

*Original Article***Epidemiology of Cesarean Delivery in Kassala, Eastern Sudan:  
A community-based study 2014- 2015**Abdelmageed Elmugabil<sup>1</sup>, Duria A Rayis<sup>2</sup>, Ahmed Ali Hassan<sup>2</sup>  
AbdelAzim A Ali<sup>3</sup>, Ishag Adam<sup>2\*</sup>**ABSTRACT**

**Background:** Cesarean delivery is a main obstetrical operation and its rate should be optimized where the World Health Organization regards that a cesarean delivery rate of 5-15% is an optimal range, putting in consideration the necessity of the procedure as a life-saving intervention for both the mother and fetus.

**Objectives:** To investigate the epidemiology of cesarean delivery in Kassala, Eastern Sudan from December 2014 to March 2015.

**Materials and Methods:** A stratified, multistage, household survey was carried-out. Questionnaires were applied to gather mode of delivery and its determinants.

**Results:** Out of 303 women, 87 (28.7%), 100 (33%), 116 (38.3) were primiparous, secundiparous and multiparous, respectively, Mothers' age ranged from 13 to 48 with mean (SD) 27.79 (5.94) years. In logistic regression, elder women (OR=1.1, 95 CI= 1.01-1.34, p = 0.005), primiparae (OR= 6.4, 95% CI = 1.3-31.8, p = 0.001) and women who had medical disease (OR= 2.9, 95% CI= 1.16-7.6, p= 0.023) were at higher risk to deliver by caesarean delivery.

**Conclusion:** The rate of cesarean delivery in Kassala in the current study is 17.8% and the elder women, primiparae and women with medical disorders were at a higher risk to deliver by caesarean delivery.

**Keywords:** Cesarean, Kassala, pregnancy, Sudan.

Cesarean delivery is a major obstetrical operation and its rate should be optimized where the World Health Organization considers that a cesarean delivery rate of 5–15% is an optimal range, regarding the necessity of the procedure as a life-saving intervention for both the mother and fetus<sup>1</sup>. While a low rate of cesarean delivery indicates an unmet need for this operation, high rates suggest improper selection of the procedure itself and it has to be reduced. High cesarean delivery rates has been reported in advanced countries, such as the United

States of America and Canada, in contrast to the low rates observed in low-resource setting e.g. sub-Saharan Africa where the cesarean delivery rates are not more than 3% of all deliveries in some settings<sup>2,3</sup>. Therefore, research on the epidemiology (rate, indications, risk determinants, and maternal and perinatal complications of cesarean delivery is important for health planners as well as for caregivers and practicing clinicians. There are much data on caesarean delivery for most of the countries in Africa<sup>4-6</sup>, few published data are accessible on the epidemiology of cesarean delivery in Sudan<sup>7</sup>. Moreover the vast majority of the studies on caesarean delivery in Africa were hospital ones which might not reflect the true picture at the community level. Hence there is a need for community-based research that assesses caesarean delivery and yield data

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needed to adjust or readjust the practice in the particular settings. Therefore, this was a community –based study conducted at Kassala in Eastern Sudan, to investigate the epidemiology of cesarean delivery and to add to our previous reports on caesarean delivery as well as reproductive health in this setting<sup>7-10</sup>.

#### **MATERIALS AND METHODS:**

A stratified, multistage, household survey was conducted in Kassala, eastern Sudan from December 2014 to March 2015. Kassala is the capital of Kassala State. Kassala is 550 km from Khartoum on Ethiopian-Eritrean border with 260,000 inhabitants. In Kassala, there are 28 health centres and three hospitals providing health services. Kassala state area is 42,282 Kilometres Square located in the eastern part of Sudan. The focused house (each one of ten houses out of 6 blocks in the stratum) was visited and the aim was to find women who deliver during the last six months. The second house (on the right) was chosen if the focused one contains no woman to be interviewed. Five medical officers were trained by the investigator to collect the data and how to administer the questionnaires. The data were collected through direct application of the questionnaires at community level. The recruited sample size during the study period was 303 mothers who gave birth in the last six months in Kassala. After acceptance to participate and fulfilling the inclusion criteria which included: accept to participate in the study, delivered within the last six months and available at the time of data collection. The study excluded any mother, who did not fulfill the above mentioned inclusion criteria. First, an informed consent was obtained from study participants in their own language, then explaining the purpose of the study, and the right to refuse. The participants also were assured about the confidentiality of the data. Then after acceptance to

participate in the study, a written consent was signed by the participant. The questionnaire was used to gather the background information (age, parity, education, place of living, husband education and occupation etc), medical disease e.g. diabetes, hypertension, mode of the delivery (vaginal or cesarean).

#### **Statistical analysis:**

Data were entered in SPSS and double checked before analysis. The results were illustrated in tables and text by calculating the means and standard deviation (SD) for continuous variables, and frequencies and percentages for categorical variables to describe the participants' responses. Continuous and categorical data were compared between the women with cesarean and vaginal delivery using t-test and  $\chi^2$  test, respectively. Logistic regression was conducted with cesarean delivery as the dependent variable and the other variables were the independent variables (age, parity, education, residence, and the newborn gender). Odds ratio, 95% CI were calculated and p value < 0.05 was considered significant.

#### **Ethical considerations:**

The ethical approval was obtained from Ministry of Health, Kassala State, Sudan.

#### **RESULTS:**

##### *The socio-demographic characteristics of the participants*

Three hundred and three women had complete data and analyzed in the results. Mothers' age ranged from 13 to 48 with mean (SD) 27.79 (5.94) years. Out of these 303 women, 87 (28.7%), 100 (33%), 116 (38.3) were primiparous, secundiparous and multiparous, respectively. The illiteracy among the total 303 women and their couples was 127 (41.9%) and 98 (32.3), respectively. About 41% of these women lived in rural areas. Male gender was dominating among the newborns (164, 54.1%). About one in tenth 29 (9.6) suffered from chronic problems during

pregnancy, e.g. diabetes mellitus 2 (0.7%), hypertension 7 (2.3%), and others 7 (6.6%). Regarding paternal occupation, about similar numbers of the parents were employed by the government 83 (27.4%) and the rest of the parents 84 (27.7%) were freelancers, and the rest of 303 worked as private employees 61 (20.1%), farmers 46 (15.2%), labour 13 (4.3%) and others 16 (5.3%).

Fifty four out of the 303 delivery were caesarean delivery and the rest by vaginal delivery giving the rate of 17.8%.

The mean (SD) of the age was

significantly higher in women who delivered by cesarean [29.2(5.4) vs. 27.3 (6.0) years, 0.036]. Compared to vaginal deliveries, a significantly higher number of women who delivered by cesarean were primipare, educated, resided in a rural area and were employed, Table 1.

In logistic regression, elder women OR=1.1, 95 CI=1.01-1.34, P = 0.005, primiparae (OR= 6.4, 95% CI=1.3-31.8, P = 0.001) and women who had medical disease (OR= 2.9, 95% CI= 1.16-7.6, P= 0.023) were at higher risk to deliver by caesarean delivery, Table 2.

Table 1: Demographic characteristic of cesarean delivery maternal responses in Kassala, eastern Sudan, 2014- 2015

| Characteristic                              | Cesarean delivery (n=54) | Vaginal delivery (n=249) | P     |
|---|--------------------------|--------------------------|-------|
| Parity                                      |                          |                          |       |
| Primiparae                                  | 24 (44.4)                | 63(25.3)                 |       |
| Parous (2-5)                                | 27(50.0)                 | 170(68.3)                | 0.018 |
| Grandparity (> 5)                           | 3(5.6)                   | 16(6.4)                  |       |
| Maternal education < secondary level        | 26(48.1)                 | 160(64.3)                | 0.021 |
| Maternal occupation housewives              | 36(66.7)                 | 199(79.9)                | 0.029 |
| Paternal education< secondary level         | 22(40.7)                 | 134(53.8)                | 0.560 |
| Paternal occupation (Governmental employee) | 26(48.1)                 | 118(47.4)                | 0.519 |
| Residence                                   |                          |                          |       |
| Rural                                       | 16(29.6)                 | 108(43.5)                |       |
| Urban                                       | 38(70.4)                 | 140(56.5)                | 0.040 |
| Infant sex                                  |                          |                          |       |
| Male  | 25(46.3)                 | 139(55.8)                | 0.131 |
| Female                                      | 139                      | 45.9                     |       |
| Maternal medical history                    |                          |                          |       |
| Diabetes                                    | 2                        | 0.7                      |       |
| Hypertension                                | 7                        | 2.3                      |       |
| Others                                      | 20                       | 6.6                      | 0.051 |
| No  | 9(16.7)                  | 20 (8.0)                 |       |

## DISCUSSION:

The main findings of the current study were the rate of cesarean delivery and the elder women, primiparae and women with medical disorders were at a higher risk to deliver by cesarean. We have recently shown that only 8% of deliveries were

cesarean deliveries in Sudan using the data of the national survey<sup>11</sup>. Interestingly the rate of cesarean delivery was 20% in Sudan, which was based on national hospital-based surveys that were conducted in 1993<sup>12</sup>. We have recently observed that the rate of cesarean delivery

was 43.2% in a tertiary hospital in Khartoum, Sudan<sup>7</sup>. A much lower rate of cesarean delivery was reported in neighboring Ethiopia where Fesseha *et al.*<sup>5</sup> observed that while the national population-based cesarean delivery rate was 0.6%, with regional rates varying from 0.2% to 9%. Likewise, most of the African continent countries have a low rate of cesarean delivery (e.g. the rate of cesarean delivery was 4.5% in the Congo<sup>6</sup> and it was between 0.1% and 1% in Kenya, Rwanda, Southern Sudan, and Uganda<sup>13</sup>).

In the current study elder women, primipare and women with medical disease were at higher risk to have cesarean delivery, similarly, a group of African researchers claimed the same finding<sup>14</sup>, and this could be attributed to the fact that increased maternal age is linked to complicated pregnancy such as preeclampsia as we have shown in a previous research<sup>15</sup>, moreover, chronic diseases like diabetes mellitus and hypertension are more likelier than younger ages. This is in contrast to our

Table 2: Predictors for cesarean delivery using logistic regression analysis

| Characteristic                       | OR  | 95% CI     | P     |
|--------------------------------------|-----|------------|-------|
| Age                                  | 1.1 | 1.01-1.34  | 0.005 |
| Parity                               |     |            |       |
| Primiparae                           | 6.4 | 1.3-31.8   | 0.001 |
| Parous (2-5)                         | Ref | Ref        | Ref   |
| Grandparity (> 5)                    | 1.6 | 0.40-6.911 | 0.481 |
| Maternal education < secondary level | 0.8 | 0.30-2.4   | 0.794 |
| Maternal occupation housewives       | 0.6 | 0.29-1.4   | 0.300 |
| Paternal education < secondary level | 1.1 | 0.40-3.1   | 0.828 |
| Paternal governmental employee       | 0.8 | 0.42-1.6   | 0.615 |
| Residence                            | 1.3 | 0.62-2.8   | 0.469 |
| Infant sex                           | 1.3 | 0.73-2.6   | 0.314 |
| Maternal medical history             | 2.9 | 1.16-7.6   | 0.023 |

recent findings in the hospital based study where neither age nor parity was associated with cesarean delivery<sup>7</sup>. It is worth to be mentioned that in the later study obese women were at a higher risk to have cesarean delivery. We did not investigate the body mass index in the current study because women have already delivered and it would be difficult to recall their weight and height during the index pregnancy.

Some factors e.g. education, women's job and residence showed an association with cesarean delivery in univariate analyses. It seems that these were confounders and disappeared during logistic regression. The plausible explanation for this is that

educated women were most likely to be employed and were older. Thus age was the only factor that persisted among these in logistic regression.

The limitations of this study were; its sample size was rather small, it failed to differentiate between elective and emergency cesarean and indications of caesareans were not investigated.

#### CONCLUSION:

The rate of cesarean delivery in Kassala in the current study is 17.8% and the elder women, primipare and women with medical disorders were at a higher risk to deliver by caesarean delivery.

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