Impact of Health Infrastructure on Child Health in Punjab, Pakistan

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ARTICLE DETAILS	ABSTRACT
History: *Accepted 25 April 2022* *Available Online June 2022* **Keywords:** *Health Infrastructure, Infant Mortality, Underweight, Remittances* **JEL Classification:** *H54, I10, I1, F24* **DOI:** 10.47067/reads.v8i2.437	*The objective of the study is to find the impact of health infrastructure on child health in Punjab, Pakistan. The study used the panel data collected from Punjab development statistics (PDS) between 2010 and 2016 for 35 districts of Punjab, Pakistan. The Generalized Method of Moments (GMM) is used for the current analysis. Child health in terms of infant mortality and underweight is used as dependent variable and health infrastructures, ownership of house, receiving remittances, physical access to safe drinking water, improved sanitation are independent variables. Health infrastructure is the index of four variables number of hospitals, number of dispensaries, number of mother and child health center and number of rural health centers. Results of the study conclude that health infrastructure is an important determinant of child health. There is a strong positive influence of health infrastructure in terms of different type of hospitals, dispensaries, rural health centers and mother and child health care centers is found on child health.*

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1. Introduction

Health is an important part of human capital (Schultz, 2010). In poor countries, child health is a major public policy concern. Development of a country also becomes the source of better health because increasing income level will affect the health status positively. In less developed countries, child health is a major symbol of quality of life. The health status of children in the PDHS (Pakistan Demographic and Health Survey) depends on the level of children's vaccination, birth weight, common childhood illnesses and fever, and the prevalence and treatment of respiratory tract infections and diarrhea. Low

birth weight infants not only have a lower chance of survival, but also have higher morbidity and mortality.

Child health is seen as a key indication of socioeconomic progress (Mahmud et al., 2011). Infant mortality and underweight are powerful determinants of a country's population's health. It is considered a major aspect in analyzing a country's well-being because it is part of the Sustainable Development Goals 2030(Jacobs, Newland, & Green, 1982). The infant mortality rate is considered to be a highly significant indicator of a country's economic performance, according to the World Development Report (1993). Various countries around the world have witnessed various rates of child and newborn mortality during the last few decades. Because of income development, advancements in medical and technology public health facilities, and the diffusion of information, these health outcomes varied among countries and regions (Shehzad, 2006).

The fourth Millennium Development Goal (MDG-IV) called for a two-thirds reduction in infant mortality rates by 2015, however developing countries are still falling far behind (Stuckler, Basu, & McKee, 2010). Nonetheless, there has been no considerable development in Pakistan (UNICEF, 2013). Among 2013, the incidence of underweight in children under the age of five years in Pakistan was 31 percent, according to the Child Nutrition Report (UNICEF, 2013). According to studies, Pakistan's underweight rate has risen to 43.7 percent (WHO, 2015). In Pakistan, approximately 26% of infants weigh less than 2.5 kg at birth, while 47% of children received all BCG, DPT, polio, and measles vaccinations. 60 percent of children under the age of one have been immunized against measles(Datar, Mukherji, & Sood, 2007).

Nutritional status is a significant consideration in improving child health (Chowdhury et al., 2013). There are numerous elements that can influence a child's health. These determinants include anything from maternal literacy, household income, and health-care utilization (Larrea & Kawachi, 2005; Mashal et al., 2008) to economic equality, effective decision-making, and migration (Larrea & Kawachi, 2005; Mashal et al., 2008). Micronutrient consumption has been identified as one of the most important variables in improving child health, among other things (Black et al., 2008). In impoverished nations like Pakistan, iron deficiency anemia and vitamin A deficiency are major dietary issues that lead to underweight (FAO, 2015).

In developing countries like Pakistan, where a large segment of the population lives in poverty and is afflicted by various ailments, healthcare infrastructure and services are critical. Budget constraints limit healthcare spending. A significant portion of the load is passed on to government-provided healthcare infrastructure and services. The government must spend a significant amount of money to acquire and maintain healthcare infrastructure and services. Roemer's law states that "a bed created is a bed full" (Roemer, 1961). The utilization of a bed grows as the availability of beds increases, resulting in an increase in HCE. Healthcare infrastructure and services, according to Abbas and Hiemenz (2013) and Ang (2010), determine the quality of healthcare services. When the ratio of health care workers to the total population goes up, public health care costs may go up because more people need health care infrastructure and services. Poor health of children illustrates poor government policies of health and lack of health infrastructure. Like others developing countries, Pakistan is also facing increased child mortality rate. Child health status in developing countries is poor due to lack of health infrastructure and poor condition of other socio-economic determinants. The health infrastructure contains different type of hospitals, dispensaries, rural health centers and mother and child health care centers and other different institutions which are used for the wellbeing of child

health.

In order to analyze the impact of health infrastructure in Punjab, Pakistan, on child's health. The study objective is to evaluate the impact of health infrastructure on child health. Moreover, to find the impact of family wealth status, improved sanitation, safe drinking water, ownership of house and remittances on and child health. The statement of this issue may be pointed out as: How does the health use of children relate to the health infrastructure in Punjab? What is the role of improving health facilities in affecting children's health services?

The structure of the study is as follows: second section is about the literature review of previous studies on child health and health infrastructure. Fourth section is about the formulation of the model, the data sources and methods of this study. Fifth section consist of result and the discussion. The sixth section provides conclusion and the policy suggestions.

2. Literature Review

The link between health infrastructure and child health has received a lot of attention in recent years. The literature describes several processes through which health infrastructure affects child health.

D'souza and Bryant (1999) analyzed the determinants of child mortality in slums in Karachi, Pakistan. That study was designed to determine the risk factors for under-five mortality. The paper attempts to reveal the role of behavioral problems, such as the mode of limiting mothers' autonomy and the search for healthy behaviors, and the more traditional, socio demographic factors that predict mortality among children less than five years of age. The investigation started in January 1993 in the six ghettos of Karachi and the Department of Community Health Sciences (CHS) at the University of Akakan (AKU) has been doing essential social insurance (PHC) programs since 1985. The hypothetical system chip away at Mosley and Chen's structure work was utilized. Calculated relapse display was utilized for examination. The information was optional. Their decision is that the fundamental determinant of undertaking achievement lies in the introduction of relevant social and behavioral changes in these similar rural environments, not just the bioavailability of the technology itself.

Gokhale, Rao, and Garole (2002) investigated child mortality in India: utilization of maternal and child health administrations as far as proficiency rates. The researchers found that the slow decline in infant mortality in the past decades was a major problem in India. The author's main goal was that the female literacy rate was closely identified with all factors identified with maternal care and infant mortality. On the basis of female illiteracy, identities are divided into the best medium and worst. The infant mortality rate in the worst group was significantly higher than that in the medium group and the best group. The data comes from the National Family Health Survey. The National Family Health Survey (NFHS) was a household survey of the overall sample size. Two-stage stratified sampling designs are used in rural areas. Urban areas use a three-stage sampling design. Interview details of the collection of live women. The data was primary and cross-sectional. Using SPSS, data was analyzed using multiple regressions and clustering methods. The authors conclude that the impact of female illiteracy rates on infant mortality and maternal and child health services was much detrimental in village areas than in city areas. Male literacy rates are high, male literacy rates are low, maternal and child health services are better utilized, and infant mortality rates are significantly reduced.

Fay, Leipziger, Wodon, and Yepes (2005) studied the part of infrastructure in accomplishing the

related millennium development goal related to child health. The primary reason for the paper was to experimentally break down the determinants of the three child health results identified with the related millennium development goals, specifically the infant death rate and the pervasiveness of lack of healthy sustenance. The investigation utilized infant mortality, unhealthiness, foundation, access to pipelines for water supply, enhanced private floors, enhanced cleanliness, birth conveyance, inoculation and pre-birth mind factors. In view of information utilized as a part of statistic and health studies, the report rises above customary cross-country relapses by abusing the inconstancy of results and logical factors saw inside nations between resource quintiles. The consequences of the investigation demonstrate that notwithstanding customary variable salary, resources, training, and direct health intercessions, better access to fundamental framework administrations assumes a vital part in enhancing child's health results(Ravallion, 2007).

Omariba, Beaujot, and Rajulton (2007) showed the determinants of child and child mortality in Kenya by utilizing Weibull's imperceptibly heterogeneity (shortcoming) survival display. Contrast the after effects of these models and the consequences of the standard Weibull survival demonstrate. The investigation particularly considered the degree to which child survival dangers kept on changing, notwithstanding the watched factors and the degree to which the unintended examples were one-sided because of infringement of the freedom factual suspicions. Information gathered from the 1998 Demographic and Health Survey of Kenya.The consequences of the standard health survival demonstrate unmistakably demonstrate that natural populace factors are more vital in clarifying child mortality, and financial, socio cultural and health factors are more imperative in clarifying infants mortality. Early stages and youth, the impacts of shortcoming are extremely huge and exceptionally critical; however, the conclusions are steady with the conclusions in the no-insufficiency display.

Huq and Tasnim (2008) investigated mother education and child care in Bangladesh. In that study examined the effect of maternal instruction on the health status of Bangladesh and the utilization of child health care services. Studies had demonstrated that maternal instruction was an essential determinant of the health status of infants in Bangladesh. Information examination depends on the 2000 Family Income Expenditure Survey. The review was directed by the Bangladesh Bureau of Statistics in 1999-2000. Multivariate logistic regression models were utilized for examination. Their decision was that child's health and mother instruction are considered as imperative determinants of childcare administrations. With a specific end goal to enhance the health status of child in Bangladesh, it is prescribed to enhance the instruction of the populace and mothers.

Miller and Rodgers (2009) focused on the mother's education and child nutrition, new evidence from Cambodia. He used information from the 2005 Demographic and Health Survey of Cambodia to investigate that the three children's nutritional status measurement standards vary according to the level of mother education. In order to determine the mechanism of this association, he analyzed the size of birth weight, which depends on the factors during pregnancy, as well as the short stature (developmental delay) and the stature (embroidery) affected by postnatal influence factors. In multivariate norms that control socioeconomic status, maternal education intensity is closely related to stunting, but not a small number of births or weight loss. Adding family composition and environmental factors to the model only slightly reduces the correlation between maternal education and child nutrition outcomes.

Kosec (2014) examined the effect of privatization of water supply in African urban communities

on child health. The fundamental motivation behind the investigation was to comprehend the effect of private segment interest in the water part on child' health. The report utilizes childhealth, water, privatization, and health framework and instruction factors. This archive utilizes child level information from 39 African nations in the vicinity of 1986 and 2010. The information was examined utilizing common minimum squares. Accordingly, it was discovered that the private part was engaged with diminishing urban living, 2.6 rate purposes of diarrhea in child under five, or 16% of the normal frequency rate. Child from the poorest families advantages the most. The investment of the private division is additionally identified with the 7.8 rate focuses increment in the school participation rate in the vicinity of 7 and 17 years of age. Vitally, the investment of the private segment has expanded the utilization of faucet water by 9.7 rate focuses, showing a conceivable causal channel for clarifying health change. To be approved to causality, it is important to exploit changes in the private water piece of the overall industry controlled by previous provincial African nations. Fake treatment investigation demonstrated that interest of the private part did not influence respiratory infections, nor did it influence control bunches in rustic children.

Rieger and Wagner (2015) found that child malnutrition was far reaching in developing nations, and anthropometric estimations, for example, stature, weight, and tallness have been turned out to be dependable indicators of here and now lack of healthy sustenance and hindering. Rather than concentrate these indicators independently, we take a gander at their associations and build up child health progression. Considering that child's health stock and the tallness of stature and weight are the surrogate indicators of nourishing venture, we have built up a child health creation work that has self-profitability of past sound stocks and synchronous dietary sources of info. In this study utilized the dynamic board strategy to test 271 Senegalese boards of 0- to 5-year-old child to control the endogeneity of the generation work. In view of past confirmation, found that child can mostly get up to speed with lack of healthy sustenance spells. Be that as it may, child's health stocks are immediately drained and should be continually refreshed. This demonstrates the significance of solid memory; lack of healthy sustenance can't battle with preview intercessions. In this manner, manageable sustenance mediations must be long haul and create higher returns at a very early stage in their introduction to children.

Maniruzzaman et al. (2018) examined child mortality and neonatal mortality rates in Bangladesh. The reason for that paper was to analyze the interregional changes in infant child mortality related with specific parts of financial and nourishing status; access to health and the utilization of health administrations. The paper recognized probably the latest determinants of infant mortality. The data was collected from the Registrar's general development, Family health bureau and the medical statistics unit of ministry of health. Secondary data was used in that study. Multiple regression models were used for analysis. The three components analyzed here (birth weight, pregnant women with access to safe drinking water) straightforwardly influence neonatal mortality, of which infant death rates in Bangladesh are near seventy five percent.

Study Gap: According to the literature on "health infrastructure and child health," health infrastructure has a positive impact on child health. However, the vast majority of studies have relied on subjective measurements of the variables of interest. Despite this, most studies do not estimate panel data for Punjab district by including infant mortality and underweight. Furthermore, there is an endogeneity problem in the existing empirical literature on health infrastructure and child health. Previous studies have used many proxies for child health and health infrastructure. That study is used the index of health infrastructure (number of hospitals, number of dispensaries, number of rural health

centers, number of mother and child health centers), infant mortality and underweight to capture the child health.

3. Data and Methodology

Current section explains the measurement of variables and data collection resources by using Grossman (1972) model. Grossman studied how individuals allocate resources to generate health. This model is very important in health economics. He treats people with a dual role, that is, consumers and producers. The idea of investigating human capital (health and education) to increase productivity and efficiency was introduced in the model. The following two elements include health needs (1) consumption effects (direct effects of health), and (2) investment effects (more likely to participate in market and non-market activities). For the current analysis, different social, economic and environmental factors are used by following the studies of Ahmad, Shafiq, and Gillani (2019) and Majeed and Gillani (2017).

In order to explore the effect of health infrastructure on child health in 35 districts of Punjab, Pakistan. The data comprises 35 districts of Punjab is collected from Punjab Development Statistics (PDS) and range from 2010 to 2016. Child health is measured in terms of infant mortality (IM) and underweight (UW). For current study, infant mortality and underweight child are the dependent variables whereas health infrastructure (HI), improved sanitation (IMS), physical access to safe drinking water (PATD), homeownership (OH), and receiving foreign remittances (RR) are taken as independent variables. The functional form is as follows.

$$IM = f(HI, IMS, PATD, OH, RR) \ldots \ldots \ldots (1)$$
$$UW = f(HI, IMS, PATD, OH, RR) \ldots \ldots \ldots (2)$$

Above mentioned relationship of child health and health infrastructure with other control variables can be written in econometric form as:

$$IM = \alpha_0 + \alpha_1 HI_{it} + \alpha_2 IMS_{it} + \alpha_3 PATD_{it} + \alpha_4 OH_{it} + \alpha_5 RR_{it} + \mathcal{E}it \ldots (3)$$

$$UW = \beta_0 + \beta_1 HI_{it} + \beta_2 IMS_{it} + \beta_3 PATD_{it} + \beta_4 OH_{it} + \beta_5 RR_{it} + \mathcal{E}it \ldots (4)$$

In equation 3 and 4, α_1- α_5 and β_1 – β_5 indicate the impact of health infrastructure, improved sanitation, physical access to safe drinking water, homeownership, and receiving foreign remittances on infant mortality and underweight respectively. Moreover, α_0 and β_0 indicates the intercepts, i represents individual district (panel of 35 districts of Punjab Pakistan), t represents the time period (the period from 2010 -2016).

Table 1: Variables of the Models and Description of Variables

Indicators	Numerators	Expected sign
Infant mortality rate	"Possibility of dying between delivery and the first birthday"	
Underweight	"Number of children under age 5 who fall below (a) minus two standard deviations (moderate and severe) (b) minus three standard deviations (severe)"	
Health infrastructure Index of (No of hospitals, dispensaries, RHC and MCHS)	"A hospital is defined as a facility with ten or more beds. A dispensary is a medical facility with fewer than ten beds."	Negative
Use of improved sanitation (%)	"The number of individuals of a household who use enhanced sanitary facilities that are not shared"	Negative
Use of improved drinking water sources (%)	"Number of household members that use upgraded drinking water sources"	Negative
Receiving remittances from abroad (%)	"The number of members of a household that received remittances from abroad during the year before to the survey"	Negative
Ownership of House (%)	"Number of household members living in a household that own a house"	Negative

4. Result and Discussion

In order to estimate the impact of health infrastructure on child health, GMM technique is used for the current analysis. This investigation covers the period 2010-2016 and utilizes districts level panel data. Table 2 presents the summary statistics of the variables used for the current analysis which indicate the mean, maximum and minimum observations.

Table 2: Descriptive Statistics

Variables	Mean	Max	Min	Std. Dev	Obs.
Health infrastructure (index numbers)	14.594	64.413	3.516	3.049	245
Infant mortality (Numbers)	70.429	113.571	46.286	9.8126	245
Underweight (Numbers)	33.114	47.243	21.686	1.739	245
Improved sanitation (%)	66.812	94.286	33.714	3.069	245
Physical access to safe drinking water (%)	89.947	99.714	74.571	2.421	245
Ownership of house (%)	86.900	94.257	74	2.535	245
Receiving remittances (%)	5.3678	24.757	0.686	2.267	245

To check the stationary of a mentioned variables, Levin Lin Chu panel unit root test is applied. If the probability value is less than 1% and 5%, we accept H_1 and reject H_0, which means the series is not stationary. All variables are stationary at level I(0).

Table 3: Result of panel unit root Test

Variable	Statistics value	Levin Lin Chu (P value)	Level
Health infrastructure	-1.3e+02	0.0000	I (0)
Infant mortality	-4.8932	0.0000	I (0)
Underweight	-7.9010	0.0000	I (0)
Improved sanitation	-2.0620	0.0196	I (0)
Physical access to safe drinking water	-1.5839	0.0566	I (0)
Ownership of house	-13.4270	0.0000	I (0)
Receiving remittances	-2.45	0.0070	I (0)

Table 4 indicates the estimated results of GMM in order to capture the impact of health infrastructure on child health; infant mortality and underweight. According to column (1), the lag value of infant mortality has a positive effect on the current level of infant mortality. It can be interpreted as previous year infant mortality rate increases current year infant mortality rate. Estimates indicate that health infrastructure is significant and negatively correlated with infant mortality. The results show that a reduction in one unit of health infrastructure reduces infant mortality by 0.24 units. It shows improvements in rural medical centers and hospitals play vital role in reduction of infant mortality. Moreover, expanded medical facilities has a positive effect on child's health (Valdivia, 2004).

Table 4: Results of GMM

Variables	(1) Infant Mortality	(2) Underweight
Lag of Infant mortality	0.514***(0.094)	
Lag of Underweight		0.746***(0.102)
Health infrastructure	-0.2442***(0.106)	-2.256**(0. 940)
Improved sanitation	-0.246***(0.070)	-0.045**(0.023)
Physical access to safe drinking water	-0.275***(0.016)	-0.174***(0.060)
Ownership of house	-0.401***(0.131)	-0.057(0.083)
Receiving remittances	-0.184(0.143)	-0.136**(0.072)
Observations	245	245
R-square	0.674	0.757
AR1 (Pr > z)	0.085	0.087
AR2 (Pr > z)	0.653	0.724
Hansen test Prob > chi2	0.245	0.273

Note: () indicates standard errors and "*** p<0.01, ** p<0.05, * p<0.1"

One unit increase in improved sanitation reduces 0.25- and 0.04-units' infant mortality and underweight of child respectively. For instance, improvement of sanitary conditions has a slightly higher impact on children's health. Improved sanitation has a major impact on health as it can lead to reduction in large number of disorders of the gastrointestinal tract and other inflectional diseases which cause infant mortality and underweight child (Montgomery & Elimelech, 2007).About 10% of the

world's infection is related to the lack of adequate sanitation facilities and diarrhea, resulting in approximately 2.5 million children less than 5 years of age each year (UNICEF, 2012).

In case of safe drinking water, one percent increase in improved water caused 0.275- and 0.17-units' reduction in infant mortality and underweight respectively. Findings are consistent with the previous researches (Esrey, Potash, Roberts, & Shiff, 1991; Fewtrell et al., 2005; Mamoon, Raza, & Arshed, 2014). With regard the impact of ownership of house on infant mortality and underweight, our results indicate that there is a negative impact of ownership of home on infant mortality and underweight child. The results were supported by a number of studies. Health difficulties and other health and welfare risks are more prevalent in rental neighborhoods and among low-income households. This is focused on the needs of these families. Housing problems have a long-term impact on physical conditions(Chamberlain & Johnson, 2001). Children with poorer living conditions are more likely to suffer respiratory and mental health problems(Fuller-Thomson, Noack, & George, 2011).

Impact of remittances in case of infant mortality is found insignificant. However, there is a negative correlation between the remittances received from abroad and underweight. The results are in line with a number of studies(De & Ratha, 2012; Hildebrandt, McKenzie, Esquivel, & Schargrodsky, 2005; Ratha, 2013).Remittances improve the family's financial situation and increase purchasing power to spend on health, education and clothing(Acosta, Calderon, Fajnzylber, & Lopez, 2008; Amuedo-Dorantes & Pozo, 2006; Amuedo-Dorantes & De la Rica, 2007; Shafiq & Gillani, 2018; Vladicescu, Cantarji, & Jigau, 2008).Moreover, Remittances play vital role in reducing child health issues including underweight. Remittance is an anti-poverty tool (Ratha, 2013) that allows people to access fundamental necessities like health care. The main factor of child health is individual income (Wood & De Carvalho, 1988). The Hansen test verifies the accuracy of the instruments used for the analysis.

5. Conclusion

As a child's health improves, he becomes a part of a potentially productive labor force later in life, contributing favorably to the economy (Schultz, 2010). In this sense, the availability and condition of basic health infrastructure affect the provision of health services (Health establishment and health personnel). The objective of the investigation is to find the impact of health infrastructure on child health in Punjab, Pakistan. The study used panel data from 35 districts in Pakistan Punjab between 2010 and 2016. The Generalized Method of Moments (GMM) is used in order to avoid the interlinkage between health infrastructure and child health. Recent study includes two child's health indicators i.e., infant mortality and underweight. Health infrastructure has a negative and critical effect on infant mortality and underweight. If the health infrastructure is good and more facilities are provided, the infant mortality and underweight rate in the Punjab districts of Pakistan will certainly decline. All control variables including improved sanitation, safe drinking water, ownership of house and remittances are helpful in reducing infant mortality and underweight.

Health foundations are considered a vital role in improvement of child health. In this regard, government should formulate policies that are conducive to health infrastructures. The government should expand health infrastructure by increasing the number of hospitals, and the number of pharmacies. Moreover, Different types of programs should be launched in which the awareness about child health should be created. In order to improve the lives of children, different type of infrastructure such as clean drinking water, improved sanitation, and various health centers should be maintained mostly in in backward areas.

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