering women are among the paramount challenges facing the world today. When women are healthy, educated and free to take the opportunities life affords them, children thrive and countries flourish, reaping a double dividend for women and children.

Effective policy formulation to improve both the survival and health of children requires knowledge of not only the levels but also the determinants of infant and child mortality. There is voluminous empirical literature focusing on the role of demographic and social factors determining infant mortality rate [Aly (1990), Kishor and Parasuraman (1998), Mustafa (2008), Van de Poel, et al. (2009) and Mahfouz, et al. (2009)]. Among such factors, women empowerment is one that not only determines the status of a woman but also affects the quality of life and welfare of children in the household at large. Regarding women's role at the household level, it has been affirmed that women generally place a higher premium on welfare related goals and are more likely to use their influence and the resources they control to promote the needs of families, particularly children [UNICEF (2006)]. According to Do and Kurimoto (2012), this definition reflects two major properties of women empowerment and one way is through which a woman could bring a remarkable change in her life, while the other is related to the autonomy in making decisions about every aspect of life.

The extent of control over resources and participation in the decision making process by females is the key towards their health and the health of their child since the primary care giver of a child is her mother. More empowered women, more frequently and more commonly utilize maternal healthcare services [Bloom, et al. (2001) and Hossain (2015)]. An educated woman with adequate access to resources can take

better decisions for her family and is in a position to effectively utilize all available information which can reduce the risk of her child's death [Duflo (2012)].

There is a lack of literature on the relationship between women empowerment and infant mortality in Pakistan. Given the fact that infant mortality rate reflects both the health status and the level of the development of the country and given the importance of women empowerment for infant mortality. The present study is first of its kind to analyze the impact of women empowerment on infant mortality in Pakistan. The study aims to:

- estimate the Women Empowerment Index (WEI) for Pakistan.
- analyze the impact of women empowerment on infant mortality in Pakistan.
- examine the impact of other determinants on infant mortality.
- compare the infant mortality across rural and urban areas and provinces in Pakistan.

The study utilizes the internationally available micro-data of Demographic and Health Surveys-IV, carried out by the United States Agency for International Development (USAID).Women empowerment is measured using Principal Component Analysis on factors like women's education level, employment status, asset holdings and decision-making power. The study also includes other socio-economic, demographic and biological factors as plausible determinants of infant mortality. Additionally, provincial and regional dummies are also included in the regression analysis to capture differences in the incidence of infant mortality across provinces and across rural and urban regions.

After the introduction (Section 1), the paper proceeds with the trend analysis of infant mortality and women empowerment in Section II, while the review of literature is presented in Section III. Description of methodology and data is given in Section IV, while, results of descriptive and inferential analyses are presented in Section V. Finally, the last Section VI concludes the study with some policy recommendations.

II. Status of Infant Mortality and Women Empowerment in Pakistan

Health related analysts have revealed that Pakistan's health care system is still underprivileged. According to recent World Development Indicators, Pakistan's infant mortality rate, in 2018, is 57 per one thousand live births. This is an alarmingly high rate even by the South Asian standards of 25, 30, 27 and 6 in Bangladesh, India, Nepal and Sri Lanka respectively (see Figure 1). Historically, Nepal has much higher rates of infant mortality in 1960 as compared to Pakistan, but the decrease in case of Nepal is much steeper than for Pakistan. In the same way, it is evident from Figure 1 that Bangladesh and India performed much better in reducing their infant mortality. Trends have shown that Pakistan lags behind other South Asian countries in terms of its health indicators which reflect poor health conditions of the masses, ensued by poor quality of human resources, which in turn results in lower productivity.

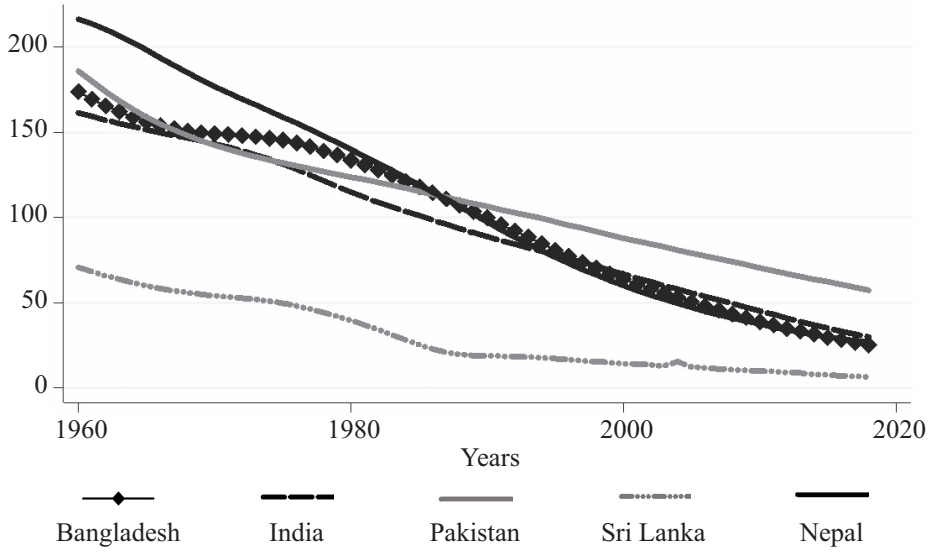

FIGURE 1

Trends of Infant Mortality in South Asia

Women empowerment is a multi-dimensional and complex phenomenon. While exploring the concept of women empowerment, Kabeer (1999) states that empowerment is acquiring the ability to make choices by those who have previously been denied to have such ability. Some of these choices have a more significant impact with regard to the consequences they impart on people's lives than the others, for instance, strategic life choices. These choices, in turn, help frame others as well that might be less consequential but still important for the one's wellbeing. How individuals exercise their ability to make choices can be viewed as having three inter-related dimensions, namely, resources, agency and achievements. These three can be thought of as preconditions, process and outcomes, respectively. Resources can be in material, human or even intangible forms. The access and control over such resources enhance one's ability to make choices. It also entails some norms and rules that govern the distribution and exchange in any institutional setting [Giddens (1979)]. According to Malhotra, et al. (2002), resources can be viewed as the conditions, enabling factors or critical inputs required to foster the process of empowerment. Agency, the second dimension of empowerment, is related with how one defines and acts to pursue one's goals. In social science literature, agency is operationalised as the decision making power; it lies at the heart of several notions of empowerment. It comprises of the abilities to form strategic choices and control resources and decisions important to one's life outcomes. Finally, resources and agency together make up what Sen (1985) mentions as capabilities, which is the potential to live the life one wants for oneself. Functioning achievements are fi-

nally attained when one lives the way one wants when one fails to achieve all this due to several constraints, then it can be viewed as a sign of dis-empowerment.

Therefore, women empowerment is defined as a process of giving the ability to the neglected women to evolve the future strategy in their lives. This ability ensures access to material and social resources; to agency where decision-making is processed and achievements that are the well outcomes [Niaz, et al. (2010)]. MDG-III and SDG-I has strongly emphasized on promoting gender equality which is a prerequisite for women's empowerment because inclusive objectives of the development cannot be achieved without recognizing the role of women in the society and the economy [Mujahid, et al. (2015)].

As far as facts regarding women empowerment in Pakistan are concerned, various indices have depicted that women in Pakistan are disempowered. Human Development Report (HDR) 2018, has revealed that the value of Pakistan's Gender Inequality Index (GII) in 2017 was only 0.541, placing it on 133rd position in 188 countries, while the corresponding measure in HDR 2009 estimates was as low as 0.386.[1] Compared to some of the South Asian countries, Pakistan and Bangladesh are worst performers in gender inequality. At the same time Sri Lanka has been quite successful in reducing its gender inequality [See Table 1].

Furthermore, with a ranking of 148th among 149 countries, Global Gender Gap Report 2016, by the World Economic Forum, revealed a dismal picture of Pakistan regarding gender inequality. The value of the overall index for Pakistan is 0.550 (1=max-

TABLE 1

Gender Inequality Index of Selected South Asian Countries (2017)

Countries	GII Value	GII Rank	Population with Secondary Education Level (%)		Labor Force Participation Rate		Maternal Mortality Ratio	Adolescent Birth Rate	Share of Female Seats in Parliament (%)
			Female	Male	Female	Male			
Pakistan	0.541	133	27.0	47.3	24.9	82.7	178	36.9	20
India	0.524	127	39.0	63.5	27.2	78.8	174	23.1	11.6
Bangladesh	0.542	134	44.0	48.2	33.0	79.8	176	83.5	20.3
Sri Lanka	0.354	80	82.6	83.1	35.1	74.1	30	14.1	5.8
Nepal	0.480	118	27.3	43.1	82.7	85.9	258	60.5	29.6

Source: UNDP Human Development Report, 2018.

[1] The inability to provide recent evidence on Gender Empowerment Measure owes to discontinuity of this measure in HDR.

imum gender equality). As far as different dimensions of gender inequality are concerned, Pakistan has a score of only 0.318 in 'Economic Participation and Opportunity' and 0.127 in 'Political Empowerment'. Gender inequality in Pakistan is least in 'educational attainment' and 'health and survival' with respective scores of 0.810 and 0.946 [Global Gender Gap Report (2018)].

III. Literature Review

Considering the existing empirical evidence, Gupta (1990) concluded that mother's education, women's decision-making power, mother's hygiene and child's sex are significant determinants of infant mortality in rural Punjab, India. Similarly, Griffis (2012) found that standard indicators of women empowerment such as wealth and education are highly effective for reducing infant mortality rates in Malawi. Luz (2014) also confirmed similar results regarding the impact of women empowerment on infant mortality in rural Mozambique. In a relatively different study, Sharma and Kader (2013) indicated that women's decision-making power regarding their family related issues is positively related to infant's birth weight. Finally, a recent study by Hossain (2015) revealed a significant and negative impact of women's empowerment, measured through female's attained level of education, their freedom of movement and decision making power, on infant mortality in Bangladesh.

Stiyaningsih and Wicaksono (2017) estimated the impact of women empowerment on infant mortality in Indonesia. Utilizing the Indonesia Demographic and Health Survey, a sample of 9754 women was drawn. Results of the binary logistic model showed that more empowered women were less likely to experience infant mortality. Islam and Hyder (2016) also provided similar conclusions regarding the role of women empowerment in reducing child and infant mortality rates in selected South Asian countries and thus advocated the women empowerment in health related issues. While investigating the impact of women empowerment on child health status in two developing countries (India and Nigeria). Ibrahim, et al. (2015) also concluded that women's autonomy in terms of decision-making is of utmost importance for the overall wellbeing of children.

Focusing on some of the recent literature related to micro-level determinants of infant mortality in Pakistan, Ijaz (2012) has reported that number of lady health workers, sanitation, number of households having job and education level of household head are negatively related with infant mortality in Punjab. According to Nasrullah, et al. (2014), early marriages of women are positively affecting the incidence of child and infant mortality in Pakistan. While, Durrant and Sathar (2000), using data of 1036 women from Pakistan Status of Women and Fertility Survey have shown that some of the female's autonomy related factors like access to financial resources, freedom of mobility, absence of purdah restriction and decision-making autonomy on child's issues are important in determining infant mortality in rural areas of Punjab.

IV. Methodology and Data

The mentioned earlier, the paper use latest phase of a reliable data source, DHS-VI of the USAID[2] . The Demographic and Health surveys (DHS) Program is a world-wide program for gathering data on family planning, fertility, child and maternal health, gender, malaria, HIV/AIDS and nutrition. The purpose of the data is to use it for effective policy formulation for the development of masses. USAID funded the DHS Program. As a general rule, any national statistical agency is responsible for collecting the data under the technical guidance of the DHS Program Staff.

On the basis of the extensive empirical literature, a specific methodology is employed to estimate the model of the study. Adapting from the literature on determinants of infant mortality, the specific form of the model used to estimate the impact of women empowerment on infant mortality is:

$$IMR_i = \alpha + \beta_1 WEI_i + \beta_2 MA_i + \beta_3 FS_i + \beta_4 BO_i + \beta_5 PBI_i + \beta_6 WI_i + \beta_k \sum D_{ij} + \varepsilon_i$$

whereas:

IMR_i = Dummy for infant mortality (1=infant dies and 0=infant survives)
WEI_i = Women empowerment index (computed by using PCA)
MA_i = Mother's age at first birth (in years)
FS_i = Family size (number of household members)
BO_i = Birth order of the child
PBI_i = Preceding birth interval in months
WI_i = Wealth index
ΣD_{ij} = Dummies for multiple birth, region, child sex, provinces, sex of the household head, place of delivery and blood relation between husband and wife. The wealth index is a compound measure of household's accumulative living standard based on household asset ownership and community level characteristics. The detailed description of variables along with their respective code in DHS is given in Table 2.

While moving from conceptualization to the measurement of women empowerment, it is worth considering that there exists a gap between this theoretical concept and the way women empowerment is operationalized. Since empowerment is a complex and multi-dimensional qualitative phenomenon, hence it poses many challenges to quantify it. Different researchers, in the field of sociology, demography and economics, have used different measures of empowerment. In most of the earlier work, researchers used status like formal education and employment status as an indicator of empowerment [Mason (1986)]. Following the United Nations International Con-

[2] The DHS project of USAID is based on six year stages out of which five phases have been carried out since 1984. Stage six is the most recent stage lying between the year 2008 and 2013.

TABLE 2

Description of Variables

Variables	Code in DHS	Variable Definition
Infant mortality rate	b5 and b6	Dichotomous variable, 1 if infant dies and 0 if infant survives. It is generated from two variables, b5 which is 'whether child is alive or dead' and b6 which is 'age at death of the child'. Age at the death is usually reported in months. Hence the outcome variable takes a value of 1 if the child is dead and the age at the death is less than 12 months
Women empowerment index	-	It is composite measure constructed using PCA on women's education, employment status, asset holdings and questions related to decision making power.
Mother's age	v212	Mother's age at first birth (years)
D_{1i}	b0	Dummy for birth of two or more offspring (1=birth of twins, 0=otherwise)
D_{2i}	v025	Dummy for region (1=urban and 0= rural)
Family size	v136	Number of members in the households
D_{3i}	b4	Dummy for child sex (1=boy and 0=girl)
D_{4i}	v024	Dummy for Punjab (1=Punjab, 0=otherwise)
D_{5i}	v024	Dummy for KPK (1=KPK, 0=otherwise)
D_{6i}	v024	Dummy for Balochistan (1=Balochistan, 0=otherwise)
Birth order	Bord	Chronological orders of births
D_{7i}	v151	Sex of household head (1= male and 0=female)
PB_{1i}	b11	Preceding birth interval. It is a period between previous child birth and index child birth (in months)
D_{8i}	m15	Dummy for place of delivery (1=health centers/hospital and 0=otherwise)
D_{9i}	s110	Dummy for the blood relation between husband and the wife (1=related and 0 otherwise)
Wealth index	v190	Index based on household ownership of assets, material used for housing construction and access to water and sanitation facilities

Source: Demographic and Health Surveys (DHS).

ference in 1994 on Population and Development, researchers started to use other measures such as decision making in the households and mobility. Duflo (2012) makes an important contribution in this context by highlighting three dimensions of women empowerment; namely education, involvement in the decision-making process and participation in economic activities. An important development is Demographic and Health Surveys (DHS), which are one of the pioneering surveys to collect information on women empowerment related variables for several countries [Griffis (2012), Upadhyay and Karasek (2012), Phan (2016), and Atake and Ali (2019)].

In the same way, the study utilizes principal component analysis PCA to measure WEI which is based on eight characteristics of women, namely; education, employment status, ownership of property, ownership of land, and decision-making power regarding household purchases, income earned, contraceptive use and personal health care. The decision making regarding the number of children are not included to compute women empowerment index to avoid possible endogeneity issues [Durrant and Sathar (2000)]. The statistical technique PCA is commonly used for data reduction. It is useful for converting numerous variables in a data set in to a fewer number of a logical set of uncorrelated (orthogonal) factors, the principal components. The principal components explain much of the variance among the original variables; each component is a linear weighted combination of the initial variables. The leading eigenvectors from the Eigen decomposition of the correlation or the covariance matrix of the variables describe a series of uncorrelated linear combinations of the variables that contain most of the variance. The PCA procedure generates components in descending order of importance, i.e., the first component explains the largest variation in the data while this variation is minimum for the last component.

Results of the PCA are presented in Table A-1 (Appendix). For meaningful interpretation in regression analysis, the computed women empowerment index is standardized before using in regression. The average value for the index is 0.312, with a standard deviation of 0.18. The average value below 0.5 indicates that the status of women empowerment in Pakistan is low.

V. Results and Discussions

The sample in regression analysis consists of 24,201 observations. Table A-2 of Appendix presents the descriptive statistics of the variables used in the analysis. Table 3 shows the results of the logistic regression on determinants of infant mortality. Estimated coefficients in Table 3 are the log of odds ratio. Additionally, the average marginal effects are also estimated and reported in Table 3. The estimated results have shown that the model is overall significant, as indicated by the LR statistics. To begin with results of individual coefficients, the estimated coefficient of women empowerment index, WEI, is negative and significant illustrating that one unit increase in women empowerment will decrease the log of odds ratio in favour of infant mortality by 0.055.

Looking at the average-marginal effect, it can be said that one unit increase in women empowerment index decreases the probability of infant mortality by 0.4 per cent. The finding is consistent with prior empirical studies, which have revealed that women empowerment indicators have negative effect on infant mortality. With regard to the impact of women's education level on infant mortality, significant as well as negative relationship is found between women's higher educational attainment and infant mortality, as an educated mother can take better care of her infant because of her awareness of health care facilities. Women's decision making power is reported to have a negative impact on infant mortality. Women with strong decision-making power are reported to have smaller family size, longer birth intervals and normal birth size of children, which significantly reduces infant mortality. Infants belonging to working women are found to be healthier because mothers' preference to utilize a large part of their income for the welfare of their children. Similarly, women's control over economic resources has been reported to have significantly increased infants' survival rate, because necessities of life are far more easily accessible to a wealthier mother [Hossain (2015), Gupta (1990), Shetty and Shetty (2014), Griffis (2012), Waghamode and Kalyan (2014), Kaldewei (2010), Biks, et al. (2015), Alemayehu, et al. (2015), Lamontagne, et al. (1998), and Adhikari and Sawangdee (2011)].

The estimated coefficient of preceding birth interval, PBI, is negatively and significantly related with infant mortality at the significance level of one per cent. It shows that one additional month of birth interval decreases the log of odds ratio of infant mortality by 0.047. Alternatively, one additional month of birth interval decreases the probability of infant death by 0.3 per cent. This result is also consistent with the existing empirical literature. An infant born soon after preceding birth is found to be more vulnerable to death because of smaller birth size [Kaldewei (2010), Knodel and Hermalin (1984), Kembo and Ginneken (2009) and Rotstein (2005)]. Another related variable is birth order, BO, listing a positive and significant coefficient in Table 3, showing that the log of odds ratio of infant death increases with higher birth order by 0.022. The probability of infant death increases by 0.9 per cent with the increase in a number of births by a woman. In other words, eldest child has least chances of death compared to younger siblings. Kembo and Ginneken (2009) have also endorsed that higher birth orders significantly increase the incidence of infant mortality because of poor health of the mothers.

In contrast to the above results, the estimated coefficient of the dummy variable for child's sex, D_1, is insignificant in Table 3. This result supports the study by Kaldewei (2010) who has also reported no difference between male and female infants' mortalities. The next biological variable is multiple births, D_2, which elucidates a positive and statistically significant relationship with infant mortality. The coefficient value indicates that the log of odds ratio of infant death is higher by 1.6 for twin births as compared to the singleton birth. Putting it alternatively, the probability of infant death is higher in multiple births by 0.235 per cent as compared to singleton birth. Uthaman, et al. (2008)

TABLE 3

Determinants of Infant Mortality Rates in Pakistan

Variables	Coefficients	Marginal Effects
Women Empowerment Index(WEI)	-0.055**	-0.004**
	(-2.37)	(-2.37)
Preceding Birth Interval(PBI)	-0.047***	-0.003***
	(-18.96)	(-23.94)
Birth Order(BO)	0.022**	0.009**
	(2.34)	(2.34)
D_{1i} (Dummy for Child's Sex)	0.029	0.002
	(0.72)	(0.72)
D_{2i} (Dummy for Multiple Births)	1.609***	0.235***
	(16.74)	(11.41)
D_{3i} (Dummy for Place of Delivery)	-0.691***	-0.048***
	(-11.26)	(-13.18)
D_{4i} (Dummy for the Sex of Household Head)	0.253*	0.018**
	(2.72)	(2.99)
Wealth Index(WI)	-0.058**	-0.004**
	(-3.08)	(-3.08)
Family Size(FS)	-0.075***	-0.006***
	(-10.19)	(-10.55)
D_{5i} (Dummy for the Blood relation between Husband and Wife)	0.190***	0.015***
	(4.37)	(4.46)
Mother's age (MA)	-0.064***	-0.005***
	(-10.51)	(-10.65)
D_{6i} (Dummy for the Region)	-0.109**	-0.009**
	(-2.15)	(-2.17)
D_{7i} (Dummy for Punjab)	0.097*	0.008*
	(1.80)	(1.76)
D_{8i} (Dummy for KPK)	-0.215***	-0.016***
	(-3.34)	(-3.52)
D_{9i} (Dummy for Baluchistan)	0.178**	0.015*
	(2.95)	(2.81)
Pseudo R^2=0.10 LR statistics=1046.6***		

Source: Authors' estimation based on the data of DHS.

Notes: *significant at10 per cent, **significant at 5 per cent and ***significant at 1 per cent

and Miyahara, et al. (2016) have also reported less chances of survival among neonatal and infant twins because of smaller birth size and inappropriate food intake.

With regard to the dummy for the place of delivery, D_3 results in Table 3 show that its coefficient is negative and significant; indicating that log of the odds ratio of infant death is lower by 0.691 if delivery takes place in hospitals or health centers instead of homes. The chances of infant death are lower by 0.048 per cent in case the delivery takes place in the hospital instead of home. Empirical studies by Doctor (2011) and Adedini (2013) also suggest that deliveries taken place at homes have high risks of infant mortalities. The next variable is the dummy variable for the sex of the household head, D_4, with a positive and significant coefficient explicating that log of the odds ratio of infant death is higher in male-headed households, by 0.253, than that of the female headed households. Earlier studies have also concluded that infants of female headed households are less exposed to death because women can take good care of their children when they have control over the allocation of resources at the household level [Adhikari and Podhisita (2010), Doctor (2011) and Gupta, et al. (2015)].

As expected, wealth index, WI, registers a negative and significant effect on infant mortality in Table 3, signifying that with the increase in the wealth of households, the log of odds ratio (probability) of infant death decreases by 0.058 (0.4 per cent). This result is compatible with the earlier empirical studies by Kaldewei (2010), Adeini, et al. (2015) and Uthman, et al. (2008), revealing that infants from poor families are deprived of basic access to health related facilities which increases the chances of infant mortalities. Another variable bearing a negative and significant effect on infant mortality is family size, FS. Results show that the log of odds ratio of infant death is lower in large families by 0.075. The finding endorses Kaldewei (2010) who suggested that the number of household members have sizeable effect on infant mortality. Large family size therefore, may have negative effect on infant mortality because children living in large families enjoy extra care from their elders.

Blood relationship between mother and the father, D_5, is another independent variable, which shows significant and positive relationship with infant mortality in Table 3. Results show that the log of odds ratio (probability) of infant death is higher by 0.190 (0.015) if parents have blood relation than otherwise. Some other empirical studies have also revealed that higher fertility rates and shorter birth intervals in first or second cousin marriages have significantly increased mortality rates among infants [Khayat and Saxena (2000), Bittles and Black (2010), Tuncbilek and Koc (1994)]. Lastly, mother's age, the demographic variable MA, is having a negative and significant effect on infant mortality specifying that the log of the odds ratio of infant death is higher for younger mothers by 0.064. Indeed, the existing literature extensively reports the significant effect of mother's age at birth on infant mortality. For example, findings by Kaldewei (2010) show that newborns of adolescent mothers are highly vulnerable to deaths. Similarly, the study by Adhikari and Podhisita (2010) asserts that early child marriages are an important justification of adolescent pregnancy and higher infant mortalities.

Finally, to analyze the regional and provincial differences in infant mortality across Pakistan, the first focus variable is the area of region, D_6. Its estimated coefficient bears a negative sign, showing that the log of the odds ratio of infant death is lower in urban areas by 0.11. Children born in rural areas are exposed to higher risk of infant mortality because of unavailability of basic life support facilities. Kembo and Ginneken (2009) and Adedini (2013) have also reported similar mortality outcomes of births in rural areas. Besides regional differences, there are provincial differences in incidence of infant mortality across Pakistan. The estimated coefficient for Punjab province is positive and significant. It shows that log of the odds ratio of infant death is higher in Punjab by 0.097 relative to Sindh, which is taken as the reference category. On the contrary, KPK has lower incidence of infant mortality as compared to Sindh with its coefficient being negative and significant indicating that the log of odds ratio of infant death is lower in KPK by 0.215 relative to Sindh. Similar to Punjab, the estimated coefficient of the dummy for Baluchistan province is positive and significant, showing that the log of odds ratio of infant death is higher in Baluchistan relative to Sindh by 0.18.

VI. Conclusion and Policy Recommendations

Since Pakistan has the highest rate of infant mortality among its South Asian counterparts, child health generally and infant mortality specifically, have been the core sustainable development issues of Pakistan. Role of women is important in explaining the infant mortality rate of any country. An educated and resourceful mother is the key for better child health. Given the significance of the relationship between women empowerment and child health and the dearth of literature on the topic, the present study has analyzed the impact of women empowerment on infant mortality in Pakistan, using micro-data of DHS-VI by USAID. Women empowerment index, based on women's education, employment status, asset holdings and decision making power, is computed using the PCA technique. The study has also included various socio-economic, demographic and household characteristics as plausible determinants of infant mortality. Incidence of infant mortality, being a dichotomous dependent variables is analyzed using the logit model.

According to the results, women empowerment has a negative and significant impact on infant mortality in Pakistan. Additionally, the incidence of infant mortality is negatively affected by preceding birth interval, mother's age, family's wealth and family size. Similarly, the blood relationship between husband and wife is found to be increasing the probability of infant's death. Higher birth order too is found to increase the probability of death in infancy. Moreover, the results show that singleton births have greater chances of survival compared to twin births and infants born at homes and in rural areas are highly exposed to death compared to those born in hospitals and urban areas respectively. The findings also suggest higher infant mortality in male headed households as compared to female headed households. Finally, bi-

variate (is it not multivariate?) analysis has revealed that the incidence of infant mortality is higher in Punjab relative to other provinces.

To improve the quality of life of both women and infants in Pakistan it is suggested:

- Immediate steps ought to be taken at the policy level to help develop the infrastructure of the health system, specifically in rural areas of the country;
- Correspondingly, state level interventions should focus on creating equal opportunities for women in both education and employment;
- Family planning programs should effectively familiarize masses regarding benefits of an increase in the birth interval and reduction in the family size;
- Inheritance laws should be reformed keeping in perspective the 21st century social dynamics to help women have judicious access to family wealth.
- Effective enforcement of existing inheritance laws should be ensured.

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APPENDIX A

TABLE A-1

Results of Principal Component Analysis

Kaiser–Meyer–Olkin (KMO) and Bartlett's Test of Sphericity			
Kaiser–Meyer–Olkin (KMO)	Bartlett's Test of Sphericity		
	Chi square	Degrees of freedom	Probability value
0.787	1.15e+05***	28	0.00

Principal components, Eigen values and proportion of variance				
Component	Eigen values	Difference between eigen values	Proportion of variance explained	Cumulative proportion of variance explained
Comp 1	2.9839	1.46101	0.3730	0.3730
Comp 2	1.5229	0.509785	0.1904	0.5633
Comp 3	1.01311	0.101103	0.1266	0.6900
Comp 4	0.912008	0.395621	0.1140	0.8040
Comp 5	0.516387	0.10986	0.0645	0.8685
Comp 6	0.406527	0.0431787	0.0508	0.9194
Comp 7	0.363348	0.0815281	0.0454	0.9648
Comp 8	0.28182	-	0.0352	1.0000

*** shows significance at one percent level of significance.
Notes. Bartlett's test of Sphericity and Kaiser–Meyer–Olkin (KMO) are statistical tests used to examine the suitability of principal component analysis.
Source: Authors' estimation based on the data of DHS.

TABLE A-2

Descriptive Statistics

(a.) Frequency Distribution of Categorical Variables			
Name of the Variable	Frequency	Percentage	Cumulative per cent
Infant Mortality			
Infant Survives	27,878	86.98	86.98
Infant dies	4,173	13.02	100.00
Total	32,051	100	-
Child Sex			
Girl	15,335	47.85	47.85
Boy	16,716	52.15	100.00
Total	32,051	100	-
Multiple Birth			
Single birth	31,291	97.63	97.63
Twins	760	2.37	100.00
Total	32,051	100	-
Place of Delivery			
Home	26,213	81.79	81.79
Hospital/Health Center	5,838	18.21	100.00
Total	32,051	100	-
Region			
Urban	13,711	42.78	42.78
Rural	18,340	57.22	100.00
Total	32,051	100	-
Area			
Punjab	8,602	26.84	26.84
Sindh	6,597	20.58	47.42
KPK	6,257	19.52	66.94
Baluchistan	5,512	17.20	84.14
Gilgit Baltistan	3,256	10.16	94.30
Islamabad	1,827	5.70	100.00
Total	32,051	100	-
Sex of Household Head			
Male	29,585	92.31	92.31
Female	2,466	7.69	100.00
Total	32,051	100	-
Blood Relation between Husband and Wife			
No	11,801	36.84	36.84
Yes	20,228	63.16	100.00
Total	**32,029**	**100**	**-**

(Continue)

TABLE A-2

Descriptive Statistics *(Continued)*

Descriptive Statistics of Numerical Variables					
Variables	No. of Observations	Mean	Standard Deviation	Minimum	Maximum
Women empowerment index	32,051	0.312	0.18	0	1
Wealth Index	32,051	2.86	1.42	1	5
Family Size	32,051	9	5	1	48
Birth Order	32,051	4	2	1	19
Mother's age at first birth	32,051	20	4	12	44
Preceding birth interval (months)	25,043	30.65	18.53	9	241

Source: Demographic Health Survey, 2008-2013.