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Predictors for Continuum of Care for Maternal, Newborn and Child Health in Pakistan: An Analysis from Demographic and Health Survey 2017-18

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Abstract: Background: As a developing country, Pakistan has bad conditions for neonatal and maternal morbidity and mortality. Most of the neonatal and maternal deaths can be controlled if continued care is provided during postpartum period. This study aimed to identify the predictors for the complete continuum of care (CoC) at the three phases: antenatal care, skilled birth attendance and postnatal care for optimal maternal, newborn and child healthcare (MNCH) in Pakistan. **Methods:** Secondary data was analyzed from Pakistan Demographic and Health Survey (PDHS) 2017–18 – a publicly available largest dataset. This research limited to 6,711 women of childbearing age (15-49 years), who gave birth during the last five years preceding the survey. Weighted samples were calculated. Descriptive, cross tabulation and multivariate logistic regression were applied to check the association between CoC and key characteristics. Chi-square test was performed to determine the association, where $p<0.05$ was considered significant. For binary logistic regression, Odds ratio (OR) and Adjusted OR (AOR) were calculated for multivariate logistic regression at 95% confidence interval. **Results:** Results showed a wider gap in utilization of CoC among women as 84.8% of respondents did not receive CoC at three levels. Results showed that the women from ICT and urban backgrounds within the age group of 20-29 years, who attained higher education levels, belonged to the richest wealth index, had exposure to mass media, autonomy to health care and face no difficulty in going to health facilities, are more likely to achieve CoC at all three levels. **Conclusion:** This research found that a substantial proportion of women in Pakistan did not complete the CoC, placing them at greater risk for adverse maternal and neonatal outcomes. There is a need to introduce targeted interventions to ensure that women receive care across all three stages – antenatal, delivery, and postnatal. Both government and private sector stakeholders must collaborate to strengthen service delivery, raise awareness and ensure equitable access to maternal health services.

Keywords: Continuum of care, Antenatal, Postnatal, Skilled birth assistance, MNCH, DHS.

1. Introduction

Continuum of Care (CoC) denotes to the continued care across the course of life, which involves childbirth, pregnancy, and the postnatal period, to improve the well-being and survival of children and their mothers (Kerber et al., 2007). Reducing mother and child mortality continues to be an important indication of community health and development. Globally statistics indicate that the maternal mortality ratio (MMR) decreased to nearly 38%, with a 2.9% decline on average per year between 2000 to 2017, (Maternal Mortality, n.d.). Sustainable Development Goals (SDGs) are progressing to improve maternal, newborn, and child health (MNCH) and prioritizing in the world political agenda (Hogan et al., 2010). According to Perin et al., (2022), the under-five mortality rate has also decreased globally, from 75 deaths to 38 deaths per 1,000 live births from 2000 to 2019.

Literature suggests that 80% of maternal deaths and two-third of neonatal deaths can be deterred if complete care is provided during the pregnancy and first week of childbirth (UNICEF, 2008). According to Aboagye et al. (2022), this high incidence of child and maternal mortality had been associated with various preventable measures, including low antenatal care (ANC), inadequate postnatal care (PNC), low utilization of skilled birth assistance (SBA) and facility-based delivery.

Pakistan – low-middle income country reports a high maternal mortality ratio of 186 deaths per 100,000 live births during 2019 with more concentration in rural areas (NIPS, 2019). According to Nadeem et al., (2023), the latest Demographic and Health Survey (PDHS) report 2017-2018 showed that just 51% of women received four or more antenatal care visits, 69% had availed skilled birth assistance, and 62% received postnatal care within 48 hours of delivery (Rahaman et al., 2024). Particularly, the situation is poor for remote areas, where healthcare infrastructure is deficient, coupled untrained service providers (Sarfraz & Hamid, 2014).

Pregnancy is the most crucial period, when women require regular ANC visits, followed by the support of SBA during delivery (Engmann et al., 2016). Regular antenatal care (ANC) visits help women prepare for birth by identifying and treating illnesses during pregnancy and accessing urgent deliveries (Chen et al., 2007). Skilled treatment before, during, and right after birth lowers the possibility of death or impairment for both mothers and infants (Kerber et al., 2007). Women and children should also receive PNC at specified intervals to avoid any complications (Methun et al., 2022; Tiruneh et al., 2022). According to (Mohan et al., (2017), more than 75% women received four or more ANC visits, were 75.6% and 86.7% received postnatal care within 2 days after birth.

During the last decades, progress in maternal and newborn child health has improved in Pakistan, however there is still a need to put more effort to save the health of mothers and children. Given the context, our research is aimed to determine the factors associated with continuum of care for maternal, newborn, and child health in Pakistan.in three stages, i.e. during pregnancy, delivery, and postpartum, including ANC, SBA and PNC.

2. Theoretical Framework

The theoretical underpinning for this research is deeply rooted into the Andersen's Health Behavior Model, which explains why people use healthcare services (Andersen, 1995). Applying this model to understand the predictors of CoC, leading towards the women' health behavior, we classified it into three categories [Figure 1]:

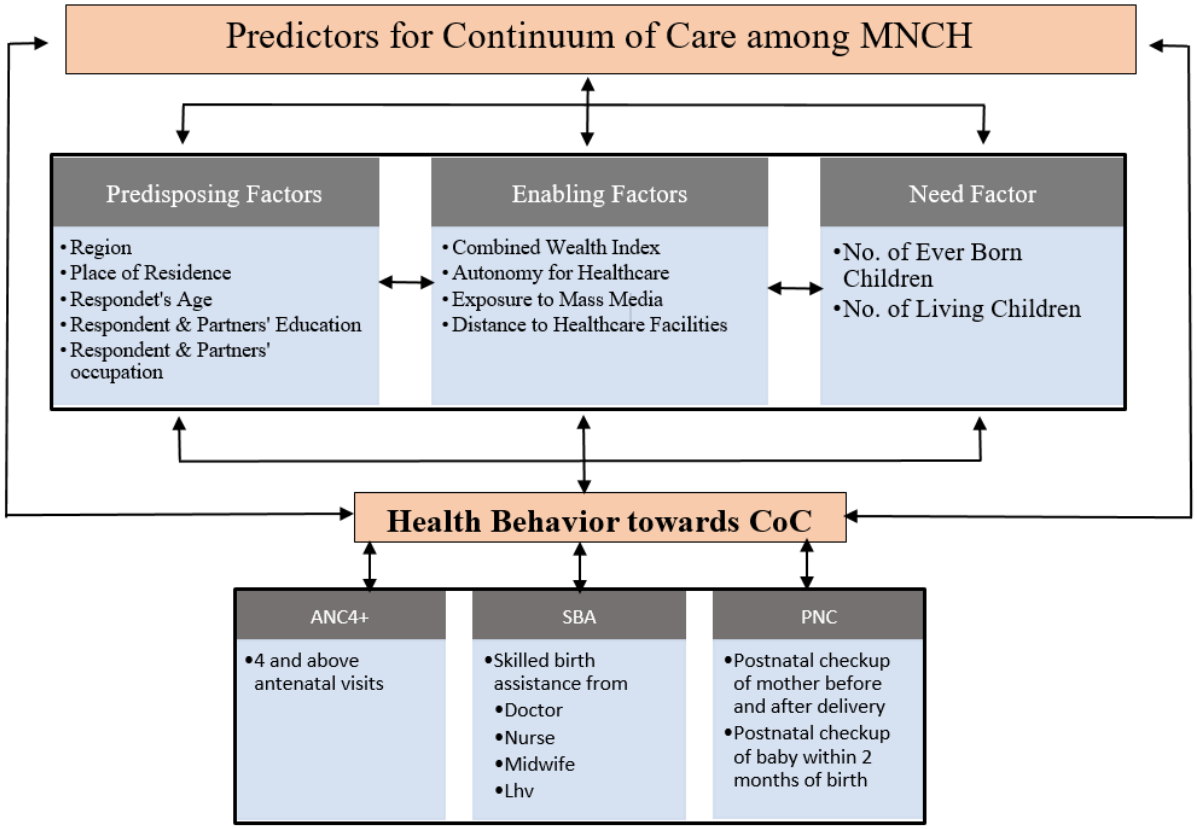

Figure 1: Research Theoretical Framework

- Predisposing Characteristics include socio-demographic characteristics such as age, region/province, place of residence, respondents and their husbands' education and their occupation.

- Enabling Factors that make service use easier, such as household level wealth index, mass media exposure, access to healthcare facilities and respondents'' autonomy to healthcare.
- Need Factors include perceived and actual health needs that require medical attention, such as number of living children and ever born children.

3. Materials and Methods

Data source

The research is based on the secondary analysis of the Pakistan Demographic and Health Survey (PDHS) 2017-18 – a nationally representative and publicly available household level dataset. The PDHS 2017-18 is the fourth survey in the international series of DHS, funded by USAID. Data was collected from November 22, 2017 to April 30, 2018. The PDHS 2017-18 used two-stage stratified sampling technique. The first stage involved selecting sample points (580 clusters), whereas the second stage involved a systematic sampling of 28 households in each cluster, resulting in a total sample size of 16,240 households. The survey was carried out successfully in 561 clusters, with 19 clusters being dropped due to security concerns. The 169 individuals including 22 fieldwork teams collected data, comprising of supervisors, enumerators, and field editors. Data entry and modification were performed using the CSPRO software program. The PDHS included six questionnaires including a woman's questionnaire which included a series of questions about maternal, newborn and child health care. This research limited to 6,711 women of childbearing age (15-49 years), who gave birth during the last five years preceding the survey.

Operationalization of variables

Outcome variable

The outcome variable for this research is a continuum of care received at three levels: ANC, SBA & PNC. The composite variable CoC was constructed from the following conditions, in consistent with previous research (Iqbal, et al., 2017):

1. At least four antenatal visits during the pregnancy level (yes/no)
2. Delivery attended by a professional healthcare provider e.g. nurse, doctor, lady health visitors, or midwife (yes/no)
3. Postnatal care for the mothers and newborns within two months of the child birth (yes/no)

The four antenatal visits (ANC4+ are defined as the CoC during pregnancy level while the CoC at delivery level is defined as ANC4+ and SBA. Further, the complete CoC at the postpartum level was measured from the composition of ANC4+, SBA, and PNC. In case if the mother has not availed services in any of the above three stages, the complete CoC was not considered. The internal consistency of the composite CoC was evaluated, using Cronbach's alpha, which was found 0.66, indicating higher reliability.

Independent variables

Seeking insights from literature and theoretical framework, several independent variables were selected for analysis. Predisposing factors included region/province (Punjab, Sindh, Baluchistan, KPK, ICT, and FATA), place of residence (urban/rural), respondent's age into 3 groups (15-19, 20-29, and 30 years and above), education of the respondents and their partners (uneducated and educated), and the employment status for women and their husbands (unemployed and employed). Enabling factors included exposure to mainstream media such as radio, television and internet (no/yes), a combined index of household wealth (poorest, poorer, middle, richer, and richest), autonomy of respondents to decision-making for health care (no/yes) and distance to health care facility (not a big problem and big problem). Further, need factors included the number of living children and ever-born children (0-2, 3-4, and 5+).

Ethical consideration

This research utilized secondary data of PDHS for analysis, which is publicly available dataset, thus, no ethical approval was required. The data source has been properly acknowledged.

Data analysis

Data analysis was done by using SPSS version 21. Weighted samples were calculated. The frequency and percentage of descriptive statistics are displayed. Cross-tabulation and chi-square tests were utilized in the analysis to determine the relationship between CoC and key predictors. Afterwards, multivariate logistic regression was applied. The variables in multivariate logistic regression were included based on the combination of theoretical relevance and findings from previous literature (Iqbal et al., 2017). Chi-square test was performed to determine the association, where $p \leq 0.05$ was considered statistically significant. For binary logistic regression, Odds ratio (OR) and Adjusted OR (AOR) were calculated for multivariate logistic regression at 95% confidence interval.

4. Results

Table 1 presented demographic characteristics of women aged 15 to 49 years. Results showed that most of women live in Punjab (51.5%), particularly from rural areas (66.5%) and are between the ages of 20 to 29 (48.9%). The majority of women were uneducated (47.9%) and unemployed (82.4%). On the other side, most of the husbands were educated at secondary level (35.1%) and employed in the professional category (54.3%).

The majority of the women (63.4%) had access to mass media and belonged to the middle wealth index (24.5%). Further, 53.8% women lacked autonomy in healthcare decision-making, however 54.9% respondents claimed that distance to healthcare facilities is not a big problem for them to access medical care. Furthermore majority (41%) has 0-2 children and 45.1 % have living children from the same group.

Table 1: Socio-demographic characteristics of women who gave birth within the last five years preceding the PDHS 2017-18

Characteristics	n = 6,711	
	f	%
Predisposing factors		
	Regions	
Punjab	3,453	51.5
Sindh	1,571	23.4
KPK	1,101	16.4
Balochistan	377	5.6
ICT	54	0.8
FATA	156	2.3
	Place of residence	
Urban	2,248	33.5
Rural	4,463	66.5
	Respondent age	
Below 20 yrs.	251	3.7
20-29 yrs.	3,283	48.9
Above 30 yrs.	3,178	47.4
	Respondent educational level	
Uneducated	3,212	47.9
Primary	1,097	16.3
Secondary	1,492	22.2
Higher	911	13.6
	Respondent Employment status	
Unemployed	5,528	82.4
Professionals	709	10.6
Agricultural	403	6.0
Unskilled/domestic	68	1.0
	Partner's educational level	
Uneducated	1,908	28.9
Primary	1,085	16.4
Secondary	2,316	35.1
Higher	1,293	19.6
	Partner's Employment status	
Unemployed	173	2.6
Professionals	3,575	54.3
Agricultural	1,154	17.5
Unskilled/domestic	1,685	25.6
	Enabling factors	
	Mass media exposure	
No	2,372	36.6

Yes	4,111	63.4
Wealth quintile		
Poorest	1,444	21.5
Poorer	1,299	19.4
Middle	1,371	20.4
Richer	1,349	20.1
Richest	1,248	18.6
Distance to healthcare facilities		
Not a big problem	3,683	54.9
Big problem	3,024	45.1
Respondent autonomy to healthcare		
No	3,550	53.8
Yes	3,054	46.2
Need factors		
Total children ever born		
0-2	2,749	41.0
3-4	2,183	32.5
5+	1,780	26.5
No. of living children		
0-2	3,027	45.1
3-4	2,222	33.1
5+	1,463	21.8

Table 2 highlighted that the majority of women (51.4%) received at least ANC4+ , achieving CoC at the pregnancy stage. Over 70% of women delivered with the assistance of a trained healthcare professional, resulting in 45.3% of women achieving CoC at the delivery stage. However, a significant proportion of women and newborn did not receive PNC, leading to a sharp decline in overall CoC. Consequently, the majority (84.8%) of women did not receive completed CoC across all three stages, i.e. pregnancy, delivery and postpartum.

Table 2: Descriptive statistics of the CoC at three levels for women (15-49 years), who gave birth within 5 years preceding the survey

Characteristics	n = 6,711	
	f	%
CoC at the pregnancy level (ANC4+)		
No	3,258	48.6
Yes	3,452	51.4
Skilled birth assistance		
No	1,973	29.4
Yes	4,738	70.6
CoC at the delivery level (ANC4+ & SBA)		
No	3,668	54.7
Yes	3,043	45.3
PNC for mother and newborn		
No	5,042	75.2
Yes	1,661	24.8
CoC at the postpartum level (ANC4+, SBA & PNC)		
No	5,682	84.8
Yes	1,021	15.2

Table 3 presented cross-tabulation where chi-square test was applied. Here the CoC has a significant relationship (*p-value* ≤ 0.05) with region/province, place of residence, respondent and partners' education and occupation, exposure to mass media, wealth index, number of living children, ever born children, respondent's autonomy to health care and distance to healthcare facilities. Results showed that the most of the women did not receive complete CoC, who live in Balochistan province, rural areas, are uneducated, employed in the agricultural sector and belonged to the poorest wealth index.

Table 3: Relationship between CoC with various Predictors

Characteristics	Women received a continuum of care		
	No	Yes	*p*-value*
Predisposing factors			
Regions			
Punjab	83.0%	17.0%	0.00
Sindh	78.8%	21.2%	
KPK	93.3%	6.7%	
Balochistan	98.1%	1.9%	
ICT	66.7%	33.3%	
FATA	97.8%	2.6%	
Place of residence			
Urban	75.5%	24.5%	0.00
Rural	89.5%	10.5%	
Respondent age			
Below 20 yrs.	89.6%	10.4%	0.09
20-29 yrs.	84.4%	15.6%	
Above 30 yrs.	84.8%	15.2%	
Respondent education			
Uneducated	92.3%	7.7%	0.00
Primary	85.7%	14.3%	
Secondary	79.5%	20.5%	
Higher	65.9%	34.1%	
Respondent occupation			
Unemployed	84.5%	15.5%	0.00
Professionals	80.8%	19.2%	
Agricultural	94.0%	6.0%	
Unskilled/domestic	92.5%	7.5%	
Partner's education			
Uneducated	93.0%	7.0%	0.00
Primary	88.8%	11.2%	
Secondary	82.3%	17.7%	
Higher	73.8%	26.2%	
Partner's occupation			
Unemployed	86.7%	13.3%	0.00
Professionals	80.7%	19.3%	
Agricultural	89.7%	10.3%	
Unskilled/domestic	89.9%	10.1%	
Enabling factors			
Exposure to mass media			
No	93.3%	6.7%	0.00
Yes	80.7%	19.3%	
Wealth index			
Poorest	93.8%	6.2%	0.00
Poorer	91.4%	8.6%	
Middle	88.5%	11.5%	
Richer	79.4%	20.6%	
Richest	69.1%	30.9%	
Distance to healthcare facilities			
Not a big problem	80.7%	19.3%	0.00
Big problem	89.8%	10.2%	
Respondent autonomy to healthcare			
No	88.2%	11.8%	0.00

Yes	80.9%	19.1%	
Need factors			
Total children ever born			
0-2	79.0%	21.0%	
3-4	86.0%	14.0%	0.00
5+	92.1%	7.9%	
No. of living children			
0-2	79.8%	20.2%	
3-4	86.5%	13.5%	0.00
5+	92.5%	7.5%	

*p-value was calculated using chi-square

Table 4 indicated bivariate and multivariate analysis for CoC at three levels with its predictors. Results showed that the women from urban backgrounds with higher education levels tend to receive complete CoC. Similarly, the odd ratio was high for highly educated respondents and their husbands respectively (AOR 1.69; 95% CI: 1.27-2.25 and AOR 1.57; CI: 1.19-2.08). Further, the respondents from richest wealth index are more likely to achieve CoC at all three levels than middle or poor wealth quintile.

The table showed that women from ICT, within the age group of 20-29 years are more likely to avail CoC at postpartum level. A high odd ratio was seen with respondents' and partners' employment status respectively (AOR 1.85, 95% CI: 1.11-3.09) and (AOR 1.33, 95% CI: 1.08-1.63). The findings showed that respondents who had exposure to mass media are more likely to avail CoC as they had more knowledge and awareness through media. Moreover, respondents who had autonomy to health care and face no difficulty in going to health facilities were more likely to achieve complete CoC.

Table 4: Bivariate and multivariate analysis of getting a complete continuum of care at the all three levels (ANC4+, SBA & PNC)

Characteristics	**Women received a continuum of care**					
	Bivariate			**Multivariate**		
	OR	**CI (95%)**	***p-value***	**AOR**	**CI (95%)**	***p-value***
Predisposing factors						
Regions						
Balochistan	1			1		
Punjab	10.13	4.87-21.06	0.00	5.49	2.54-11.87	0.00
Sindh	13.36	6.39-27.19	0.00	9.46	4.36 -20.52	0.00
KPK	3.58	1.67-7.67	0.00	2.68	1.20-5.99	0.02
ICT	24.03	9.55-60.47	0.00	8.87	3.31-23.81	0.00
FATA	1.36	0.40-4.59	0.62	1.84	0.53-6.38	0.34
Place of residence						
Rural	1			1		
Urban	2.76	2.41-3.16	0.00	1.02	0.85-1.23	0.86
Respondent age						
Below 20 yrs.	1			1		
20-29 yrs.	1.59	1.05-2.43	0.03	1.36	0.86-2.15	0.19
Above 30 yrs.	1.56	1.02-2.37	0.04	1.66	1.03-2.68	0.04
Respondent education						
Uneducated	1			1		
Primary	1.99	1.61-2.46	0.00	1.10	0.86-1.41	0.45
Secondary	3.07	2.56-3.68	0.00	1.19	0.93-1.51	0.16
Higher	6.17	5.11-7.45	0.00	1.69	1.27-2.25	0.00
Respondent occupation						
Agricultural	1			1		
Unemployed	2.83	1.87-4.29	0.00	1.46	0.90-2.36	0.12
Professionals	3.68	2.35-5.77	0.00	1.85	1.11-3.09	0.02
Unskilled/domestic	1.27	0.47-3.41	0.64	1.51	0.53-4.26	0.44

Partner's education						
Uneducated	1			1		
Primary	1.65	1.28-2.14	0.00	1.14	0.86-1.51	0.37
Secondary	2.83	2.31-3.48	0.00	1.54	1.20-1.96	0.00
Higher	4.66	3.76-5.78	0.00	1.57	1.19-2.08	0.00
Partner's occupation						
Unskilled/domestic	1			1		
Unemployed	1.36	0.85-2.17	0.19	1.51	0.90-2.53	0.12
Professionals	2.14	1.79-2.56	0.00	1.33	1.08-1.63	0.01
Agricultural	1.03	0.80-1.32	0.83	1.32	1.00-1.73	0.05
Enabling factors						
Mass media Exposure						
No	1			1		
Yes	3.31	2.77-3.96	0.00	1.32	1.04-1.66	0.02
Wealth quintiles						
Poorest	1			1		
Poorer	1.45	1.09-1.93	0.01	1.41	1.01-1.97	0.43
Middle	1.98	1.51-2.59	0.00	1.32	0.92-1.89	0.13
Richer	3.98	3.09-5.13	0.00	1.82	1.24-2.67	0.00
Richest	6.84	5.35-8.75	0.00	2.32	1.53-3.53	0.00
Distance to healthcare facilities						
Big problem	1			1		
Not a big problem	2.10	1.82-2.43	0.00	1.09	0.92-1.29	0.33
Respondent autonomy to healthcare						
No	1			1		
Yes	1.76	1.53-2.01	0.00	1.31	1.12-1.54	0.00
Need factors						
Total children ever born						
5+	1			1		
0-2	3.12	2.56-3.79	0.00	1.63	0.91-2.92	0.09
3-4	1.92	1.55-2.36	0.00	1.02	0.67-1.55	0.93
No. of living children						
5+	1			1		
0-2	3.11	2.51-3.85	0.00	1.44	0.79-2.63	0.23
3-4	1.92	1.53-2.42	0.00	1.46	0.93-2.29	0.09

5. Discussion

The CoC, consisting of three essential components (ANC, SBA & PNC) is critical to reduce the risks associated with maternal, newborn, and child health, while promoting optimal health outcomes. A woman's health during infancy, childhood, and childbearing years significantly influences her long-term well-being and productivity, and is shaped by multiple factors. Strengthening MNCH services remains a priority for countries like Pakistan to address existing gaps through an integrated CoC approach (WHO, 2016). This research analyzed CoC to identify the predictors that influence women's CoC during pregnancy, labor, and postpartum.

An increase in uptake of CoC was observed over time – from 2012 to 2018, potentially attributed to rising maternal age at birth and higher education levels. However, women in Pakistan continue to lag behind in achieving CoC across all three levels (Iqbal et al., 2017). The most significant drop-off occurred after the first stage – ANC – with low coverage of SBA and PNC, contributing substantially to incomplete CoC. This is primarily due to inadequate ANC visits and a high prevalence of home-based deliveries, with nearly half of births occurring without trained professional (Sarfraz & Hamid, 2014). This research found that the proportion of women receiving complete CoC – from pregnancy to childbirth and the postpartum period remain low. Though many women-initiated ANC, a large number discontinue care before receiving SBA or PNC for themselves and their newborns. This results in significant dropouts, particularly during the delivery and

PNC, consistent with research undertaken in Asia and Africa (Shibanuma et al., 2018, 2021; Yeji et al., 2015; Iqbal et al., 2017).

Antenatal care is positively linked to receive SBA. High-quality ANC visits enhance women's understanding of pregnancy-related risks and increase their awareness of the importance of skilled professionals for delivery assistance. Women who received professional delivery assistance were more likely to avail PNC from trained healthcare providers within first 6 weeks after childbirth. Increasing the usage of SBA can lead to increased PNC uptake, thereby enhancing the overall CoC in Pakistan. These findings are consistent with a multinational investigation in Africa, which found that ANC significantly improved both delivery assistance and PNC outcomes (Adjiwanou & Legrand, 2013).

Study discovered that the predisposing factors, such as respondents' region, place of residence, education, and occupation are associated with the CoC and its measures (ANC, SBA, and PNC) in Pakistan. Similarly, the enabling factors such as mass media exposure, wealth index, distance to healthcare facilities, and autonomy to health care also affect the completion rate of CoC. Moreover, the need factors i.e. number of living children and many ever-born children are also associated with the completion rate of CoC. These findings are consistence with the past research (Mohan et al., 2017).

The findings demonstrated that there are more chances of discontinued care among uneducated women because they had not enough knowledge and awareness about the outcome of receiving complete CoC. Research showed that women's autonomy and mass media exposure play a significant role in shaping maternal health utilization (Nigatu et al., 2014). Unemployment was found to indicate late beginning of prenatal care (Fobelets et al., 2015).

Discontinued CoC may be attributed to traditional practices, limited awareness, lack of health education, financial constraints, unavailability of services, shortage of trained female healthcare providers and overall poor health system performance.

As this research utilized data from the PDHS 2017-18, certain limitations are acknowledged. Firstly, due to the cross-sectional nature of the data, causal relationship between the dependent and independent variables cannot be established. Secondly, the survey relies on self-reported information, which may be subject to recall bias, affecting the accuracy of the responses.

6. Conclusions

This study presents a comprehensive overview of the continuum of care at all three stages – ANC, SBA and PNC. Findings revealed a significant gap, with 84.8% of women not receiving complete CoC. The research concludes that there is urgent need for targeted, actionable interventions aimed to improve PNC and promote complete CoC. Strengthening the health system to support CoC completion requires context-specific strategies tailored to the needs of Pakistani women and must involve coordinated efforts from both the private and public sectors. It is essential to enhance women's knowledge and awareness regarding maternal healthcare services before, during and after pregnancy. Future programs should prioritize the deployment of qualified healthcare workers, community mobilization, and delivery of quality maternal health services. Engaging key stakeholders and development partners will be critical in promoting and sustaining the CoC in Pakistan.

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