**Trends in Out-of-Pocket Costs for Child Delivery Care in Bangladesh: An Analysis of Three Nationally Representative Surveys, 2014-2022**

Mohammad Nayeem Hasan1,2, Sabrin Sultana3, Isratul Jannat Mim4, Sohagi Akhter5, Muhammad Abdul Baker Chowdhury6, Md Jamal Uddin1,7,\*

1Department of Statistics, Shahjalal University of Science & Technology, Sylhet-3114, Bangladesh

2UNITY Bangladesh, Sylhet, Bangladesh.

3Department of Banking and Insurance, University of Chittagong, Chittagong-4331, Bangladesh

4Department of Pharmacy, University of Asia Pacific, Dhaka-1205, Bangladesh

5Department of Economics, Shahjalal University of Science & Technology, Sylhet-3114, Bangladesh

6Department of Neurosurgery, University of Florida College of Medicine, Gainesville, FL, USA

7Department of General Educational and Development, Daffodil International University,

Dhaka-1230, Bangladesh

\*Corresponding Author

Md Jamal Uddin, PhD

Professor, Department of Statistics, Shahjalal University of Science and Technology, Sylhet-3114, Bangladesh.

Phone: +8801716972846

Email: jamal-sta@sust.edu

<https://orcid.org/0000-0002-8360-3274>

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**Abstract:**

**Introduction:**

In Bangladesh, the primary financial burden of childbirth is often covered through out-of-pocket (OOP) spending, which can place significant strain on household finances and disrupt family livelihoods. This study aims to examine trends in OOP costs, coping strategies, and the factors influencing childbirth expenses in Bangladesh between 2014 and 2022. Specifically, it seeks to understand how these costs have evolved and their impact on maternal health service utilization.

**Data and Methods:**

The study used secondary data from the Bangladesh Demographic and Health Surveys (BDHS) conducted between 2014 and 2022. A sample of 12,752 mothers provided details on the costs of their most recent childbirths. Descriptive statistical methods and log-linear regression were used to analyze trends across each survey wave, as well as pooled data. To account for inflation, costs were adjusted to U.S. dollars based on the year of each survey. The study also assessed changes in the prevalence of high OOP costs over the study period.

**Results:**

From 2014 to 2022, the average OOP cost for childbirth tripled, increasing from US$ 80.94 to US$ 228.16. The overall mean OOP cost for childbirth during this period was US$ 130.32. Cesarean-section (C-sections) deliveries consistently incurred the highest OOP costs, ranging from US$ 258.45 in 2014 to US$ 285.14 in 2022, with a mean cost of US$ 275.15 over the entire period. Institutional normal deliveries saw a sharp rise in costs, from US$ 59.91 in 2014 to US$ 93.03 in 2022, with an average cost of US$ 75.88. In contrast, OOP costs for normal home deliveries, saw the slowest increase and lowest of any other delivery types. Pooled data analysis revealed a significant positive correlation between the costs of C-sections and institutional normal deliveries compared to home deliveries, with coefficient values of 1.31 and 0.68, respectively. Wealthier households consistently faced higher delivery costs than the poorest quintile for all types of delivery. Additionally, significant differences in OOP costs were observed across various socio-demographic factors, including age, employment status, BMI, antenatal care visits, husband’s education level, birth order, exposure to mass media, division, and place of residence.

**Conclusions:**

This study highlights a significant increase in OOP costs for childbirth in Bangladesh from 2014 to 2022, with considerable disparities across socio-economic groups and delivery types. Social health insurance and other financial protection mechanisms could play a crucial role in addressing these disparities and supporting Bangladesh’s goal of achieving universal health coverage.

**Keywords:** *Bangladesh, delivery care, out-of-pocket expenditure, service utilization, trends, healthcare financing, universal health coverage.*

**Introduction**

Maternal mortality rate (MMR) has always been a universal concern. Many conferences and forums have addressed the global situation of MMR and the necessity of reducing this worldwide. The declaration of the Millennium Development Goals (MDGs) gave it an extra push, which brought a noticeable change in this global crisis [1]. While the Middle East and the Commonwealth of Independent States did not show significant contributions, Asia contributed 19%, the second-highest amount to the reduction in the under-five mortality rate due to the MDG campaign [2]. Among the nations of Asia, Bangladesh achieved a noteworthy improvement in its MMR from 574 per 100,000 live births in 1990 to 176 by 2015. Despite not entirely meeting the three-quarter reduction goal, the progress still deserves commendation [3]. After the completion of MDG 5, the United Nations introduced the Sustainable Development Goals (SDGs) in 2015, intending to achieve them by 2030 [4].

To accomplish this goal, countries should decrease MMR through improved antenatal care (ANC), skilled medical delivery, and changing the mode of delivery when required [5]. In recent years, women’s interest in obtaining maternal healthcare services seems to be increasing in Bangladesh. Between 2017 and 2022, the number of mothers receiving high-quality ANC rose from 18% to 21% [6,7]. Childbirth through medically qualified professionals also increased remarkably to 70% in 2022, which was 33% in 2011. From 2017 to 2022, deliveries at public institutions decreased by 3%, while deliveries at private facilities increased by 13%. NGO facilities had a meager 4% of the market in 2017–18; by 2022, this had dropped to 2%.

According to BDHS 2022 these data lead to the conclusion that maternal healthcare services in Bangladesh are improving [7]. However, a significant concern is the rising costs associated with these services, leading to increased out-of-pocket (OOP) spending. The fear of high OOP costs may deter families from seeking skilled birth care, leading to an increased risk of complications during delivery, which can further exacerbate both financial and health-related outcomes for mothers and infants [8]. This growing financial burden from OOP expenses hinders Bangladesh's progress toward achieving the Sustainable Development Goal (SDG) 3 target of ensuring healthy lives and well-being for all.

Both direct and indirect costs present significant barriers to women's use of facility-based maternity care. While direct expenses are more visible, indirect costs like lost wages can also be substantial and are harder to measure because of variations in income, employment, and seasonality. Some studies suggest that these indirect costs may even surpass direct OOP expenses [9]. Several factors may influence high OOP costs during childbirth, including the mother's age, educational background, socioeconomic status, the mode of delivery, and even sometimes the mother’s religion. These factors are often key contributors to the variation in OOP expenses. Women who are more educated or have a good socioeconomic background tend to spend more during delivery [7,10,11]. Place of birth has also a substantial influence on OOP expenditure. Delivery costs are highest in private institutions, averaging around Taka 6,800, while public facilities and non-profit organizations have lower average costs, at approximately Taka 3,000 and Taka 2,600, respectively. At private facilities, the median cost of a C-section was approximately Taka 20,000. In contrast, the government facilities had the lowest median cost—roughly Taka 12,000—for C-section deliveries [12]. The cesarean section (CS) is one of the important factors contributing to the skyrocketing OOP costs. Among all the delivery modes, the CS is gaining popularity globally. High rates of cesarean delivery are linked to high rates of catastrophic health spending (CHS) and OOP expenditure [13]. In 2018, families in Bangladesh paid $483 million for a medically unnecessary C-section [14,15].

Building on the understanding of rising health expenditures in Bangladesh, it becomes clear that the healthcare system, while well-organized and supported by private and nongovernmental organizations (NGOs), faces significant challenges [16]. Despite collaborative efforts between the government, development partners, donors, and specialists, out-of-pocket (OOP) expenses related to childbirth continue to increase, exacerbating the financial strain on families [17]. In Bangladesh, 'free' maternity care comes with significant hidden expenses, which could be a big reason fewer people use maternity services overall, especially those from lower-income backgrounds [18]. Numerous studies have shown that lower-income families in Bangladesh often rely on family savings, gifts from relatives, and bank loans to finance the significant out-of-pocket (OOP) expenses associated with childbirth [19]. This growing financial burden calls for a thorough investigation into the trend of OOP expenses related to childbirth in the country. This study aims to research the trend of out-of-pocket (OOP) expenses related to childbirth in Bangladesh from 2014 to 2022. By analyzing the increasing rate of these costs over time, the study seeks to identify how escalating OOP expenses impact access to skilled birth attendants and contribute to the ongoing challenges in reducing MMR. The results will help to highlight the urgency for policy interventions, including potential government roles and insurance schemes, to mitigate financial burdens on families while improving maternal healthcare accessibility.

**Methodology**

***Research Setting***

Bangladesh is a rapidly growing populous country in the world where approximately 10 thousand children are born in each day (UNICEF). It came to light that the incidence of in Bangladesh sections was extremely high [21]. Data from the National Institute of Population Research and Training show that of the 3.6 million babies born in Bangladesh in 2022, over 1.6 million, or about 45 percent, were delivered via C-section. Furthermore, in 2018, parents paid over Tk 4,071,031,200 in out-of-pocket costs for medically unnecessary C-sections, with an average of Tk 51,905 per case [22]. In 2016-2018, the c-section rate increased from 31% to 51% [14].

***Study Design and Sampling***

We collected data from a secondary source from the years 2014, 2017-18, and 2022 of the Bangladesh Demographic and Health Survey (BDHS). These are the BDHS's Seventh, Eighth, and Ninth national surveys respectively and women who had ever been married were the target group for this survey ages ranging from 15-49. Moreover, the purpose of this survey was to report on the demographic and health status of Bangladeshi women and their families and performed by the private research firm Mitra and Associates. However, the sample strategy, survey design, tools, measurement system, quality control, etc. have been described elsewhere [6,7,23]. The survey was carried out under the direction of the Medical Education and Family Welfare Division, the Ministry of Health and Family Welfare, and the National Institute of Population Research and Training (NIPORT).

Interviews were conducted with 17,863 women in the 2014 BDHS, 20,127 women in the 2017-18 BDHS, and 30,078 women in the 2022 BDHS. Among those interviewed, 4,625 women in 2014, 5,051 in 2017-18, and 5,104 in 2022 provided information about the type of facilty and type of delivery. A total of 4,572 women in 2014, 4,948 women in 2017-18, and 3,232 women in 2022 provided information on the costs associated with their most recent births, which occurred within the two years prior to each respective survey. These births took place either at home or in a health facility where expenses were incurred for the delivery. By combining all survey data, we obtained a sample of 12,752 mothers who shared details about the costs of their most recent births under these conditions.

***Outcomes and Covariates***

Dependent Variable

The dependent variable in this study is out-of-pocket expenditure (OOP). OOP was calculated for home deliveries, institutional normal deliveries, C-section deliveries, and the total cost of childbirth services, based on the most recent births that occurred in the two years prior to the survey. To adjust for inflation, costs were converted to U.S. dollars using the exchange rate from the year of each survey, set by Bangladesh Bank. Exchange rates for Taka are determined by dealer banks based on demand and supply, with Bangladesh Bank intervening in the market as needed to maintain stability [24].

Possible Covariates

By the study's goals and because of the BDHS data's hierarchical structure, two-level independent variables were considered. We classified individual levels of independent variables in different groups such as socioeconomic and demographic factors.

The socioeconomic and demographic factors are the respondent’s age (15-24, 25-34,35+), husband's age (15-29, 30-44, 45+), respondent’s and their husbands’ educational level (no education, primary, secondary, or higher), household heads’ occupation (not working, farmer/agriculture, businessman, skilled others), respondents’ current work status (yes, no), wealth index (poor, middle, rich), respondents’ exposure to the mass media (yes, no). On the other hand, division, and area of residence (urban, rural) are regional independent variables.

Statistical Data Analysis

We performed a comprehensive analysis using descriptive statistics to assess the mean, standard deviation, median, and interquartile range among participants from different socioeconomic backgrounds in each survey and pooled survey. We pooled all three surveys' data into a single dataset. In STATA, a singleton was introduced to handle a single primary sampling unit (PSU) within a stratum. We chose the singleton (scaled) approach for analysis. We used this method because each survey has a different PSU in each study, using singleton (scaled) will provide a single PSU for all countries or combined datasets. In addition, a single PSU in the stratum can occur for various reasons such as missing data. This leads to numerous problems in analyzing the data such as not being able to calculate standard errors 29. Singleton PSUs also handle those issues and provide standard errors.

Student's t-test is used to compare the means between two groups, whereas ANOVA is used to compare the means among three or more groups, with significance set at p < 0.05 and 95% confidence intervals. Due to the positive skewness of the cost data, we applied a log transformation to the OOP costs to normalize the data and achieve linearity. A log-linear regression model was then used to identify the factors associated with OOP payments for delivery care services, including home delivery, institutional normal delivery, C-section delivery, and the total cost of childbirth services. Socio-demographic variables such as age, education, wealth index, marital status, type of residence, religion, state of residence, number of antenatal visits, place of delivery, and mode of delivery were considered as independent variables. The natural logarithm of OOP payments was treated as the dependent variable, with beta coefficients and 95% confidence intervals (CI) reported. Variables with a p-value less than 0.05 were considered statistically significant and were included in the multivariable regression model through a stepwise selection process. Additionally, we assessed multicollinearity in the final model using a cut-off value of 4.00 for the variance inflation factor (VIF) analysis [25,26]. At this stage, all variables were incorporated into the model since the VIF values for each variable were below 4.00. All models were adjusted for sampling weights and survey design using the “svy” command in STATA. Data cleaning, validation, and statistical analyses were performed using Stata/SE 18.0 (StataCorp, College Station, TX, USA).

**Results**

From 2014 to 2022, a total of 12,745 mothers who delivered a child were included in this analysis (Table 1). In 2014, 61.52% of deliveries were at home, but this percentage decreased to 50.02% in 2017-18. Overall, 5,284 (41.46%) deliveries were home deliveries. Institutional normal deliveries accounted for 19.34% of the total, with 659 (14.43%) in 2014, 829 (16.78%) in 2017-18, and 976 (30.19%) in 2022. The cesarean section rate showed a significant increase from 24.06% in 2014 to 69.81% in 2022, with 4,997 (39.21%) cases overall. The mean age of the mothers increased slightly over the years, from 24.59 years in 2014 to 25.65 years in 2022, with a mean age of 25.00 years across all years. Regarding age distribution, the majority (around 34%) of the mothers were between the ages of 20-24, followed by 26.26% in the 25-34 age group. A smaller proportion, about 18%, were in the 15-19 age group, and 21.43% were between 35-49 years old. Educationally, the majority of mothers had completed secondary education, with 50.32% overall having received secondary education. However, the percentage of mothers with higher education rose from 10.07% in 2014 to 23.93% in 2022. Notably, only 8.40% of mothers had no education by 2022, a significant decrease from 14.15% in 2014. For fathers, 18.95% had completed higher education, while 16.63% had no education. In 2014, 23.81% of mothers were working, while this proportion increased to 37.56% in 2017-18 but decreased again to 20.23% in 2022. In contrast, the number of non-working mothers remained high, at 71.76% overall. Regarding BMI, the number of underweight mothers decreased significantly, from 23.71% in 2014 to just 6.40% in 2022. Obesity rates also increased, particularly in 2022, where 57.61% of mothers were classified as obese. Regarding prenatal care, the percentage of mothers receiving the recommended four or more antenatal care visits (ANC ≥4) increased from 31.27% in 2014 to 49.60% in 2022. On the other hand, the percentage of mothers with no ANC visits decreased from 21.42% in 2014 to 2.60% in 2022. Concerning husbands' age, the majority (around 60%) were in the 30-44 age range, with a smaller proportion (around 8%) aged 45 or older. The educational levels of husbands mirrored the trend seen among mothers, with 34.41% of fathers having completed secondary education, and 18.95% having completed higher education. Regarding occupation, the most common occupation for husbands was skilled worker (24.48%), followed by business (21.34%) and factory worker (14.56%). Only a small percentage (0.76%) of husbands were not working. The wealth index indicated that 38.51% of the mothers came from poor families, while 41.88% were from wealthy families. A significant proportion (67.83%) of the families had more than four members. In terms of family size, the majority (67.83%) of the mothers came from households with more than four members. Regarding media exposure, 65.62% of mothers had exposure to mass media, which showed a clear increase from 59.71% in 2014 to 75.56% in 2022. Geographically, the Dhaka division had the highest representation of mothers, accounting for 29.20% of the total. The majority of mothers (72.56%) resided in rural areas, a slightly lower proportion than in 2014 when rural residents were 74.09%. Most of the mothers (91.46%) identified as Muslim, with a small proportion (8.54%) identifying with other religions.

Overall, from 2014 to 2022, the mean out-of-pocket (OOP) expense during child delivery in Bangladesh was US$ 130.32. The highest OOP costs (US$ 145.87) were observed among women in the 35-49 age group. Women’s education and socioeconomic status were significant determinants of higher OOP spending. Specifically, highly educated women (US$ 228.47) and women from wealthier households (US$ 184.59) incurred the most substantial expenses during childbirth. Furthermore, obese women spent notably more, with an average OOP cost of US$ 217.76. The place of delivery also had a considerable impact on the overall cost. Participants from Dhaka (US$ 164.67) and urban areas (US$ 164.37) had the highest expenditures for child delivery. Additionally, women who had attended four or more antenatal care (ANC) visits with skilled healthcare providers had the highest OOP expenses (US$ 178.83) over the study period. These findings highlight the influence of various demographic and healthcare factors on the financial burden of childbirth in Bangladesh (Table 8).

The analysis revealed several key factors influencing the cost of childbirth in Bangladesh. Cesarean sections were found to be the most expensive delivery option (p < 0.001), followed by institutional normal deliveries (p < 0.001). Women with higher levels of education, particularly secondary or higher, tended to incur higher delivery costs (p < 0.05). Additionally, those who attended more than three antenatal care visits spent significantly more on childbirth (p < 0.001). Wealthier families also faced higher delivery costs, with the middle and rich wealth categories spending more compared to the poor (p < 0.05). Conversely, women with multiple children, particularly those with two or more, generally experienced lower delivery costs (p < 0.001). Regional variations were also notable: childbirth costs were significantly lower in Rajshahi, Rangpur, and Sylhet compared to other regions (p < 0.01). Finally, the place of residence had an impact on delivery costs. Institutional deliveries in rural areas were more expensive than in urban areas (p < 0.05), indicating that geographic location plays a role in determining the cost of childbirth. These findings highlight how socio-economic factors, healthcare access, and regional disparities influence childbirth expenses in Bangladesh (Table 9).**Discussion**

This study aims to explore delivery costs and the determinants associated with them. Our study observed that the proportion of live births delivered in a health facility has increased tremendously over the last three decades (from 3% to 65%), and the proportion of home deliveries decreased (from 97% to 35%). We also observed that institutional and C-section delivery has increased over time. The proportion of live births delivered by cesarean section rose from 3% in 1999–2000 to 45% in 2022 one. We found several indicators of institutional and C-section delivery, such as mother’s education, birth order, ANC visit, wealth quintile, region, etc. This is supported by earlier studies [27,28] .

Our study revealed that the tendency toward institutional delivery is higher among educated women and lower education. According to our study, the more educated the mother, the higher the percentage of deliveries assisted by a medically trained provider. Live births of the first order have a higher C-section rate (51%) than births of the fourth or fifth order (21%). Compared to mothers who had no ANC visits (22%), mothers who had at least four ANC visits (80%) gave birth in a medical facility more frequently. Women in the lowest wealth quintile had the lowest tendency of deliveries in a health facility, whereas women in the highest wealth quintile had the highest tendency. As household wealth rises, so does the percentage of mothers receiving assistance from medically trained providers during delivery; mothers in the lowest wealth quintile receive 47% of this assistance, whereas mothers in the highest quintile receive 91%. Older mothers had a higher demand for institutional delivery than younger mothers.

According to our study, the demand for institutional delivery was higher among employed women than unemployed women [10,28]. We also found that there was a lower chance for institutional and C-section delivery in rural areas than urban areas (76% versus 61%) [15,28,29]. This might be the result of reduced access to institutional delivery in rural areas and a poor communication system, higher transportation costs, and other related expenses. According to a study of Eritrea, due to their limited ability to make decisions, women who lived in rural areas had little control over their reproductive health [30]. We observed that the delivery rate in health facilities was highest in Khulna and lowest in Barisal. Maybe socioeconomic environment resulted in this condition.

The delivery cost was typically higher in private facilities than in public facilities. And C-section delivery in private facilities was more than twice according to earlier studies [31,32]. Our study revealed that the primary coping strategies during delivery were family funds, loans, and outside support, which is supported by another study [10]. An earlier study found that generally, richer households preferred to use their current income and savings to pay for their medical expenses, indicating that borrowing money or depleting assets were undesirable options [33]. According to our study, although the majority of the costs associated with the delivery were paid for by family funds (85%), the amount of delivery cost payments through loans had increased by almost 50% in the last five years, sold assets and mortgages increased by almost 70%, and gifts from relatives and friends also increased. This indicates the burden of delivery costs is alarming for the households.

We analyzed years of data and compared one year's data with another year's data. We were able to show the increasing rate of delivery cost and which factors were associated with the increase in delivery cost. We were able to present the determinants of delivery-related expenses thoroughly. These are the strengths of our study. We have several limitations in our study. We used the Bangladesh Demographic and Health Survey's secondary data. Since the survey was based on self-reported data from respondents, recall bias may be associated with some factors. The survey was cross-sectional. That's why we were unable to provide any evidence of a causal relationship. Many poor households may have been unable to afford institutional deliveries, but we could not identify those households. We didn’t have available data for several factors. The delivery costs might be varied due to the pandemic situation of 2019-20 or due to other reasons, but we were not able to identify these.

**Conclusion**

Our present study shows the comparison and distribution of delivery cost and its determinants such as age, education, wealth quintile, region, birth order, working status of mother, ANC visits, etc. One noteworthy development is the increasing trend towards better care. There are many variations among the factors affecting delivery cost. Although there are many reasons behind the higher rate of delivery cost, the tendency toward C-section and institutional delivery is increasing, and as a result, the delivery cost is at a higher rate.

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