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Antenatal Care (ANC) Coverage, Health Infrastructure, and Postnatal Care (PNC) Services Utilization: A District Level Analysis of Punjab-Pakistan

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ABSTRACT

Awareness of receiving postnatal care is uncommon in Punjab (Pakistan) and supply-side is also unfortunate. Sufficient uptake of PNC may helpful in reducing maternal mortality. Thus, this study explored the demand and supply-side determinants of maternal health (utilization of PNC) care for 35 districts of Punjab, Pakistan. Percentage of women of reproductive ages using PNC services in the 35 districts of Punjab was the outcome variable. While, ANC utilization, adult literacy rate, household wealth, physical infrastructure had been considered as the explanatory variables. Secondary data were obtained from Punjab Development Statistics reports from the years 2010 to 2016. Pooled ordinary least square (OLS) and Generalized Method of Moments (GMM) were applied as estimation techniques. It was found that the percentage of women of reproductive ages using ANC services (0.662, $p < 0.01$), the percentage of households receiving remittances from abroad (0.570, $p < 0.01$), the percentage of households having access to improved sanitation facilities (0.569, $p < 0.01$), the percentage of households having their own houses (0.530, $p < 0.05$), and district-based health infrastructure index (0.237, $p < 0.05$) had strong positive and significant impact on PNC utilization. The study concluded that district-based targets relating to PNC coverage could be achieved by intervening through ANC utilization behavior, household wealth (remittances receipts), and through the provision of infrastructure (healthcare, sanitation) to the residents of the district. Need to ensure the availability and accessibility of PNC in order to reduce the health disparities among the districts of Punjab.

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1. Introduction

Postnatal care—defined as the medical care obtained during the first six weeks after birth—is an important instrument to ensure the wellbeing of mother and neonates (Kabir & Khan, 2013). Although worldwide, maternal mortality has declined by 38 percent yet 810 women still dying daily due to inevitable roots associated with pregnancy and childhood[1] and among that major fraction lies in developing countries (Alkema, Kantorova, Menozzi, & Biddlecom, 2013). As women in less developed countries have more pregnancies so their life is at high risk as compared to that of developed countries[2]. Moreover, majority of maternal deaths (75%) occur in the postnatal period associated with severe complications including access bleeding, infertility, chronic pains, infections (Dhakal et al., 2007; Sultana & Shaikh, 2015) which is common in developing countries. Pakistan is also among those developing countries where lack of political will to implement health care programs and health inequality have been cited as major obstacles to reduce maternal mortality to the desired level, suggested by prior development agendas (Bhutta et al., 2013; Malik & Kayani, 2014). Still, maternal health has gained first ranking in 3rd Sustainable Development Goals[3] due to its severity, target to reduce maternal mortality below 70 per one lac live births till 2030. A case study of Punjab reveals that approximately 52% women visit clinics and medical centers for ANC but mostly do not follow-up as they are not satisfied with the quality of services (Majrooh, Hasnain, Akram, Siddiqui, & Memon, 2014) ultimately, they can't gain PNC due to prenatal experience. Many demand, and supply-side factors describe the PNC level of Pakistani women.

On the demand side, discriminatory improvement in female education is an important obstacle from attaining PNC (Caldwell, 2005). For an instant, Pakistani culture and traditions allow women to follow the instructions of husband and older in-laws. Customs and traditions also play an influential role in explaining the females' treatment pursuing medical care and budget management (Bhutta et al., 2013; Mumtaz & Salway, 2009). In this regard, "Man as partners" program is launched to evoke men to realize the responsibilities to contribute to family planning and women reproductive health before and after pregnancy (Organization, 2014). In addition, wealth status, area of residence, women occupation (Akibu, Tsegaye, Megersa, & Nurgi, 2018; Babalola & Fatusi, 2009; Baqui et al., 2008; Dahiru & Oche, 2015; Ndugga, Namiyonga, & Sebuwufu, 2020). Figure 1 highlights the trend of receiving postnatal care is comparatively less than that of antenatal care. The situation of PNC is worse than ANC (DHS, 2013) in districts of Punjab.

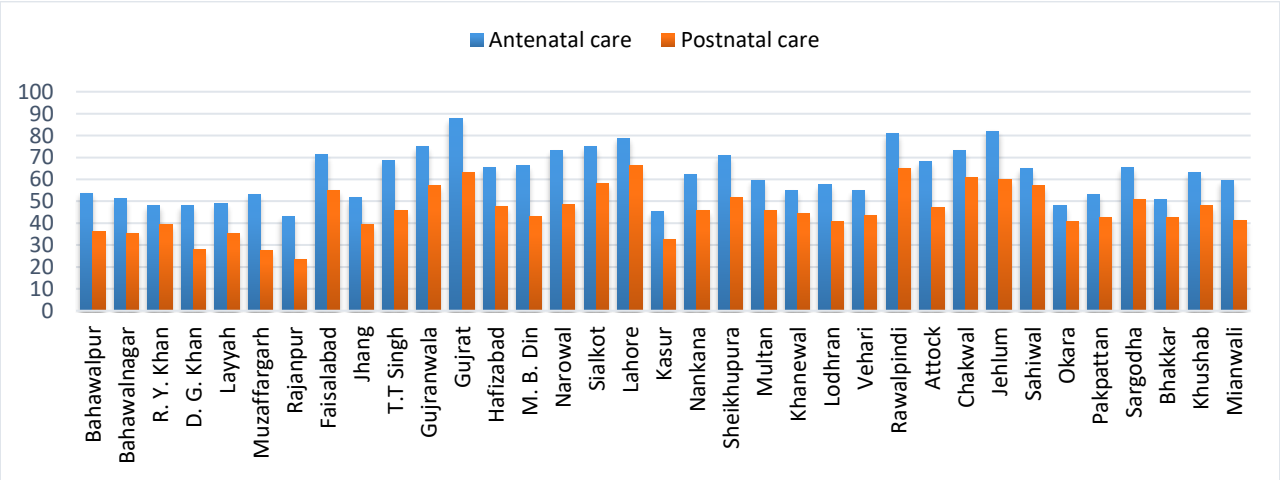

Figure 1: Regional Disparities in Punjab

[1] https://www.who.int/health-topics/maternal-health
[2] https://www.who.int/en/news-room/fact-sheets/detail/maternal-mortality
[3] https://sdgs.un.org/goals/goal3

On the supply side, the quality of health care services is questionable in developing countries. Although Pakistan has organized over one lac lady health workers to improve maternal health including ANC and PNC services especially in rural areas (Bhutta et al., 2013). Whereas, the lack of sufficient resources, derisory training, poor facilities cause an increase in maternal death immediately after the baby birth. In Pakistan, it is observed that service providers vary from district to district, region to region as women belong to Lahore gain more PNC than Women belongs to other districts (Authors own calculation) as mentioned in Figure 2. Similarly, 94% of women belong to Islamabad gain PNC while such maternal health services received by the women of Baluchistan is only 30% (Akhtar et al., 2018).

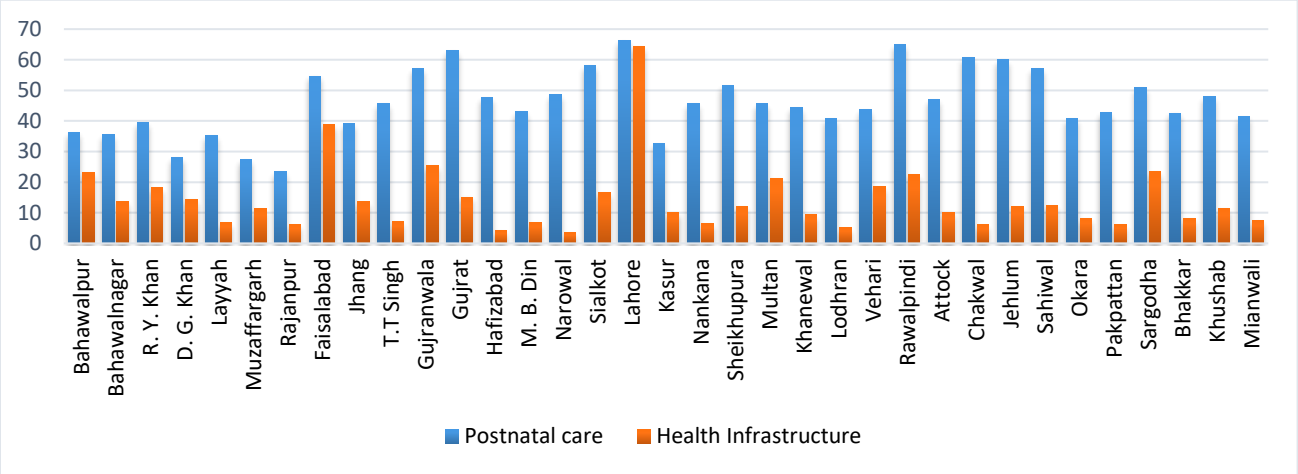

Figure 2: Health Infrastructure and PNC in Punjab

Although maternal mortality related to postnatal period has declined in Punjab however regional disparities (see Appendix) is still alarming for policymakers. This study attempts to explore different influential characteristics of PNC in 35 regions of Punjab. The present study is distinctive in the context that it uses both demand and supply-side factors to explore the circumstantial nature on PNC in Punjab. After introduction, the study is systematized as follow: section 2 describes the methodology and data used for the analysis. Section 3 interprets the results and section 4 draw conclusion and suggests recommendations.

2. Literature Review

Role of antenatal care is vital to receive PNC as literature revealed that mostly postnatal care received by those women who already received antenatal care. This conclusion is parallel to theoretical studies showed in Nepal, Nigeria and Zimbabwe (Dahiru & Oche, 2015; Jacobs, Moshabela, Maswenyeho, Lambo, & Michelo, 2017; Khanal, Adhikari, Karkee, & Gavidia, 2014). For instance, women who had received information and guidance during Antenatal care period were more chances to receive PNC. A huge part of qualitative literature reveals that ruler women are more deprived as compared to urban women in using and gaining better PNC (Babalola & Fatusi, 2009; Baqui et al., 2008; Chatterjee & Paily, 2011; Mosiur Rahman, Haque, & Sarwar Zahan, 2011; Sharma, Sawangdee, & Sirirassamee, 2007; Sohn & Jung, 2020; Yadav, Sahni, & Jena, 2021).

Further influencing factors identified in the literature include the wealth status (Aslam, Sadiq, & Mehmood, 2020; Mosiur Rahman et al., 2011; Ndugga et al., 2020; Sultana & Shaikh, 2015; Yaya, Da, Wang, Tang, & Ghose, 2019) age, material status of women (Akibu et al., 2018; Babalola & Fatusi, 2009; Izudi, Akwang, & Amongin, 2017; Mohan et al., 2015; Rutaremwa, Wandera, Jhamba, Akiror, & Kiconco, 2015), health care facilities and distance from the clinic (Babalola & John, 2012; Dahiru & Oche, 2015; Rutaremwa et al., 2015), birth order and place of delivery (Akibu et al., 2018; Mohan et al., 2015). Religion is influential factor shaping customs

and beliefs, norms which impact the decision on either attaining PNC as the study revealed that Muslim women were more reluctant to receive PNC than women belong to other religious (Barman, Saha, & Chouhan, 2020; Woldemicael & Tenkorang, 2010). In addition, studies conducted in Bangladesh and Ghana explained that most Muslim women have to take permission from husband before pursuing any outdoor activities comprising health services as well (Fatema & Lariscy, 2020; Ganle, 2015; Merrell & Blackstone, 2020; Mosiur Rahman et al., 2011).

Similarly, the role of women or partner education indicates the decision on receiving PNC. Studies identified that as compared to illiterate women, those who had completed primary education were more likely (Agha, 2011; Borba et al., 2011; Sarma & Rempel, 2007) and those who completed secondary education were most likely (Dhakal et al., 2007; Kabakian-Khasholian & Campbell, 2005; Mosiur Rahman et al., 2011; Sharma et al., 2007) to use PNC. Similarly, the Partner education increases the use of PNC as an educated spouse is well aware and know the importance of maternal health as compared to an illiterate spouse (Borba et al., 2011; Dhakal et al., 2007).

Dhakal et al. (2007) found the rural community-level determinants of postnatal health care of Nepalese women. The survey-based study is conducted from 150 women of two neighboring villages in 2006. Results indicated that only 34% of women took postnatal care after delivery which was very low. Only 19% of women avail medical care within a day of giving birth. Unawareness among women was captured the main hurdle to utilize postnatal care, mostly women in villages were uneducated. Perceived barriers are the main barriers to gain better health services after pregnancy. Poverty, lack of time and transportation facilities is observed the other vital factors that deprive women to gain postnatal health care. Policymakers and service providers need to create awareness among women.

Mrisho et al. (2009) gathered the viewpoint of women and health care workers to capture the antenatal and postnatal services for eight villages of southern Tanzania. Primary data was collected from the women who had one baby no more than 1 year for 10 months (2007 to 2008). Discussion based on the perceived barriers, timings of antenatal and postnatal care services further suggestion to improve maternal health. The main reason was found that women perceived barriers to visiting clinic several times as clinics were far from their homes and budget constraint was also rigid for poor ruler women. Fear of caesarean was also responsible to avoid the clinic's visits. On the supply side, shortage of equipment, the well-trained staff was reported during the discussion. The study suggests that women awareness should be promoted by offering incentives to well-trained staff.

Yunus et al. (2013) highlighted the contributing factors of postnatal health care facilities in Pakistan. PDHS (2006-2007) was used for the analysis by taking a sample of 5,724 females having childbirth 5 years earlier. Results obtained from Univariate, Bivariate and Multivariate logistic regression indicated that the place of residence played a significant role in defining the quality of postnatal care. Women education, developed regions, less number of children, history of abortion and access to health care are significant determinants of antenatal and postnatal care. Sultana and Shaikh (2015) highlighted the issues of low postnatal health care of women in Islamabad (Pakistan) by using a sample of 225 postnatal women. Data was collected from both public and private sectors. Results revealed that only 30% had access to postnatal health care services. Majority women had no awareness about post-delivery care. Other factors included transportation issues and low purchasing power to afford health services. The study suggested that role of women education is vital to improve the maternal and new born health status.

Jacobs et al. (2017) analyzed the arrangements linked with maternal health care in the distant and deprived areas of Zimbabwe. The cross-sectional survey-based study is conducted in 2012 by collecting 551 samples from mothers whose baby age lie between 0-5 months. Results obtained from the multivariate model indicated that women took ANC (30%) and PNC (28%) within 24 hours due to the fear of malaria. In remote areas, women were more vulnerable

situation as compared to those who live in better places. Quality of health care services was also found questionable in poorer regions.

Tiruneh, Worku, Berhane, Betemariam, and Demissie (2020) highlighted the causes of postnatal health care at individual and community level in different regions of Ethiopia by using cross-sectional survey-based data from 12 months after postnatal women. Results obtained from multilevel random effects binary logistic regression indicated that obstetric factors (Attended Antenatal health care, mode of delivery, history of miscarriages and sex of birth etc.) are very vital for postnatal care. Other important determinants included the area of residence, visits of community health workers, the behaviour of family during the pregnancy period, birth notification which identifies postnatal women health care. So, need to deliver the basic health care facilities to the women of all regions in the best manners.

Ndugga et al. (2020) emphasized that mother life is at risk especially for 2 days after childbirth and the importance of availing PNC is negligible in Uganda. The study used primary data from 5471 women who delivered a child before 2 years preceding the study. Results obtained from the multivariate analysis indicated the half percent of sampled women used early PNC and main sources of PNC were well education, wealthy status, perceived approachability of health services, ANC appearance, mass media and better place of delivery (urban or near access to clinic etc.). Only 2-thirds of Ugandan women gained PNC who delivered childbirth either public or private hospitals. Whereas the deprived section in this regard is those who delivered at home. So, policymakers should promote programs to provide early PNC to those poor women.

Tessema and Tiruneh (2020) conducted a study on the determinants of PNC for 36 Sab-Saharan African countries by using Demographic and Health Survey data from 2006-2018. Data consisted of women who gave birth 5 years preceding the survey. Results obtained from Multi logistic regression indicated that African women belonged to Eastern regions were more deprived than that of Central regions in availing basic health and PNC services. Main determinants of PNC include women education, place of delivery, age group, occupation and ANC visit.

2.1. Research Gap

A massive part of literature focused on discussion and primary level analysis for particular area or community (Dhakal et al., 2007; Jacobs et al., 2017; Mrisho et al., 2009; Ndugga et al., 2020; Tiruneh et al., 2020; Yunus et al., 2013). Based on the secondary data, this study used the proper methodology to explain the demand and supply-side determinants of PNC for the whole region including the 35 districts of Punjab to capture the district level disparities.

Authors	City/Country	Source of data	Estimation Technique	Results
Dhakal *et al*., (2007)	Nepal	150 women	Descriptive Analysis	Perceived barriers are main barriers to gain better health services after pregnancy. Poverty, lack of time and transportation facilities is observed the other vital factors that deprive women to gain postnatal health care.
Mrisho *et al*., (2009)	Eight villages of southern Tanzania	74 women with baby less than one year and pregnant females with same background	Conversation based study	Women perceived barriers to visit clinic several times as clinics were far from their homes and budget constraint was also rigid for poor ruler women. Fear of caesarean was also responsible to avoid the clinics visits. On supply side, shortage of equipment, well

				trained staff was reported during the discussion.
Yunus *et al*., (2013)	Pakistan	5,724 women having child birth during 5 years earlier	Univariate, Bivariate and Multivariate logistic regression	Place of residence played significant role in defining the quality of postnatal care. Women education, developed regions, less number of children, history of abortion and access to health care are significant determinants of antenatal and postnatal care.
Sultana & Shaikh (2015)	Islamabad (Pakistan)	225 postnatal women	Descriptive cross-sectional study	Lack of awareness among women is main determinant of postnatal poor health care.
Jacobs *et al*., (2017)	remote and poorest areas of Zimbabwe	551 samples from mothers who baby age lie between 0-5 months	Multivariate modeling	In remote areas women were more vulnerable situation as compared to those who live in better places. In addition, Quality of health care services were also found questionable in poorer regions.
Tiruneh *et al*., (2020)	Amhara, Oromia, SNNP and Tigray (Ethiopia)	2727 postnatal women	Multilevel random effects binary logistic regression	Obstetric factors (Attended Antenatal health care, mode of delivery, history of miscarriages and sex of birth etc.), Sociodemographic factors (education, distance from hospitals) and community level health services, well identify postnatal women health care.
Ndugga *et al*., (2020)	Uganda	5471 women who delivered a child before 2 years	multivariate analysis	Education, wealthy status, perceived approachability of health services, ANC appearance, mass media and better place of delivery (urban or near access to clinic etc.). Only 2-thirds of Ugandan women gained PNC who delivered child birth either public or private hospitals. Whereas deprived section in this regard is those who delivered at home.
Tasseme & Tiruneh (2020)	36 Sab-Saharan African countries	Demographic and Health Survey data (2006-2018)	Multi logistic regression	African women belonged to Eastern regions were more deprived than that of Central regions in availing basic health and PNC services. Main determinants of PNC include women education, place of delivery, place of delivery, age group, occupation and ANC visit.

3. Methodology and Data

The present study uses the Andersen's Behavioral model of application of health facilities as this model explains demand-side factors that form the use of PNC. According to Andersen's behavior model, three sets of features explain the use of health care facilities. One set consists of predisposing features such as age, wealth, material status and religion (Babalola & Fatusi, 2009; Mohan et al., 2015; Rutaremwa et al., 2015). The second set includes enabling factors

such as earlier use of ANC and distance from the clinics (Dahiru & Oche, 2015; Rutaremwa et al., 2015). The third set includes need factors like birth order and place of birth (Mohan et al., 2015). All these factors define the demand-side aspects of utilization of health care services. To capture demand-side factors for the utilization of PNC, predisposing and enabling factors of Anderson behavioral model are used.

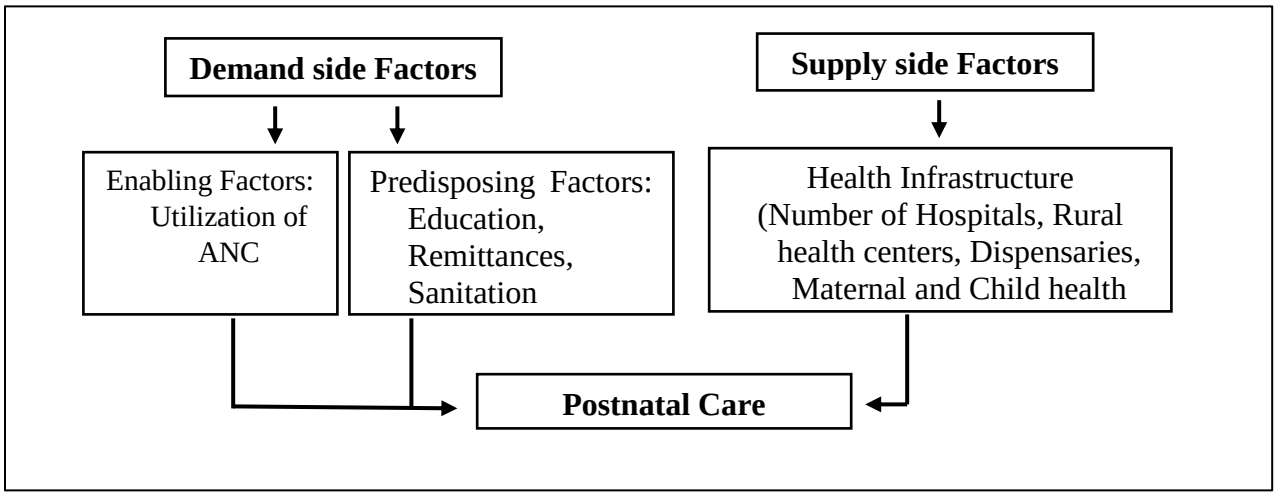

Figure 3: Demand and Supply side factors explaining PNC

Figure 3 explains the demand and supply-side determinants of PNC, so model specification is as

$$\boldsymbol{PNC = f\ (ANC, Education, Remittances, Ownership\ of\ House, Access\ to\ improved\ sanitation, Health\ infrastructure)} \quad (1)$$

The functional form of the model is as:

$$\boldsymbol{PNC_{it} = \beta_{0it} + \beta_1 ANC_{it} + \beta_2 EDU_{it} + \beta_3 REM_{it} + \beta_4 OH_{it} + \beta_5 IS_{it} + \beta_6 HINF_{it} + \epsilon_{it}} \quad (2)$$

Here, PNC stands for postnatal care which is the dependent variable. Demand-side variables consist of utilization of Antenatal Care utilization (ANC), education (EDU), Remittances (REM), Ownership of house (OH), Access to improved sanitation (IS) and health infrastructure (HINF). β_0 is intercept, β_1, β_2, β_3, β_4 and β_5 represent the change in PNC with respect to education, remittances, ownership of the house, access to improved sanitation and health infrastructure. As well "*t*" is the time period from 2010-2016 and "*i*" indicates 35 districts of Punjab and $\boldsymbol{\epsilon_{it}}$ is error term with standard classical properties Data for the analysis is taken from Punjab Development Statistics (PDS).

Table 1
Data Description and Summary Statistics

Variables	Description	Mean	Std. Dev.	Min	Max
Antenatal care	*Utilization of ANC (%)*	62.08	17.11	34	97.3
Postnatal care	*Utilization of PNC (%)*	45.97	21.59	12	98.9
Education	*Adult literacy rate from 15-24 years (%)*	70.42	12.69	43	93
Remittances	*Receiving remittances from abroad (%)*	5.37	6.21	0.5	29.7
Ownership of house	*Ownership of house (%)*	86.9	6.21	66	97.8
improved Sanitation	*Access to improved Sanitation (%)*	66.81	14.95	26	97
Health Infrastructure	*Index of total number of hospitals and dispensaries, rural health care centers, maternal and child health care centers*	14.28	11.92	2.51	70.4

4. Results and Discussion

Panel data set is used for the analysis by capturing 35 districts of Punjab as discussed earlier. Postnatal care (PNC), is used as a proxy for maternal and health care, independent variables consist of demand-side factors: education, remittances, ownership of the house, improved sanitation and supply-side factor contains health infrastructure. Before scheduling towards estimation techniques, diagnostic tests are checked to select the accurate model and perfect estimation technique. Outcomes of Link test, VIF test and Breusch-Pagan test specify that model is appropriately identified, there is no issue of multicollinearity whereas heteroscedasticity prevails in the model. Robust regression is used to deal heteroscedasticity issue.

Table 2
Diagnostic Test

LINK test (Hat Sq. P-value)	**VIF** (Mean VIF)	**Breusch-Pagan's test** (P-value)	**Jarque-Berra test** (chi2)
0.810	1.85	0.4473	0.229

Column 1 in Table 3 indicates the results obtained from pooled OLS. Utilization of ANC is positively and significantly influence the uptake of PNC. As women who had experienced the benefit of antenatal care during pregnancy will be motivated to get postnatal care after pregnancy as well. So, the finding indicates that excellent ANC visits can lead to upsurge the utilization of PNC (Adjiwanou & Legrand, 2014; Iqbal, Maqsood, Zakar, Zakar, & Fischer, 2017; Kogan, Leary, & Schaetzel, 1990; Yunus et al., 2013). Remittances have a positive and significant impact on PNC as a one percent increase in remittances increases utilization of PNC by 0.570 percent. For instance, remittances are the main source of income and boost one's purchasing power to satisfy basic health-related needs (Cingolani, Thomsson, & De Crombrugghe, 2015; Gillani, Shafiq, & Ahmad, 2019; Kamiya, 2010; Shafiq & Gillani, 2018) in this way women ability to maintain health standard by regular check including postnatal care services. Ownership of house increases the utilization of PNC as being an owner of the family, the ability to avail better services proliferates health and wealth standard of the family members (Mamoon, Raza, & Arshed, 2014).

Health infrastructure is positively correlated with utilization of postnatal care, perfections in all sorts of health infrastructure including transportation, rural health centers, hospitals support to attain development objectives, likewise enhance maternal health care through postnatal care. The result illustrates that one unit increase in health infrastructure increases utilization of PNC by 0.237 percent in overall Punjab district. Unavailability and low quality of infrastructure create underutilization of PNC (Babalola & John, 2012; Dahiru & Oche, 2015; Glatleider, 2006; Organization, 2019; Rutaremwa et al., 2015; Van Eijk et al., 2006). Similarly, improved sanitation has a highly significant and positive impact on PNC (postnatal care). Improved sanitation endorses both social and economic benefits. Social benefits in terms of time-saving, hygienic impact and avoid hazard conditions (Mahon & Fernandes, 2010). Economic benefits mean that better health of women makes them enough capable to participate in economic activities (Hutton, Haller, & Bartram, 2007).

The problem if endogeneity prevails in the model caused by simultaneous association between PNC and health infrastructure and might be due to the issue of omitted variable bias. In order to tackle the endogeneity issue appropriate technique is the Generalized Method of Moments (GMM) by using Internal instruments for the analysis. Results obtained from GMM yields more perfect result than pooled OLS.

Table 3
Impact of Demand and Supply-side Factors on PNC

	Dependent Variable: Postnatal Care (PNC)	
VARIABLES	**(Pooled OLS)**	**(GMM)**
Antenatal care	0.662***	0.564***
	(0.000)	(0.000)
Education	0.0680	0.254**
	(0.138)	(0.063)
Remittances	0.570***	0.471**
	(0.214)	(0.07)
Ownership of House	0.530**	0.523***
	(0.210)	(0.042)
Improved Sanitation	0.569***	1.391***
	(0.120)	(0.000)
Health Infrastructure	0.237**	0.496***
	(0.116)	(0.046)
Constant	-49.27***	-38.27***
	(20.71)	(0.016)
Observations	245	245
R-Squared	0.3044	0.3044
AR1 (Pr > z)		0.023
AR2 (Pr > z)		0.477
Hansen test (Prob > chi2)		0.343

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Results of GMM indicate that education is vital in the utilization of PNC that is one percent increase in adult literacy rate increase the utilization of postnatal care by 0.254 percent. Literature has realized that education has a direct and indirect impact on a health level. Indirectly by, a well-educated individual not only seek a better job and in return get a smart reward in terms of money and able to attain better services (Akhtar et al., 2018; Cingolani et al., 2015; Kamiya, 2010; Majeed & Gillani, 2017). Directly as an educated individual is well attentive of health allied facts and evades unsafe behavior (Adjiwanou & Legrand, 2014; Agha, 2011; Borba et al., 2011; Caldwell, 2005; Mondal, Hossain, & Ali, 2009; Sarma & Rempel, 2007). Moreover, Education develops health pursuing behavior through awareness (Babalola & Fatusi, 2009; Celik & Hotchkiss, 2000; Elo, 1992). As higher education enhances the autonomy level to take the decision regarding better health. Findings of over-identification test (Null hypothesis = valid instruments) and endogeneity (Null hypothesis= exogenous variables) indicates that instruments are valid in endogeneity case.

5. Conclusion

Punjab is the highly denser province of Pakistan with more than 100 million people, comprising approximately half of Pakistan's population. Although the overall maternal mortality rate is lesser than other provinces, yet large variation is observed among different districts of Punjab. Furthermore, postnatal care is comparatively most ignorance zone than antenatal care throughout Punjab.

Literature has identified many socio-economic factors including education (Adjiwanou & Legrand, 2014; Agha, 2011; Borba et al., 2011; Caldwell, 2005; Mondal et al., 2009; Sarma & Rempel, 2007), wealth status (Mosiur Rahman et al., 2011; Ndugga et al., 2020; Sultana & Shaikh, 2015), rural-urban area (Babalola & Fatusi, 2009; Baqui et al., 2008; Chatterjee & Paily, 2011; Mosiur Rahman et al., 2011; Sharma et al., 2007), age of women and many other factors by taking discussion-based and primary analysis for a limited area. Current study conduct research on 35 districts of Punjab for the time period 2010-2016. Data is collected from Punjab Development Statistics (PDS). Generalized Method of Moments technique is used to highlight the determinants of PNC in Punjab districts. Results indicate that from demand-side factors; utilization of ANC, education, remittances, ownership of the house and improved sanitation have

a positive impact on utilization of PNC. Similarly, the supply-side factor is health infrastructure which is vital to increase the availability of resources to avail better and efficient utilization of PNC.

Summarizing above, previous utilization of ANC and awareness about maternal health are important demand-side factors, along with from supply-side factor, availability of PNC (better health infrastructure) is vital to reduce maternal death from all districts of Punjab.

5.1. Contribution and Limitations

To the best of our understanding, this is the first work that focused on both demand and supply-side determinants of PNC by using a proper methodology and contributed to literature as well. Nevertheless, a recent study has some limitations. The current study focused only on the overall trend of PNC in Punjab but ignored the comparative analysis for different government tenure. Religious and cultural factors can also well-defined the PNC in Punjab.

5.2. Recommendations

Need to focus on those policies that motivate the women to seek education with the aim of realizing the importance of utilizing antenatal care and severity of postnatal complications. Similarly, ensure the availability and accessibility of PNC in order to reduce the health disparities among the districts of Punjab.

Authors Contribution
Seemab Gillani: literature search, data analysis, data interpretation
Tusawar Iftikhar Ahmad: study design and concept, data interpretation, drafting
Feng Wang: critical revision, incorporation of intellectual content
Muhammad Nouman Shafiq: literature search, data collection, drafting

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Appendix

Table A: Building Blocks of the determinants of PNC

Districts	Postnatal care	Education	Remittances	Ownership of House	Improved sanitation	Health infrastructure
Attock	47	60	5.61	91.17	75.14	10.23
Bahawalnagar	35.44286	62.57	1.66	84.44	55.43	13.55
Bahawalpur	36.28571	59.43	2	74	55.57	23.13
Bhakkar	42.55714	58	0.87	90.98	61.14	8.18
Chakwal	60.71429	68.43	7.5	94.17	71.143	6.06
D. G. Khan	27.95714	49	7.6	93.11	42.29	14.32
Faisalabad	54.68571	79.71	3.93	84.1	78.71	38.72
Gujranwala	57	86.43	9.04	82.97	94.29	25.34
Gujrat	63.06	89.43	24.76	88.97	80	15.13
Hafizabad	47.56	75.43	3.43	83.59	69.86	4.12
Jehlum	60.07	84.29	14.24	89.3	75.29	12.09
Jhang	39.16	65.86	1.3	87.51	63.14	13.67
Kasur	32.66	65.14	0.69	86.86	62.29	10.16
Khanewal	44.36	70.57	1.91	87.61	60.14	9.39
Khushab	48.1	71.57	3.11	88.1	63.57	11.38
Lahore	66.27	84.29	3.14	76.46	94	64.41
Layyah	35.23	67.71	1.186	93.66	55.57	6.80
Lodhran	40.81	60	1.4	84.17	58.14	5.08
M. B. Din	43.03	84.86	16.4	86.7	68.71	6.77
Mianwali	41.33	72.71	1.79	85.57	70	7.35
Multan	45.66	67.86	1.86	88.53	58	21.21
Muzaffargarh	27.34	55.86	1.51	93.29	43.71	11.35
Nankana	45.73	73.14	2.96	87.29	72	6.43
Narowal	48.53	86.71	6.16	94.26	71.29	3.52
Okara	40.86	69.86	1.17	83.41	58.43	8.20
Pakpattan	42.69	70	1.53	87.69	59.86	6.17
R. Y. Khan	39.4	55.86	2.64	79.53	55	18.16
Rajanpur	23.4	44.43	1.87	92.46	33.71	6.11
Rawalpindi	65.09	78.29	7.31	75.93	81.29	22.47
Sahiwal	57.03	69.71	17.43	85.93	69.57	12.50
Sargodha	50.93	67.43	4.16	83.51	64.7	23.53
Sheikhupura	51.49	75.14	2.43	88.26	83.14	12.06
Sialkot	58.09	88.43	15.5	87.16	90	16.59
T.T Singh	45.8	80.29	6.93	88.97	79.43	7.09
Vehari	43.67	66.29	2.84	91.87	63.86	18.66

Least Lower Low Medium High