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Research Article

# Rural-to-Urban Childbirth Mobility and Delivery Outcomes among Women in Karachi, Pakistan

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**Abstract:** ***Background:*** Antenatal care (ANC) is often described as a gateway to safe childbirth, but good ANC coverage does not guarantee good delivery outcomes. In Karachi, some rural families send women to urban hospitals to give birth. We examined whether rural-resident women who delivered in urban facilities, and whose ANC use was comparable to urban women, had better delivery outcomes than rural women who delivered locally. ***Methods:*** In a comparative cross-sectional study in Karachi, Pakistan, using purposive sampling, we recruited 207 women aged 20-40 years who had given birth in the preceding 12 months and assigned them to three groups of 69: rural residence and rural birth (A), urban residence and urban birth (B), and rural residence and urban birth (C). Rural areas included (Gadap Town and Malir Town) and urban areas (Saddar, DHA, Gulshan-e-Iqbal, Nazimabad) of Karachi, Pakistan. We analyzed structured interviews using chi-square tests and logistic regression adjusted for education, spouse's education, and household size. ***Results:*** Complications were reported by 30.9% of Group C, 10.9% of Group B, and 8.2% of Group A (adjusted OR, C vs A, 4.78; 95% CI 1.51–15.18; crude OR, C vs B, 3.64; 95% CI 1.42–9.30). Instrumental or caesarean delivery was more likely in Group B (adjusted OR 4.14) and Group C (3.10) than in Group A. Low birth weight was marginally associated with Group C (adjusted OR 2.86; 95% CI 1.01–8.33). All 15 home births occurred in Group A. ***Conclusions:*** Facility birth and urban-level ANC were not accompanied by better delivery outcomes among rural-resident women who travelled to give birth. Travel-related delay, loss of continuity and support, and referral of higher-risk women are plausible explanations that this design cannot separate. ANC and facility-birth coverage alone are insufficient indicators of safe motherhood.

**Keywords:** health services accessibility; childbirth mobility; transportation of patients; maternal health; pregnancy outcome; pregnancy complications; prenatal care; three delays model; Pakistan.

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## INTRODUCTION

In 2020, an estimated 287,000 women died globally from complications related to pregnancy and childbirth, with 95% of these deaths occurring in low- and lower-middle-income countries [1]. The leading direct causes include severe bleeding (hemorrhage), high blood pressure (hypertensive disorders), and infections (sepsis) [2]. Most of these deaths can be prevented if women receive timely and adequate medical care. Antenatal care (ANC) is essential for screening, health education, and the early detection of complications [3]. However, the link between ANC use and delivery outcomes is not straightforward. A safe delivery also depends heavily on how timely and continuous the care is during labor and delivery [4, 5].

In Pakistan, there are major differences between urban and rural areas regarding maternal and newborn health. Health services are especially limited in rural regions [6–8]. Karachi, with about 14.9 million residents at the 2017 census [9], has long been the principal destination of internal migration in the country [10]. Its peripheral rural localities lie in the same metropolitan area as some of the best-equipped tertiary hospitals; even so, many households there depend on facilities with limited surgical, transfusion and neonatal capacity, and on birth attendants whose role in rural Sindh is well documented [7, 11]. Some families therefore send pregnant women to urban relatives, or arrange temporary accommodation near an urban hospital, shortly before delivery. We refer to this practice as childbirth mobility. It differs from lifetime migration, which describes where a woman has lived rather than where she travelled to give birth.

Childbirth mobility is a social as much as a clinical event. Who decides that a woman should travel, who accompanies her, and what support she can mobilize away from home are shaped by kinship obligations and gendered limits on women's movement [12–14]. Migration theory distinguishes factors at the origin and destination from intervening obstacles s uch as distance, cost, and unfamiliarity [15], and the evidence on migrants' maternal health, drawn largely from international migration, is mixed and context-dependent [16, 17]. Studies of women who move within a single metropolitan area specifically to give birth, and of their outcomes rather than their service use, are scarce.

The Three Delays Model locates avoidable maternal harm in delays in deciding to seek care (Delay 1), reaching a facility (Delay 2), and receiving adequate care once there (Delay 3) [4]. Traveling for childbirth may help reduce Delay 1 (the decision to seek care), but it can worsen Delay 2 (traveling longer distances) and Delay 3 (dealing with unfamiliar hospitals and doctors). Our data showed that rural women who gave birth in city hospitals had ANC levels similar to urban women, and much higher than those who stayed in their villages.

**Aims and Hypotheses:**

This study examined whether the ANC advantage actually led to safer deliveries. We addressed three main questions. First, are there significant differences between Group C and Groups A and B in terms of delivery complications, mode of delivery, low birth weight, urinary tract infections, and postnatal depression? Second, what specific outcome patterns do we see in Group C after adjusting for the woman's education, her husband's education, and household size? Third, does traveling for childbirth bring specific risks that cancel out the benefits of antenatal care?

**We tested three hypotheses:**

- H1: Rural women who deliver in urban health facilities will have better delivery outcomes than rural women who deliver in their villages, because of their higher ANC use.
- H2: predicted that they would have worse outcomes than urban women, because of distance from and unfamiliarity with urban facilities.
- H3: predicted that their advantage over rural women would diminish after adjustment for education and socioeconomic status.

## MATERIALS AND METHODS

**Design and setting**

This was a comparative cross-sectional study with retrospective data collection, conducted in Karachi, Pakistan, from January to December 2016. Rural participants were drawn from Gadap Town and Malir Town, and urban participants from Saddar, DHA, Gulshan-e-Iqbal and Nazimabad.

**Participants and sampling**

Women were eligible if they were 20 to 40 years old, had given birth in the last 12 months, lived in the selected areas, and agreed to participate. We excluded women with severe mental or physical illnesses that would make participation difficult. Using non-probability purposive sampling from healthcare facilities in these areas, we recruited 69 women for each of the three groups (total N = 207). The sample size gave us about 80% power to detect the main difference between groups. However, statistical power was lower for the regression models, particularly for outcomes that occurred rarely within a specific group. The index birth was defined as the woman's youngest child, identified by the lowest age code among all reported children.

**Study groups**

We divided the participants into three groups based on their residence and where their youngest child was born:

- Group A (n=69): Rural residence, rural birth
- Group B (n=69): Urban residence, urban birth
- Group C (n=69): Rural residence, urban birth (women who traveled for childbirth)

Lifetime migration; meaning the woman reported moving to Karachi from another city at any point before the study, was not used to create these groups. Instead, we recorded it as a separate variable.

**Sample size**

This study recruited 207 women (69 per group). This provided 80% power to detect a medium effect size (Cohen's w = 0.25) at $\alpha = 0.05$. Non-probability purposive sampling was used. No group assignments were missing.

**Data collection**

A structured interview schedule of 78 questions was developed from the literature and pretested on 10 women, who were excluded from the final sample. It covered demographics, education, family history, social relations, migration, economic

status, housing, health, healthcare access, family planning, reproductive history, ANC, birth outcomes, and child data. Trained female data collectors fluent in Urdu and Sindhi conducted interviews lasting 45-60 minutes. Written informed consent was obtained and was read aloud before a witness for women unable to read. Quality control comprised three days of interviewer training, daily supervision, completeness checks, and double data entry.

**Outcomes and covariates**

Outcomes included any complication (a composite of antenatal, intrapartum or postpartum complications reported for the youngest child, including hypertensive disorders, infection, bleeding, prolonged or obstructed labor, fetal distress, hemorrhage and sepsis within 42 days of delivery); mode of delivery (normal vaginal vs instrumental or caesarean); low birth weight (< 2,500 g); preterm birth (< 37 weeks, as reported); urinary tract infection (UTI) during pregnancy; postnatal depression (self-reported symptoms after the most recent delivery); and place of birth (home or hospital). Distance to hospital was dichotomized at 4 km. Covariates were the woman's education (ordinal, 1–8), spouse's education (ordinal, 1–9), and household size (ordinal, 1–5).

**Statistical analysis**

Data were analyzed in IBM SPSS Statistics 22.0. Pearson chi-square tests were used to compare groups. Binary logistic regression estimated adjusted odds ratios (OR) and 95% confidence intervals (CI) with Group A as the reference category, adjusted for the three covariates; model fit was assessed with omnibus tests, and significance was set at $p < 0.05$. Crude ORs and the comparison of Group C with Group B were calculated from group frequencies (complete cases). Low birth weight was modelled with normal weight as the outcome category, and the results were inverted for presentation. Missing data on the youngest child were handled by listwise deletion within each model. Logistic regression was not feasible for place of birth because of quasi-complete separation.

**Ethics**

The study followed the Declaration of Helsinki and was approved by the Department of Sociology, University of Karachi. All participants provided informed consent, and we anonymized the data.

## RESULTS

**Participants**

Of the 207 women, the mean age was 27.6 years (range 20–40) and 96.1% were aged 20–35. Over half (58.5%) had completed secondary education or higher, as had 70.7% of their spouses; 60.4% lived in households of six or more and 94.2% in joint or extended families. Overall, 55.1% were born in Karachi, and 29.0% had migrated to Karachi from another city. The groups also differed significantly in several aspects, including education, occupation, residence type, domestic violence, and husband's respect (all $p < 0.05$), and in the characteristics in Table 1. Lifetime migration was identical in Groups A and C (39.1% each) and lowest in Group B (8.7%), so it did not distinguish Group C from Group A. Living more than 4 km from a hospital was most common in Group C (53.6% vs 36.2% in Group A and 40.6% in Group B), but the difference was not significant ($p = 0.100$).

**Table 1. Selected characteristics by study group (n = 69 per group)**

| Characteristic | Group A n (%) | Group B n (%) | Group C n (%) | p |
|---|---|---|---|---|
| Secondary education or higher | 28 (40.6) | 55 (79.7) | 38 (55.1) | < 0.001 |
| Three or more children | 43 (62.3) | 34 (49.3) | 26 (37.7) | 0.015 |
| Migrated to Karachi (lifetime) | 27 (39.1) | 6 (8.7) | 27 (39.1) | < 0.001 |
| Lives more than 4 km from a hospital | 25 (36.2) | 28 (40.6) | 37 (53.6) | 0.100 |

Group A, rural residence and rural birth; Group B, urban residence and urban birth; Group C, rural residence and urban birth. p from Pearson chi-square (df = 2).

**Delivery outcomes by group**

Complications ($p = 0.001$) and instrumental or caesarean delivery ($p = 0.002$) differed significantly between groups (Table 2). Complications were reported by 30.9% of Group C, 10.9% of Group B, and 8.2% of Group A. Instrumental or caesarean delivery was most frequent in Group B (65.1%), followed by Group C (58.8%) and Group A (32.7%). Low birth weight (25.0%, 12.9% and 12.2% in Groups C, B and A), preterm birth, UTI and postnatal depression did not differ significantly in unadjusted tests. All 15 home births (7.2% of the sample) occurred in Group A (21.7%); Groups B and C had 100% facility delivery ($\chi^2 = 32.34$, df = 2, $p < 0.001$). Data on the youngest child were missing for 20 of 69 women in Group A (29.0%), 5 in Group B (7.2%), and 1 in Group C (1.4%).

**Table 2. Delivery outcomes by study group**

| Outcome | Group A n/N (%) | Group B n/N (%) | Group C n/N (%) | p |
|---|---|---|---|---|
| Any complication | 4/49 (8.2) | 7/64 (10.9) | 21/68 (30.9) | 0.001 |
| Instrumental/caesarean delivery | 16/49 (32.7) | 41/63 (65.1) | 40/68 (58.8) | 0.002 |
| Low birth weight (< 2,500 g) | 6/49 (12.2) | 8/62 (12.9) | 17/68 (25.0) | 0.104 |
| Preterm birth | 6/49 (12.2) | 4/63 (6.3) | 11/68 (16.2) | 0.214 |
| UTI during pregnancy | 13/69 (18.8) | 22/69 (31.9) | 17/69 (24.6) | 0.209 |
| Postnatal depression | 6/69 (8.7) | 13/69 (18.8) | 15/69 (21.7) | 0.095 |
| Home delivery | 15/69 (21.7) | 0/69 (0) | 0/69 (0) | < 0.001 |

p from Pearson chi-square (df = 2). Denominators vary because data on the youngest child were missing for some participants.

**Adjusted analyses**

After adjustment (Table 3), Group C had higher odds of any complication than Group A (OR 4.78, 95% CI 1.51–15.18, p = 0.008), whereas Group B did not (OR 1.01, 95% CI 0.26– 3.97). Both Group B (OR 4.14, 95% CI 1.73–9.88, p = 0.001) and Group C (OR 3.10, 95% CI 1.41–6.80, p = 0.005) had higher odds of instrumental or caesarean delivery than Group A. Group C had marginally higher odds of low birth weight (OR 2.86, 95% CI 1.01–8.33, p = 0.047) and borderline higher odds of postnatal depression (OR 2.77, 95% CI 0.99–7.74, p = 0.052); the overall postnatal depression model was not significant (omnibus $\chi^2$ = 8.60, df = 5, p = 0.126). UTI was more likely in Group B (OR 3.21, 95% CI 1.31–7.88, p = 0.011) but not in Group C (OR 1.63, 95% CI 0.70–3.77). Adjustment changed the estimates for Group C modestly and in different directions (complications 5.03 crude to 4.78 adjusted; instrumental or caesarean delivery 2.95 to 3.10; low birth weight 2.39 to 2.86; postnatal depression 2.92 to 2.77).

**Table 3. Crude and adjusted odds ratios (95% CI) for delivery outcomes; Group A is the reference**

| Outcome (N) | Group B, crude | Group B, adjusted | Group C, crude | Group C, adjusted | Omnibus p |
|---|---|---|---|---|---|
| Any complication (181) | 1.38 (0.38–5.01) | 1.01 (0.26–3.97) | 5.03 (1.60–15.79) | 4.78 (1.51–15.18) | 0.004 |
| Instrumental/caesarean (180) | 3.84 (1.74–8.47) | 4.14 (1.73–9.88) | 2.95 (1.37–6.35) | 3.10 (1.41–6.80) | 0.004 |
| Low birth weight (179) | 1.06 (0.34–3.29) | 1.67 (0.48–5.88) | 2.39 (0.87–6.59) | 2.86 (1.01–8.33) | 0.024 |
| UTI (207) | 2.02 (0.92–4.43) | 3.21 (1.31–7.88) | 1.41 (0.62–3.18) | 1.63 (0.70–3.77) | 0.031 |
| Postnatal depression (207) | 2.44 (0.87–6.84) | 1.75 (0.58–5.27) | 2.92 (1.06–8.04) | 2.77 (0.99–7.74) | 0.126 |

Adjusted for education, spouse's education and household size. Crude ORs calculated from the frequencies in Table 2 (complete cases). Low birth weight is expressed as odds of low birth weight. Preterm birth was analyzed unadjusted only.

**Group C compared with Group B**

In unadjusted comparisons, Group C had higher odds of complications than Group B (OR 3.64, 95% CI 1.42–9.30, p = 0.005). The groups did not differ significantly in instrumental or caesarean delivery (OR 0.77, 95% CI 0.38–1.56), low birth weight (OR 2.25, 95% CI 0.89– 5.67), preterm birth (OR 2.85, 95% CI 0.86–9.46), UTI (OR 0.70, 95% CI 0.33–1.47) or postnatal depression (OR 1.20, 95% CI 0.52–2.75).

## DISCUSSION

**Principal findings**

Rural-resident women who travelled to urban Karachi to give birth had ANC use comparable to urban women and universal facility delivery; nevertheless, they reported more complications than rural women who delivered locally and also more than urban women. They were more likely than rural women to have an instrumental or caesarean delivery, and showed marginally higher odds of low birth weight and borderline higher odds of postnatal depression. We describe this as a childbirth mobility paradox. H1 was not supported, because outcomes in Group C were worse rather than better than in Group A. H2 was partly supported, because complications were higher than in Group B while other outcomes did not differ significantly. H3 could not be evaluated as indicated due to the absence of an initial benefit; the disadvantage of Group C continued even after adjustment. The result contests the assumption that ANC coverage and health facility birth are adequate indicators of safe motherhood [3, 7].

**Interpretation through the Three Delays Model**

Similar levels of antenatal care (ANC) use across groups suggest that the first delay deciding to seek care may have been less prominent among Group C women [4]. Geographic access may have played a role in the second delay, as a greater proportion of women in Group C lived more than 4 km from a hospital. This observation is consistent with evidence that distance can impede timely access to healthcare [5], including situations in which travel barriers persist within the same city [15]. However, because the difference was not statistically significant, the role of distance should be considered a possible explanation rather than a confirmed finding. The third delay, which concerns the quality and continuity of care after reaching a facility, may also be relevant when women arrive without previous medical records or an established relationship with the healthcare provider [4]. The findings on mode of delivery should nevertheless be interpreted cautiously. Instrumental and caesarean deliveries were most common among women residing in urban areas, with no significant difference between Groups B and C. This pattern may reflect differences in facility practices and access to surgical services rather than differences in clinical severity.

**Social support and gendered mobility**

Traveling for childbirth can have effects beyond the physical journey, especially when it separates women from their usual social support. In Pakistan, female relatives often provide essential support during childbirth [13], and the decision to travel often depends on having an escort, family approval, and access to transport and money [12]. According to Kandiyoti, staying with relatives to access better healthcare involves a trade-off: getting better medical care but temporarily depending on another household [14]. Similarly, Coleman's concept of social capital suggests that support comes from social relationships rather than existing independently within individuals [18]. Therefore, women who leave their familiar support networks might not receive the same level of help at their destination. This is important during childbirth, as continuous support is linked to shorter labor and fewer operative deliveries [19]. Social relationships are widely recognized as a key factor influencing health [20]. The slightly higher rate of postnatal depression seen in Group C may support this idea. However, this association was not statistically significant, and our study did not directly measure social support.

**Alternative explanations**

Selection bias is another likely explanation for our findings. Women with high-risk pregnancies, or those who developed complications at rural facilities with limited emergency care, may have been referred to or chosen to travel to city hospitals [7, 8]. Thus, the higher complication rate in Group C might reflect the medical conditions that forced them to travel, rather than the effect of travel itself. Because this is a cross-sectional study, we cannot clearly separate these two possibilities. The higher rate of urinary tract infections (UTIs) in Group B might have different reasons, such as more frequent testing and diagnosis during urban antenatal care, or differences in exposure. The mobility framework alone does not fully explain these findings. Overall, our results suggest that simply moving to a city for childbirth should not be assumed to improve maternal health just because it increases access to healthcare [16, 17].

**Implications**

If travel-related difficulties and disruptions in continuity of care contribute to the observed risks, interventions should support women throughout the care pathway. These could include coordinated transport and referral systems, temporary accommodation near urban hospitals for women who need to stay close to emergency services, timely transfer of antenatal records, continuity with a familiar healthcare provider before labor, and the opportunity to have a chosen birth companion present during childbirth [19]. At the same time, improving emergency obstetric services and strengthening community-based antenatal care in peripheral areas may enable more women to give birth safely closer to home [7, 8]. Routine maternal health monitoring should therefore consider both place of residence and place of delivery when reporting outcomes, alongside conventional indicators such as antenatal care coverage and facility-based births.

**Strengths and limitations**

This study has several strengths, including a three-group design that distinguishes between place of residence and place of childbirth, equal-sized study groups, and the assessment of multiple maternal outcomes. The use of trained female interviewers and double data entry also helped support the quality of data collection and management.

However, several limitations should be acknowledged. The cross-sectional design does not permit causal conclusions, and the purposive sampling approach limits the generalizability of the findings beyond the study participants. Data relating to the youngest child were unavailable for 26 women (12.6%), with missing information disproportionately affecting Group A (29.0%). This imbalance may have introduced bias into comparisons involving that group. In addition, the number of events was low in some outcome categories, including only four complications in Group A. These small numbers may have resulted in imprecise and unstable odds ratio estimates, which should therefore be interpreted cautiously.

Outcomes were self-reported, and adjustment was limited to education, spouse's education, and household size, without age, parity, income, ANC visits, or distance. Facility-based recruitment would underrepresent women who delivered at home

and never presented to a facility, so the 21.7% home birth rate in Group A may be an underestimate, and the rural localities studied lie within Karachi, so findings may not generalize to more remote areas.

## CONCLUSION

Rural-resident women who travelled to urban Karachi to give birth achieved urban-level ANC and universal facility delivery, yet they did not have better outcomes than rural women who delivered locally, and had more complications than urban women. Distance, unfamiliarity, loss of support, gendered constraints on mobility, and the referral of higher-risk women are all plausible contributors, and the present design cannot rank them. Prospective studies that record the reason for travel, risk status at the time of travel, and stage of labor at arrival, with direct measures of social support, are needed to distinguish the effect of mobility from selection.

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