What it costs to access skilled birth attendance in Pakistan

Nida Khan (1)
Muhammad Amir Khan (1)
Shaheer Ellahi Khan (2)
Muhammad Ahmar Khan (1)
Azza Warraitch (1)

(1) Association for Social Development, Islamabad, Pakistan
(2) Health Services Academy, Islamabad, Pakistan

Correspondence to:
Khan, Nida,
Association for Social Development,
House No. 12, Street 48, F-7/4,
Islamabad, Pakistan
Email: nidakhan@asd.com.pk

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Abstract

Background: A costing study was conducted as part of a randomized controlled trial on promoting safe birthing, among 60,000 pregnancies in Punjab. This costing study aimed to estimate the costs incurred by women for utilisation of skilled birth attendance.

Methods: 640 women were recruited from six public health clusters in two districts of Pakistan. Costs were calculated using the societal perspective where the costs incurred on enhancing birth skilled attendance by delivering birth planning intervention were calculated from both the client and health service provider perspective. Province wise projection of costs were also calculated for two years' time duration.

Results: Health services capital cost for enhancing utilization of skilled birth attendance was Rs: 801 (US$ 8) per LHW and the recurrent per pregnant woman was Rs. 4.8 (US$ 0.05). Client cost of skilled birth utilization for normal delivery ranged from 3564(US$ 35.64) at a public facility vs 5276 (US$ 52.76) at a private facility, while for caesarean delivery it ranged from 10383 (US$ 103.83) at a public facility to 14339 (US$ 143.39) at a private facility. Cost of normal delivery was found to be correlated with category of birth attendant. Personal savings and loans were two main modes of payment for child birthing. In Punjab the incremental investment of Rs 67.7 million (US$ 677000) can achieve 675,971 additional deliveries by skilled birth attendants.

Conclusion: The birth planning intervention was found to be cost-effective in enhancing skilled birth attendance rate as compared to the control arm.

Keywords: Skilled birth attendance, health services cost, out of pocket cost, normal delivery, caesarean delivery

Background

Pakistan has the highest maternal mortality ratio and the third highest rate of neonatal mortality in South Asia(1, 2). The rate of neonatal and maternal mortality in Pakistan is drastic even when compared to its neighbouring countries like Bangladesh(3). Analysis of birthing practices in Pakistan show that only 65% of women seek any antenatal care and around 48% of deliveries occur under sub-optimal conditions without any assistance from skilled birth attendants resulting in a skilled birth attendance rate of 52.1%(4). The priority according to millennium development goals was to enhance the use of skilled birth attendance to more than 90% by year 2015(5) as increased use of skilled birth attendance has been proven to be effective in reducing the maternal and neonatal mortality rate(6). The components of an enhanced skilled birth attendance include: availability, access, perceived quality, and effective cost of skilled birth attendance(7). A key known determinant in use of skilled birth attendance, especially in low and middle income countries is the affordability of antenatal care and skilled birth attendance, as evidence from African and south Asian studies indicate delivery and antenatal care costs are high for households belonging to low-socioeconomic status(8, 9). High costs associated with skilled birth attendance could impede the utilization rate of skilled birth attendants in rural areas of Pakistan which could contribute to the increased rate of neonatal and maternal mortality. Findings from an on-ground situation review in Pakistan (unpublished data) revealed that lack of a birth plan with antenatal care provider before delivery could contribute to the high costs of skilled birth attendance as skilled birth attendants tend to charge more for patients who walk in at time of delivery. To enhance utilization of skilled birth attendance, we implemented a structured birth planning intervention to provide guidance to mothers to improve their birth planning practices that could result in enhanced utilization of skilled birth attendance.

Making birthing safe for Pakistan women

Making birthing safe for Pakistani women was a cluster randomized controlled trial (10) conducted to evaluate the effectiveness of a structured birth planning intervention in reducing the neonatal and maternal mortality rate by enhancing skilled birth attendance rate in three districts of Pakistan i.e. Jhang, Khanewal and Chiniot. The intervention proved to be effective in enhancing the rate of skilled birth attendance from 51% in control arm to 63% in intervention arm ($p<0.01$), without any significant impact on neonatal or maternal mortality rate (unpublished data).

Economic evaluation as a part of randomized trials is the recommended best practice(11). This costing study was conducted as an extension of the cluster randomized controlled trial of 'making birthing safe' to estimate the costs incurred after implementation of structured birth planning intervention to avail skilled birth attendance using societal perspective.

The research objectives were:

- To estimate costs to avail skilled birth attendance from a societal perspective
- To estimate projected budget required for health service sector to enhance skilled birth attendance utilization in Punjab province of Pakistan

Methods

This costing study was embedded within the parallel, three-arm, cluster-randomised controlled trial to evaluate the effectiveness of two intervention arms; a) structured birth planning intervention arm and b) structured birth planning intervention combined with travel mobilization strategies, in reducing neonatal mortality rate by increasing skilled birth attendance as compared to treatment as usual. Cluster units were defined as a sub-district (tehsil) hospital or a rural health centre (RHC) along with their respective catchment areas. The costing study was designed to analyse cost using the societal perspective(12). The client cost for skilled birth attendance utilization was estimated by calculating the out of pocket costs for women and their households and healthcare cost by calculating the intervention implementation cost to enhance skilled birth attendance (details are given in data collection section). The study was conducted in 2014, therefore the exchange rate used for PKR to USD is of 2014. No discounting method was used as the time horizon was less than one year.

Health services and social context of the study setting

Punjab is a province with a population of around 27 million(13). The provincial health sector is responsible for planning, financing and delivering the health care. The public infrastructure for delivering health care (including Maternal and Child Health Program) at district level, mainly includes: district and tehsil level hospitals; rural health centres; and four to six basic health units around each rural health centre. At these facilities the main qualified skilled birth attendants are: doctors and Lady Health Visitors "LHVs". The LHVs are health facility staff with formal training in maternal and child health care, including antenatal care, safe birthing and post-natal care of mothers and children. The qualified community-based female health workers, linked to these health facilities, mainly include: Lady Health Workers "LHWs" – with focus on mother and child health promotion through bridging their linkage with the facilities and services; and relatively recently introduced (through Maternal and Child Health Program) community midwives – with the prime focus on delivery of safe birthing services. At the community level, the birthing services are also being provided by a range of unskilled birth attendants (semi-qualified and unqualified). In each district, the birthing services (including Emergency Obstetric and Neonatal Care "EmONC") are also being provided by private health facilities that vary widely in quality and cost of care. Within communities LHWs serve about 1,000 women, and as part of their routine duties they are responsible for identifying and registering all new

pregnancies, as well as providing basic antenatal care to registered pregnancies, encouraging women to attend skilled antenatal examinations at their nearest health facility, promoting skilled birth attendance, preparing women and families for possible birth complications, and reporting registered pregnancies and their eventual outcomes on a monthly basis. In their work they are supervised and monitored by a lady health supervisor, employed by the MNCH Programme, as well as by a lady health visitor, who resupplies them with medications and equipment and provides technical support.

Interventions

We compared two interventions, delivered by LHWs, to the existing LHW-led care of pregnant women which includes structured birth planning plus a voucher allowing free travel to an EmONC facility (SBP and travel voucher), and structured birth planning alone (SBP alone).

Prior to the implementation of the intervention all lady health visitors, lady health supervisors and LHWs in the 21 recruited clusters were enlisted. Then, with the support of the district offices, the enlisted lady healthy visitors and lady health supervisors were trained by research staff on a specially designed set of care reporting and monitoring activities to support the implementation and running of the intervention and the data collection. Then, with the support of the respective sub-district hospital/ RHC staff, the enlisted lady health visitors in the 14 intervention clusters were trained by research staff on a specially designed programme to deliver the intervention components, including conducting structured birth planning, and mapping skilled birth attendants, transport service providers and potential suitable EmONC facilities within their cluster catchment areas. Once trained the lady health visitors then trained the LHWs within the intervention clusters on these activities during the LHWs routine monthly meetings.

LHWs in the intervention arms then mapped all the skilled birth attendants (including public and private midwives and doctors), suitable EmONC facilities (providing basic or comprehensive EmONC) and potential travel providers (to EmONC facilities) in their catchment populations. Research staff support the lady health visitors and lady health supervisors then check their data for completeness and correctness, and created directories of the mapped services that were then used by LHWs in the intervention arms during structured birth planning sessions.

The structured birth planning intervention was motivated by the relatively low use of available skilled birth attendants and suitable health facilities, as well as concerns around how well and frequently women and family members recognise danger of signs of birth complications and act appropriately (i.e. access EmONC). We therefore aimed to increase informed access to and use of safe birthing services (and EmONC where necessary) for women via this intervention. Structured birth planning therefore included structured birth-preparedness and complication-readiness counselling, which were provided to consenting women in both intervention arms by LHWs during their routine visits, following the registration of a pregnancy. During a structured birth planning session in a clients' home, LHWs used the directory to help clients select a skilled birth attendant from those available locally, as well as a place of delivery, which was chosen based on careful consideration of the options available (including the ability to access EmONC if needed), with input from family members planning to be present during the delivery, and following communication with their selected skilled birth provider.

They also provided pregnant women and their family members with information on a range of pregnancy and birth related issues focused on birth-preparedness and complication-readiness. A specially designed illustrated education tool (flipchart) was developed to help LHWs simply and effectively deliver this counselling information. Counselling on birth-preparedness covered the following areas: 1) paying for services (e.g. through savings, a personal loan or selling a disposable asset), 2) making a safe delivery kit (a list of consumables required, and arranged in-advance, for hygienic delivery), and 3) pre-delivery communication with the selected birth attendant to discuss and agree on important service details including how they can communicate, the cost and payment method. Counselling on complication-readiness covered the following areas: 1) recognising the danger signs of birth complications, indicating the need for EmONC services, 2) pre-identifying a MNCH Programme endorsed facility offering comprehensive EmONC services, and 3) arranging, in-advance, transport to the chosen EmONC facility, including selecting a transport service provider with a known type of transport, and contacting them in advance, directly or via mobile phone, to discuss their availability, how they can communicate, the cost and payment method. In addition to this intervention-specific information, the LHWs also provided pregnant women with a range of routinely provided information on antenatal care (relating to diet, rest, hygiene and use of iron tablets) and postnatal care (relating to breastfeeding, diet and family planning).

At the end of a counselling session LHWs then gave pregnant women a specially designed information leaflet containing the same set of key messages as covered during the counselling, including pictures illustrating pregnancy-complication danger signs. We intended this leaflet to act as a reference guide for women to use during their antenatal period. LHWs also recorded information about the birth-preparedness and complication-readiness decisions made by pregnant woman and their families in a birth plan form for the trial. Then in the SBP and travel voucher arm, in addition to the structured birth planning, LHWs also gave pregnant women an EmONC travel voucher. This allowed them to get a cash reimbursement of eight US dollars (equivalent to 800 Pakistani Rupees) for transport costs if they accessed EmONC services from a MNCH Programme endorsed comprehensive EmONC facility (in practice, a district hospital). We therefore hoped

this would encourage women and family members to seek EmONC when needed without hesitation due to concerns over transportation costs.

In the control arm, LHWs continued to give health education to pregnant women following their existing routine practices. This may have included information related to birth-preparedness and complication-readiness, but this would not have been provided in a structured way as CHWs were trained to do in the intervention arm, and CHWs in the control arm had no access to any of the materials developed for the structured birth planning component of the intervention (i.e. the directory, flipchart and information leaflet). Therefore, any such information would have been provided ad-hoc at the CHW's discretion and mixed with the other routine antenatal and postnatal care information provided. More generally, in the control arm the CHWs, through their routine practice, focused on telling women and their family members on what to do, but not the specifics of how to do it. There were no modifications to the intervention during the trial.

Research participants

The trial consisted of 21 clusters in total. For the costing study; through purposive random sampling technique, six cluster facilities randomized to 3 trial arms on 1:1:1 allocation ratio were selected to equally represent urban and rural clusters.

Participants for the costing study were recruited from five sampling strata including; 1) women with normal delivery by doctors, 2) women with normal delivery by lady health visitors, 3) women with normal delivery by community midwives, 4) women with normal delivery by unskilled birth attendants; and 5) women with reported caesarean delivery by doctors. A sample of twenty women in each of the five groups, in each selected cluster, with an anticipated five percent non-response rate, yielded a total sample size requirement of a minimum 630 women for the costing survey. Participants were randomly recruited in the costing study using the trial database for each of the six selected clusters. Randomization sequence for random allocation of participants from the trial database was generated using SPSS.

Power calculations

Sample size was calculated, assuming a mean cost of 10,868 (+ 2000) (US$ 108.68 + 20) of caesarean delivery and a mean cost of 2688 (+ 2000) (US$ 26.88 + 20) for normal delivery (14) taking a ratio of 1:1 for caesarean delivery: normal delivery, five percent level of significance, power 90%, a sample size of 65 was required in one group, thus making a total sample size of 130.

Doing a post hoc power analysis, taking a mean cost of 13184 (+ 6482) (US$ 131.84 + 64.82) of caesarean delivery and a mean cost of 4002 (+ 2558) (US$ 40 + 25.58) for normal delivery, taking a ratio of 3.7:1 for normal delivery: caesarean delivery, five percent level of significance, a sample size of 503 for normal delivery and 137 for caesarean delivery, achieved a power of more than 95%.

Data collection

Data collection for calculating client cost

A standard questionnaire was developed for collecting data on client costs from women on different categories of health service utilization for skilled birth attendance. Costing data was collected from women and their households on out-of-pocket expenses incurred on service cost and travel costs, costs incurred on meals, materials, medicines and tests during the course of seeking antenatal care and skilled birth attendance at public or private healthcare centres, for normal delivery, caesarean delivery and emergency obstetric neonatal care (EmONC) event. Data was collected by external evaluators blind to the allocation status of research participants. Data was collected within two months of delivery date of mothers, using self-report method. The collected data was checked for completeness and correctness by the field staff as well as the supervising economist. Data entry was done in SPSS software and 10% of the entries were then manually checked for possible data entry errors. The analysis was also done using the Statistical Package for Social Sciences software, using a 95% confidence interval.

Data collection for calculating health services cost

Health services costs were calculated by estimating the costs associated with implementation of structured birth planning intervention to enhance skilled birth utilization. The project financial data was used as source data to estimate the cost for the structured birth planning and structured birth planning combined with travel mobilization. We included both the capital costs and the recurrent costs for implementing the intervention. The capital cost estimation covered mainly the: a) costs incurred on producing the directories of skilled birth providers available in the area and available transport service providers, and counselling tools; and b) cost of training the lady health workers, lady health supervisors and lady health visitors for their respective role in the intervention. For the cost estimation purposes, the capital costs once incurred were assumed to be valid for two years i.e. every two years programme might need to update the Directories and arrange refresher training of staff. Recurrent costs included the printing cost of birth plan forms and client communication brochures for each client in the trial.

Data Analysis

Descriptive analyses were used to calculate mean and standard deviations for cost estimates for different types of costs for normal and caesarean delivery and antenatal care at public and private hospitals across three arms. Independent sample t-test and analyses of variance (ANOVA) tests were used to compare mean difference across arms and groups using a 95% confidence interval and a p-value (two-tailed) <0.05. Analyses were performed using SPSS version 21.

Client costs were analysed for skilled birth attendance utilization by calculating the out-of-pocket costs incurred by women and their households.

Data was analysed to estimate cost of normal delivery for different types of skilled birth attendants (Doctors, LHVS, CMWs) and unskilled birth attendants and different places of birth by calculating the mean out of pocket cost for mothers. Mean out of pocket cost was calculated by combining service fee of the birth attendant, expenses incurred on birth materials or supplies, and travel cost to and from the place of birth, using 95% confidence interval and 5% significance level. Cost of service fee of the birth attendant and materials was provided by mothers in figures while travel cost was calculated differently for public and private transport. Public travel cost was calculated for the round trip to the birth attendant by combining the round-trip fare of mother and their accompanying person/s. Private travel cost was divided into two categories of travel by car or bike. Estimated travel cost per km for car and bike was used from our previous projects in similar settings. Private travel cost was calculated just for the respondent and not the accompanying person. In cases where the participants travelled on foot or by bicycle, the cost of travel was recorded as zero. Travel costs for delivery at client's home was calculated for the travel cost incurred by the birth attendant while traveling to the client's home. Mean out of pocket cost of caesarean delivery was calculated for public and private health facility by combining the service fee, meals and travel cost. Service fee included doctor's fee for delivery, hospital charges for the room, and payment of supplies and medicines for the entire duration of stay at hospital. Costs for meals were calculated for the pregnant woman and all accompanying persons to hospital, for the entire duration of stay at hospital. Travel costs were calculated for both public and private travel using the above-mentioned method.

Mean out of pocket costs for both normal and caesarean delivery were compared across the three arms by combining the service fee, meals and travel fee. Mean difference in total out of pocket costs across three arms using 95% CI and 5% significance value was calculated to explore how structured birth planning affected the cost of delivery.

Cost of antenatal care at a public or private health facility, as part of structured birth planning intervention was evaluated by combining the mean care of costs including the cost of clinical examination (i.e. consultation fee), medicines, tests and any other cost incurred to avail health services at the facility with the travel cost. Travel cost was calculated using the above-mentioned methodology. Average costs for all visits to the health facility were calculated.

Different types of financing methods used to pay for normal and caesarean delivery were analysed based on the occupation of participant's husband to analyse the financial implications of type of delivery on different types of households.

Healthcare costs were calculated by combining both the capital and recurrent costs of intervention implementation for two years. Capital costs were calculated by combining the costs incurred on developing directories of skilled birth attendants, emergency services, and transport service providers in the area, cost of intervention materials, and the cost incurred on training of LHWs to deliver birth planning intervention to women. Recurrent costs were calculated by adding the costs incurred on developing birth plan forms and client communication brochures used to deliver intervention sessions to each participating woman in the intervention. Both capital and recurrent costs were calculated per LHWs and per birth.

Based on costing study findings, quick projection of costs for health services and clients for province wide possible scaling of the structured birth planning intervention are described. The projections are based on the following assumptions: the current level of programme inputs are not reduced in the next two years; the capital investment of cost (mainly for provider Directories and staff training) once made will remain relevant for at least the next two years; total number of pregnancies in Punjab in two years period: 6,089,826 (assumed current population: 98.22 million; CBR: 3.1); net increase of 11.1% in the uptake of skilled birth attendance (as achieved in the trial i.e. intervention arms: 75.1%; control: 64%) can be replicated in a scaled-up programme; net additional projected number of skilled birth attendance in two years: 675,971.

In addition to the assumptions for health services cost projects, the client cost projections are based on the following assumptions: the pattern of enhanced attendance across various types of skilled birth attendants will remain the same as in the trial (i.e. overall 11.1% increase, with a clear shift in favour of mid-level skilled birth attendants); average cost per delivery differentials across various types of skilled birth attendants will remain the same as in the trial; if intervention is not implemented, the level and pattern of skilled birth attendance and the average cost per delivery across various types of attendants will remain the same as in the control arm.

Ethical Considerations

Approvals were obtained from the Institutional Review Board of National Bioethics Committee (NBC Ref No.4-87/10NBC-39/RDC/487). Pakistan. Written informed consent from the in-charge of public health care centres was obtained prior to randomisation of the clusters. Written informed consent was obtained from participating pregnant women before their enrolment in the study.

Results

The basic characteristics of women i.e. age, education and mode of delivery (i.e. normal vs caesarean delivery) were similar across all arms. However, the use of public health facilities for antenatal visits as well as caesarean delivery was seen to have increased in intervention arms as compared to control arm (See Table 1).

Client costs for utilizing skilled birth attendance as part of structured birth planning intervention are presented for both normal and caesarean delivery, delivery and antenatal care costs at public and private health care services, differences across arms, and financial implications of different types of deliveries. Results for healthcare costs are provided for in terms of the capital and recurrent costs of intervention implementation per woman. Projected cost implications of possible province-wide scaling-up of the 'structured birth planning' intervention to enhance skilled birth planning are also presented.

Client Costs

Cost of normal delivery by the type of birth attendant and place of birth

The mean difference for out-of-pocket cost incurred by women undergoing normal delivery by using skilled (including doctors, LHV and Community midwives) and unskilled birth attendants was found to be significant ((Rs 1633 US$ 16.33), 95% CI: 1232 – 2033, p=0.001) (Table 2). The service fee accounted for at least 75% of the total out of pocket expenses (95% for doctor and 85% for LHV). The reported mean travel and material costs for normal delivery were found relatively alike across birth attendant types ranging: Rs: 375 – 475 (US$ 3.75-4.75) and Rs: 1,000 - 1,175 (US$ 10-11.75) respectively.

The mean difference between the out-of-pocket cost paid at private hospital as compared to public hospital was found to be significant (1711 {US$ 17}, 95% CI: 1108 – 2315, p=0.001) (Table 2)

The reported mean travel costs for normal delivery at private clinics and/or place of lady health visitor/ community midwife were found slightly higher (statistically insignificant) as compared to deliveries conducted at public health facility and home respectively. The reported cost of materials was found alike for all places of delivery.

Caesarean delivery costs by the place of delivery

The reported mean for total out of pocket cost of caesarean delivery at private clinics was found to be about 35% - 40% more as compared to deliveries conducted at public health facilities (Table 3). The mean difference between average total out of pocket cost at private hospital compared to public hospital was found to be significant (3829 {US$ 38}), CI: 1309 - 6348).

Service-fees were higher at private clinic (Rs. 13,229 {US$ 132}) as compared to public health facility (Rs. 9020 {US$ 90}), with a significant mean difference (4281 {US$ 43}, CI:1941-6620); whereas the reported EmONC travel cost was found to be 70% higher for public facilities (Rs.1126 {US$ 11}) as compared to the private clinics (Rs. 652 {US$ 6.5}), with a significant mean difference (457 {US$ 5}, CI: 110-804). However, the reported cost of meals was found relatively alike for the two place-of-caesarean options.

Costs of antenatal care by the place of antenatal visit

Mean total out of pocket cost of antenatal visits was high in both public and private health centres (i.e. Rs: 1416 {US$ 14} and 1527 {US$ 15} respectively). This average cost of an antenatal visit is about 15% of the minimal monthly wage in the country (Table 4). However, the mean difference between cost at public and private health facilities was found to be insignificant (107 {US$ 1}, CI: -364-150).

Total out of pocket costs for normal and caesarean delivery across arms

Mean total out of pocket cost (including service-fee, drugs/materials, tests, other service costs and travel for normal delivery) was less in intervention arms exposed to structured birth planning intervention as compared to control arm (Table 5). The mean difference between average total out of pocket costs for normal delivery in the two intervention arms as compared to the control arm was found significant (1030 {US$ 10}, CI: 553-1506). However, the difference between total out of pocket cost of caesarean delivery between intervention arms and control arm was found to be insignificant (1000 {US$ 10}, CI: -1194-3194).

Financing of normal delivery and caesarean delivery by husband occupation

The majority of clients across all occupational groups used savings and loans as two main sources of financing the normal delivery as well as the caesarean delivery (Table 6). The breakdown of the reported mode of financing shows that saving was the main source of financing for businessmen and white-collar employees (i.e. 70% and 68% respectively); whereas about a quarter or more of them reported taking a loan to finance the normal delivery. Around 50% of the daily wagers (skilled: 49%; unskilled: 51%) reported to have taken some loan for financing the normal delivery. About 40% of blue-collar employees were found to have used loan (i.e. more frequent than businessman/white collar and less than daily wagers). In farmers, in addition to saving and loan (47%; 36% respectively), about 14% also reported to have sold an asset (generally a goat) for financing the delivery.

Table 1: Demographics

	Control	Birth plan + travel support	Birth plan only
n (%)	213 (33.4)	222 (34.6)	205 (32)
Average number of years of schooling (S.D)	2.3 (1.37)	1.9 (1.22)	2.15 (1.36)
Average number of antenatal visits (S.D)	2.69 (1.95)	3.27 (1.5)	2.75 (1.82)
Mode of delivery:			
Normal delivery (%) (n=503)	163 (76.5)	173 (77.9)	167 (81.5)
C-section delivery (%) (n=137)	50 (23.5)	49 (22.1)	38 (18.5)
Birthplace for normal delivery:			
Health facility (%) (n=153)	62 (38.2)	49 (28.3)	42 (25.1)
Private clinic (%) (n=139)	44 (27.2)	56 (32.4)	39 (23.4)
SBA informal setup (%) (n=45)	10 (6.2)	7 (4)	28 (13.7)
Home setting (%) (n=165)	46 (28.4)	61 (35.3)	58 (34.7)
Place of c-section delivery:			
Public hospital (%) (n=40)	14 (28)	19 (38.8)	7 (18.4)
Private clinic (%) (n=97)	36 (72)	30 (61.2)	31 (81.6)
Place of last antenatal visit:			
Public hospital (%) (n=476)	146 (69.8)	181 (84.2)	149 (75)
Private clinic (%) (n=147)	63 (30.2)	34 (15.8)	50 (25)

Table 2: Cost of normal delivery by the type of birth attendant and place of birth

Type birth attendant	Respondent Mother	Mean Out of pocket cost in Pak Rs. (S.E.)			
	n (%)	Service fee	Material	Travel	Total
Doctor	162 (32)	4691 (212)	1172 (80)	459 (46)	4957 (240)
LHV	128 (26)	3193 (146)	1098 (85)	367 (37)	3785 (188)
CMW	76 (15)	3427 (242)	1003 (83)	480 (41)	4558 (260)
Unskilled	130 (26)	2090 (104)	1055 (102)	397 (56)	2833 (150)
Place of delivery (n=488)					
Public health facility	153 (30)	3342 (194)	1157 (69)	357 (32)	3564 (207)
Private clinic/ hospital	139 (28)	4467 (195)	1168 (103)	463 (50)	5276 (226)
LHV/ CMW place	45 (9)	4202 (367)	924 (118)	536 (54)	5486 (380)
Client's home	157 (31)	2147 (94)	1019 (87)	362 (43)	2866 (120)

Table 3: Cost of caesarean delivery by the place of delivery

Place of delivery	Respondent Mothers	Mean Out of pocket cost in Pak Rs. (S.E.)				Mean difference in total cost (95% CI); p-value
	n (%)	Service fee	Meals	Travel	Total	
Public hospital/ facility	39 (29)	9020 (992)	592 (35)	1126 (157)	10383 (1038)	3829 (1309-6348), p=0.004
Private hospital/ clinic	94 (71)	13229 (570)	550 (19)	652 (92)	14339 (621)	

(Rs. 1= US$ 0.01 approximately)

Table 4: Cost (average) of antenatal by the place of antenatal visit

Place of last antenatal visit	Mean Care costs in Pak Rs. (S.E)					Travel cost	Total	Mean difference in total cost (95% CI); p-value
	Clinical exam	Drugs/ material	Tests	Any other	Total			
Public health facility (n=476)	373 (23)	1170 (75)	566 (31)	291 (33)	1486 (70)	276 (16)	1416 (61)	107 (-364 to 150); p=0.412
Private health facility (n=147)	321 (27)	1726 (267)	719 (132)	279 (14)	1728 (111)	178 (36)	1527 (133)	

Table 5: Average service fee and travel cost by arms in normal and caesarean delivery

Trial Arms	Mean cost in Pak Rs. (S.E)			Mean difference in total out of pocket cost between control vs any intervention (95% CI); p-value
	Service fee	Travel	Total out-of-pocket	
In case of normal delivery:				
Birth plan + travel support	2506 (139)	345 (26)	3557 (175)	1030 (553 to 1506); p=0.02
Birth plan (only)	3550 (186)	426 (43)	4541 (246)	
Control arm (no birth plan or travel)	4061 (169)	532 (52)	5420 (246)	
In case of caesarean delivery:				
Birth plan + travel support	11085 (981)	675 (119)	12441 (1025)	1000 (-1194 to 3194); p=0.368
Birth plan (only)	12660 (969)	693 (149)	13764 (1105)	
Control arm (no birth plan or travel)	12470 (755)	1046 (159)	14165 (1007)	

(Rs. 1= US$ 0.01 approximately)

Table 6: Financing of normal delivery and caesarean delivery by husband occupation

Occupation of husband	Respondent Mothers	Mode of financing			
		Savings	Loans	Saving + loan	Any other mode(s)
	n (%)	n (%)	n (%)	n (%)	n (%)
Normal delivery					
Daily wager (skilled)	129 (25)	65 (50)	42 (33)	21 (16)	1 (1)
Daily wager (unskilled)	170 (34)	79 (46)	69 (41)	17 (10)	5 (3)
Employee (blue collar)	45 (9)	26 (58)	13 (29)	5 (11)	1 (2)
Employee (white collar)	37 (7)	25 (68)	12 (32)	0 (0)	0 (0)
Businessman	71 (14)	50 (70)	16 (23)	4 (6)	1 (1)
Farmer	36 (7)	17 (47)	13 (36)	1 (3)	5 (14)
Unemployed	6 (1)	1 (17)	5 (83)	0 (0)	0 (0)
Total	494 (97)	263 (53)	168 (34)	50 (10)	13 (3)
Caesarean delivery					
Daily wager (skilled)	27 (20)	8 (30)	7 (26)	10 (37)	2 (7)
Daily wager (unskilled)	37 (28)	1 (3)	19 (51)	13 (35)	4 (11)
Employee (blue collar)	14 (11)	4 (29)	6 (43)	3 (21)	1 (7)
Employee (white collar)	15 (11)	3 (20)	11 (73)	1 (7)	0 (0)
Businessman	28 (21)	12 (43)	11 (39)	5 (18)	0 (0)
Farmer	12 (9)	3 (25)	3 (25)	3 (25)	3 (25)
Total	133 (100)	31 (23)	57 (43)	35 (26)	10 (8)

Table 7: Client cost projections for normal delivery

Birth Attendant	Estimated women clients		Average cost/ delivery (in Rs.)	Estimated Total cost (in Rs.)
	Number	Percent		
Scenario-1: Estimated client cost of normal delivery, if no intervention is implemented				
Doctor	1997463	32.8	5406	10798284978
LHV	1577265	25.9	5111	8061401415
CMW	322761	5.3	4111	1326870471
TBA	2192337	36	3902	8554498974
Total	6089826	100	-	28741055838
Scenario-2: Estimated client cost, if intervention is implemented province-wide				
Doctor	1321492	21.7	4632	6121150944
LHV	2734332	44.9	3379	9239307828
CMW	517635	8.5	4773	2470671855
TBA	1516367	24.9	2407	3649895369
Total	6089826	100	-	21481025996
Client cost savings with province-wide scaling of the intervention				7260029842

(Rs. 1= US$ 0.01 approximately)

The breakdown of the reported mode of caesarean delivery financing shows that saving was the main source of financing for businessmen (i.e. 43%); whereas more than half of them reported taking some loan to finance the caesarean delivery. Around two thirds of the daily wagers (skilled: 63%; unskilled: 86%) and employed (blue collar: 64%; white collar: 80%) reported to have taken some loan for financing the caesarean delivery. In farmers, the distribution was found more symmetrical across financing options (including selling of an animal asset).

Health Services Costs

The estimated capital costs for a two-year implementation of intervention is Rs: 801 (US$ 8) per lady health worker and Rs 36 per birth (US$ 3.6). The incremental recurrent cost was Rs 130 (US$ 13) for each LHW and remained less than Rs. 5 (US$ 0.05) per pregnant woman who received intervention. The low capital and recurrent costs highlight the effectiveness of embedding the intervention within the routine health care provision by LHWs.

Projected costs for scaling-up the intervention in Punjab

Health Services Incremental Cost Projections

Incremental **capital** cost for enabling 48,000 LHWs in the whole of Punjab:
48,000 (LHW) x 801 (Unit capital cost/ LHW):
Rs. 38,448,000 (US$ 384480)
Incremental **recurrent** cost for 6,089,826 pregnancies in two years:
6,089,826 (pregnancy) x 4.8 (Unit recurrent cost/ pregnancy): Rs. 29,232,000 (US$ 292320)

Total incremental cost (capital + recurrent) for two years: Rs. 67,680,000 (US$ 676800)

Total estimated additional number of skilled birth attendance: 675,971

Estimated incremental cost per additional skilled birth attendance: Rs. 100 (US$ 1)/ pregnancy

Cost Implications in a Scaled-Up Intervention In Punjab

Table 7 shows that with certain valid assumptions the intervention will save Rs. 7.26 billion (US$ 72.6 million) client cost on conduct of normal delivery.

Discussion

Cost of safe birthing practices has proven to be an important determinant of enhancing the rate of skilled birth attendance to reduce neonatal and maternal mortality and has been a much researched topic in low and middle income countries(15). This paper analyses the cost of enhancing skilled birth delivery in rural Pakistan by implementing a structured birth planning intervention. The cost of utilizing skilled birth attendants varied with respect to the qualification of birth attendant and the nature of roles defined within the context of birth delivery. Cost of deliveries facilitated by doctors was highest, followed by community midwives, LHVs and then unskilled birth attendants. The relatively high community midwives service cost, as compared to lady health visitors, is a testament of the fact that for community midwives the service fee is the sole source of income; whereas for lady health visitors, as public servants, it is a part of their many responsibilities and sources of income. The costing study also indicated higher service-payments for caesarean (as compared to normal delivery), which leaves some room for the provider's decision to be based on an undesirable balance between medical and commercial responsibilities and sources of income.

The costing study also indicated higher service-payments for caesarean (as compared to normal delivery), which leaves some room for the provider's decision to be based on an undesirable balance between medical and commercial considerations.

Mean cost of deliveries by LHV accounts for a nominal higher cost than the deliveries facilitated by unskilled birth attendants. Overall, the preference shift in the study (i.e. from unskilled and doctors to the mid-level skilled attendants) does indicate that cost of service is important but not the sole criteria for a family to select a birth attendant; other important considerations for making a selection include perceived quality(16), and social and physical access of the birth attendant (17).

Pakistani women face significant costs in accessing skilled birth attendance for normal or caesarean delivery at both public and private sectors as found in this study. However, the cost of both (normal and caesarean) deliveries were found to be approximately twice as higher at private health facilities as compared to public health facilities. The total out of pocket cost of normal delivery at private clinics and/or place of lady health visitor/community midwife was approximately 50% more as compared to deliveries at public health facilities and approximately 85% at client's own home respectively.

This trend of higher cost for delivery at private health facilities as compared to public health facilities was also found in rural Bangladesh where women were likely to pay one and half times more for normal and caesarean deliveries at private health facilities compared to public health facilities(18). Higher cost of private healthcare services are reflected in the perceived higher quality of services at private facilities, due to which participants are more likely to pay hefty amounts for healthcare services at private facilities(19). This difference in quality of services at public and private healthcare centres account for the higher number of women preferring to deliver at a private healthcare facility, especially in case of caesarean deliveries. A study in Gujranwala, Pakistan found that although only 50% of the respondents could afford private healthcare services, they did not avail a public health facility as 97% were of the view that they would not get immediate attention and would be subjected to a long waiting period and poor treatment there(19). This public vs private healthcare disparities are also evident in other low and middle income countries such as Nigeria ,Uganda and South Africa(20). This highlights the fact that cost-effectiveness of interventions to enhance skilled birth attendance may not yield the desirable results if the quality of services by skilled birth attendants is not improved concurrently.

Cost of delivery might be more reasonable at public healthcare centres but when it comes to cost of antenatal care, there is not much of a difference across public and private health facilities. The widely believed notion that antenatal services at public health facilities are free of cost was found to be a myth in reality. The study found that not only was there a significant cost of antenatal services at public a health facility but it was also comparable to cost of antenatal services in private health facilities. The cost of antenatal visit at both the public and private health facility was found to be 15% of the minimum monthly wage in Pakistan. These relatively high costs of an antenatal visit justify the low uptake of antenatal care at public and private health centres, as seen in the trial. Similar to Pakistan, 'Free' maternity care in Bangladesh was also found to involve substantial hidden costs which was seen as a possible major contributor to low utilization of maternity services, especially among low-income groups(21).

The cost of availing skilled obstetric care at a health facility has been reported to be unaffordable for most of the poor households and impedes the utilization of safe birthing services(22, 23). This study found that most of the respondents used their savings and took loans as modes of financing the obstetric care, while some had to resort to selling off their personal assets to afford a skilled birth attendant. The same findings were reported from rural Tanzania and Bangladesh, where nearly half of the population financed the delivery by using their savings and borrowing money (or selling assets) (24,25). Mode of financing was found to vary depending on the occupation of the husband in this study.

A comparison of the costs incurred by women and their household to pay for normal or caesarean delivery using skilled birth attendance showed statistically significant difference for costs incurred by women who received structured birth planning intervention and those who were not exposed to the intervention. It indicates that costs were significantly reduced when participants made a birth plan that incorporated agreeing with their service provider on the charges for delivery and antenatal care beforehand as birth attendants tend to charge more for last minute appointments. Travel costs were also reduced in the intervention arm as the intervention involved guiding mothers to decide on the travel mode to the health facility for delivery and make the proper arrangements beforehand. Similar findings were reported in a study from Ethiopia where birth preparedness intervention resulted in reduced costs of skilled birth attendance utilization (26). Using a birth plan under the guidance of LHWs can significantly reduce costs for utilizing skilled birth attendance which has major policy implications for maternal and child healthcare in Pakistan.

The two-year cost-effect analysis based on trial data projections, shows an estimated total investment of Rs 67.7 million (US$ 677,000) during the next two years to get an additional approximately 675,000 skilled birth attendance (i.e. Rs. 100 {US$: 1} per additional skilled birth attendance). Looking at the investment from the client perspective, assuming similar effects are achieved in the province-wide expansion, the estimated cost saving of about Rs. 7.26 billion will take place mainly due to better negotiated deals between birth attendants and consumers of safe birthing services.

In short, based on trial results and cost projections, the relatively modest investment of Rs 67.7 million (US$ 677,000) is justified, both for health services and consumers, to achieve the gains of enhanced LHW birth planning in the province.

Costing Study Limitations

As women and family members were interviewed after the pregnancy outcomes, so a possibility of biased client responses (either due to recall or perception) cannot be ruled out. Similarly, there are chances of missing expense details as some women were only able to tell a total of costs paid and could not give further breakdown of the expenditures.

Conclusion

The costing study showed that a mean total out of pocket cost of normal delivery and caesarean were lesser among those exposed to structured birth planning intervention as compared to those not exposed. The savings and personal loans have been two main reported modes of financing for normal and caesarean delivery. In conclusion, based on trial results and cost projections, the relatively modest investment of Rs 67.7 million (US$ 677,000) can lead to enhanced birth planning in the province.

Contributions

NK and MAK jointly conceived the study and supervised study implementation. SEK & MAK contributed to literature review; AW contributed to manuscript development. JW provided technical input and contributed to the design of the study. All authors critically reviewed and approved the final manuscript.

Data sharing

De-identified data that underlie the results reported in this article, will be made available to researchers whose proposed use of the data has been approved by an independent ethical review committee. Requests should be directed to the corresponding author of this study.

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