Levels and Determinants of Caesarean Deliveries in Egypt: Pathways to Rationalization

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Abstract

Objective: To identify demographic and socioeconomic determinants of caesarean delivery in Egypt.Methods: A logistic regression model ascertained the association between cesarean delivery and 21 independent variables, including data of 7,916 women from the 2000 Demographic and Health Survey.Results: The log odds of cesarean delivery was significantly higher among women of younger age, with first and second order pregnancies, who received antenatal care during pregnancy, with previous experience of child death, who had ever terminated pregnancy and who resided in urban areas. Interestingly, maternal education, occupational status, current use of modern contraception and desire to have more children were not associated with cesarean delivery. Further, none of the socioeconomic variables or the women position indicators appeared to be significantly associated with cesarean delivery.Conclusion: Caesarean delivery might be overused or used for inappropriate indications in Egypt. The study proposes directions for action to rationalize cesarean delivery in Egypt.

INTRODUCTION

The incidence of cesarean delivery has risen significantly in Egypt. It is estimated that one of every sex deliveries today in Egypt is being carried out by a caesarean section [1]. This figure is almost three times higher than the early 1990s [2]. This dramatic increase raises several concerns of medical, ethical an economic importance. Further, the public health significance of this increase is strongly debated.

Some advance the argument that caesarean delivery is an indicator for availability of and accessibility to maternal health care services. The premise is that surgical interventions such as caesarean delivery are keys to avoid maternal mortality and morbidity due to pregnancy complications [3]. Caesarean section is a life saving procedure in cases of obstructed labor, eclampsia and intractable hemorrhage [4, 5]. Therefore, the proportion of deliveries with caesarean section was suggested to serve as a proxy for the extent to which health care facilities provide this essential element of obstetric care [3]. Further, the increase in caesarean section delivery could be explained by either the availability of modern medical exigencies or the increasing in the demand for hospital deliveries. These are all positive trends.

Contrarily, others have voiced several concerns about the rising trend of caesarean section deliveries. First, though caesarean section is a fairly safe surgical procedure, several studies have reported a statistically significant increase in the risk of acute and chronic complications [6 – 14] when compared with attended vaginal delivery.

Exposing women unnecessarily to an increased risk of these complications is medically and ethically unacceptable. Second, it is not uncommon that caesarean delivery is overused or used for inappropriate indications, i.e. for reasons not related to preserving the life and health of mother or infant. The procedure can be convenient and lucrative for physicians but carries risks for the woman, particularly when conducted in less than optimal conditions [3].

Third, unnecessary caesarean deliveries impose unjustified costs on the part of the patient and waste the medical and economic resources on the part of the health system [15-19]. Fourth, it is not known whether the trends are universal in all regions of Egypt. It is said that the increase in caesarean delivered has occurred in the rich urban centers. The proportion of caesarean deliveries in the poor and rural areas is not known. These are the areas where maternal deaths are higher and the need for emergency obstetric care is greater.

This study aims at generating knowledge in two areas,

essential to resolving the controversy over caesarean deliveries in Egypt. First, it attempts to determine the time trends and spatial distribution of caesarean delivery in Egypt. Second, it intends to identify the demographic, biomedical and socioeconomic determinants of caesarean delivery. The goal is to prove a first step towards organizing caesarean delivery in the country.

DATA AND METHODS

Data for this study were driven from the Egypt Demographic and Health Survey in 2000. The survey was undertaken by the Ministry of Health and population to provide national level information on fertility, family planning and child and maternal health. In the survey a national representative sample of 8999 ever married woman (15 – 49 years old) were taken from 26 governorates in Egypt. The sample was selected using a weighted, multilevel, probability sampling technique.

In the survey women were asked to provide information about pregnancy, child birth and postnatal period of all pregnancies that toke place in the five-year period prior to the survey. Among various questions, they were asked whether the childbirth was made by a cesarean section. Further, data were collected about the demographic and socioeconomic background factors.

We included in the analysis the last birth of each woman only. This restriction was made to adjust for the hierarchical nature of data i.e. data about several births for the same woman. If this hierarchical nature was ignored, the results might have been biased since many of the statistical modeling techniques assume independence of observations. Another reason for this restriction is to shorten the recall period of mothers and ensure quality of maternal reporting.

The dependent variable was defined as a dichotomous variable, coded 1 for cesarean deliveries and 0 for vaginal deliveries. The independent variables included 19 factors, covering maternal, paternal and socioeconomic characteristics. These variables included maternal age at survey, maternal age at marriage, maternal age at first birth, maternal education, maternal occupation, fertility, whether the mother has ever had a terminated pregnancy or under 5 death, utilization of antenatal care, current use of modern contraception, desire to have more children, preceding birth interval, paternal age, paternal education, residence, type of toilet facility and whether they have a refrigerator. Furthermore, three indicators of women position and conjugal power were included in the analysis; whether the woman has a say on own health care, whether she has a say on large household purchases, and whether she has a say on visits to family or relatives. Finally, near birth problems were included as a variable.

A logistic regression model was used then to ascertain the association between cesarean delivery and the independent variables. If P is the probability of occurrence of cesarean delivery, then

{image:1}

where is the vector of the unknown coefficient to be estimated and X is a vector of the independent variables that influence cesarean delivery. The general logistic regression model can be further stated as:

{image:2}

which indicates the log odds of the cesarean delivery as a linear function of the dependent variables.

Some of the independent variables were expected to be correlated and their inclusion in the analysis could have rendered the model instable or flawed. Therefore, all independent variables were tested for multicollinearity and when the correlation coefficient was above 0.65 for any two variables, one of the variables was removed from the logistic regression equation. For example, maternal age at marriage was correlated with maternal age at first birth. Likewise, fertility was correlated with pregnancy order. A forward conditional stepwise regression method was adopted and the predicted variables with highest R^2 (at the 0.05 level of significance) were retained. These were maternal age at first birth and fertility.

RESULTS

The analysis included 7916 women, enrolled from 6 regions in Egypt. The age of respondent ranged between 15 and 49 (29.3±6.4 years). The mean age at marriage and at first births was 19.2±3.9 and 20.9±3.9 years, respectively. The parity of respondents ranged between 1 and 17 (3.4±2.2). About 56% of participants were able to read easily and 14.7% were then working.

The results showed that 11.4% of women delivered by cesarean section. Regional figures showed, however, great discrepancies. Upper Egypt, the poorest and most disadvantaged region of Egypt showed significantly lower rates of cesarean delivery than all other regions. The proportion of cesarean deliveries in Upper Egypt was 4.2%

in urban areas and 6.9% of rural areas. Urban Lower Egypt had a proportion of 10.1%, compared with 12.8% in Rural Lower Egypt. The highest proportions were reported in the urban governorates 20% and the frontier governorates (20.9%).

{image:3}

The association between the demographic and socioeconomic variables and cesarean deliveries is shown in table 1. There was a significant statistical association between maternal age and cesarean deliveries. The probability of cesarean deliveries among women aged 30 years and older was 0.8 that for women younger than 30.

The tendency to undergo cesarean section was two-fold higher among first and second order pregnancies than higher order pregnancies. The difference was statistically significant. Likewise, the probability of cesarean delivery was 2.4 higher if the mother received antenatal care during pregnancy.

Experiences of child deaths and pregnancy termination were associated with statically higher chances of cesarean delivery. For example, the probability of cesarean delivery was 1.5 higher among mothers who have ever experienced an U5 death compared with those who have never experienced an U5 death. Likewise, the likelihood of cesarean delivery was 1.3 higher among women who have ever terminated pregnancy compared with those who have never terminated pregnancy.

Residence showed a statistically significant association with cesarean delivery. Women residing the urban areas were shown to have a 1.7 higher chances of cesarean delivery than women residing in the rural areas. Finally, near birth problems, such as hemorrhage, prolonged or obstructed labor were associated with a 1.4 higher chances of cesarean delivery.

Maternal education, occupational status, current use of modern contraception and desire to have more children were not associated with cesarean delivery. Furthermore, none of the socioeconomic variables or the women position indicators appeared to be significantly associated with cesarean delivery. Finally, paternal characteristics such as age and education were shown to have no influence on cesarean delivery.

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DISCUSSION

The goal of this study was to determine the spatial levels and socioeconomic determinants of cesarean delivery in Egypt. The overall rate if cesarean delivery in Egypt was estimated at 11.4%, compared with 4.6% in 1992. There were wide variations in cesarean delivery rate among different regions. Rural and urban areas in Upper Egypt reported the lowest rates (4.2% and 6.9%, respectively), while urban and frontier governorates showed the highest rates (>20%).

The increase in cesarean delivery rates has been a global phenomenon, witnessed in both industrialized and developing countries throughout the last three decades. For example, the cesarean delivery rates in the United States showed a dramatic rise from 16% in the early 1980s to 25% in the early 1990s [20 - 22]. Although the rate had fallen to 21% in 1996, it is now rising again. Similar trends were observed in Canada [23, 24] Europe [25 – 31], Asia [32 – 35], Latin America [35 – 37] and Australia [38, 39].

Nevertheless, two features are peculiar to the Egyptian case. First, the pace of rise in cesarean delivery rates is extremely fast. Our statistics show that the cesarean delivery rate has doubled within only 5 years. Second, the rise has occurred undocumented and in the absence of national guidelines to rationalize cesarean deliveries. For example, the indications for cesarean delivery in Egypt are not known. Likewise, the complications, costs and consequences of these cesarean deliveries have seldom been a subject for research. All these factors increase the fear that a considerable proportion of these cesarean deliveries is unnecessary.

Obstetricians might opt to unnecessary cesarean deliveries because they can be convenient and lucrative. This is particularly true for the private sector. It is note worthwhile that the highest rate of cesarean delivery was reported in urban governorates, where the private sector predominates service provision. Unnecessary cesarean section is associated with increased postpartum infection, iatrogenic prematurity, higher incidence of neonatal illness, longer duration of hospitalization and higher costs of care than planned vaginal delivery [6 – 14].

With respect to the determinants of cesarean delivery, eight variables were found to be significantly associated with it. In order of magnitude of association these factors were utilization of antenatal care, parity, residence, previous U5 deaths, age at first birth, near birth problems, previous termination of pregnancy, preceding birth interval.

This study disclosed that maternal age was significantly associated with cesarean delivery. The probability of cesarean section among women older than 30 years was 0.8 that for younger women. The inverse relation between age and cesarean section rates is not congruent with results of several studies, which reported increased risk of cesarean deliveries among older women [40 – 44]. These studies argued that higher maternal age is more often associated with prolonged labor, fetal distress and failure to advance at the time of delivery, which may indicate a cesarean section.

However, many of these studies have not controlled for important confounding variables, and the magnitude of the risk conferred by age varied between reports. Differences of risk estimation might have resulted either from differences in populations or practice patterns in individual studies. Some variation, however, may also result from past studies not having uniformly controlled for potential confounding conditions that become more prevalent with age.

Nevertheless, the decisive factor to be considered in the relation between maternal age and cesarean delivery in Egypt is the proportion related to obstetricians' attitude, behavior and practice patterns. It is not uncommon in Egypt nowadays that obstetricians tend to use cesarean delivery with nulliparas, especially in Urban and better-off areas.

The utilization of antenatal care was the strongest determinants of cesarean delivery in Egypt. The probability of undergoing a cesarean delivery among women who used antenatal care was 2.4 higher than women who did not. This association is expected since most of pregnancy complications that might indicate cesarean delivery can be easily diagnosed by routine antenatal care. For example, hypertensive states of pregnancy, abnormal fetal presentations and placenta previa can all be diagnosed or predicted by simple diagnostic workups during antenatal care. A planned cesarean delivery in such cases might save the life of the mother and the newborn.

It is note worthwhile that near birth complications such as prolonged labor, hemorrhage and eclampsia were significantly associated with cesarean delivery. However, a considerable proportion of women who did not report near birth complications have undergone cesarean delivery. The indication for cesarean deliveries in these cases is unknown. While maternal underreporting of near birth complications can explain a part of these cases, we feel that a considerable part of cesarean delivery among women who did not report near birth problems might have been unnecessary.

Parity was significantly associated with cesarean delivery. Women with less than three live births were two times more likely to undergo cesarean delivery than women with higher parity. This association is incongruent with studies in other parts of the world [47 – 48]. These studies found a direct relation between parity and cesarean section rates that was statistically significant and persisted even after adjusting for the effect of maternal age. The higher rates of caesarean delivery among low parity women strongly suggest the misuse of this surgical procedure by obstetricians, presumably for lucrative reasons.

Mothers residing in urban areas had a 1.7 fold higher probability of cesarean delivery than mothers residing in rural areas. This might reflect a better access of mothers to obstetric care better in urban areas. Further, hospitals in urban centers are known to be better equipped than hospitals in rural areas with medical infrastructure, which are required to perform cesarean delivery. However, the higher rates of cesarean delivery in urban areas might indicate the lucrative incentive for overusing cesarean delivery in these areas, where patients are more able and willing to pay. The relation between socioeconomic status and cesarean delivery was established in several well-designed studies [49 – 51].

In summary, rationalization of cesarean deliveries is an urgent medical and public health need in Egypt today. Rationalization encompasses reducing unnecessary cesarean deliveries and making this operative alternative available for women who need it as well. This need a concerted action from all parties involved and concerned. These parties include the ministry of health, the doctor syndicate, the medical schools and the media. The first step in this direction could be more research for better understanding of the complex dimensions of the problem. The cost dimensions of the problem should be considered as well.

Directions for action include improving the access to cesarean deliveries in the rural areas, especially in Upper Egypt. Simultaneously, rationalization schemes and practice guidelines should be developed and introduced to obstetrical practice in public and private hospitals.

There are several successful examples in reducing unnecessary cesarean deliveries for Egypt to learn from. For example, the US Healthy People 2000 initiative [52], which was started in the early 1990s to reduce cesarean deliveries to 15%. Several models and approaches were used to attain the initiative goals, which were shown to have strong impact on cesarean delivery rates [53]. These approaches included

total quality management systems, continuous quality improvement schemes, benchmarking, active management of labor programs and incentive driven auditing [54 – 56]. These approaches were implemented in several developing countries and were shown to work in low-resourced settings as well [57 – 58].

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