An Apparent Lack in Level of Basic Knowledge of Caesarean Section Delivery among Egyptian Females: A Population-Based Cross-Sectional Survey

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Abstract

Objectives: To investigate the level of basic knowledge pertaining to caesarean section (CS) delivery and identify factors associated with having an “inadequate basic knowledge” of CS delivery among Egyptian females.

Design: Population-based cross-sectional survey.

Population: Egyptian females aged 15-49 years who responded “yes” to the question “have you ever heard of the practice “caesarean delivery”? 

Methods: Five statements of the basic knowledge pertaining to CS delivery surveyed in the Egyptian Health Issues Survey 2015 (EHIS-2015) were utilized. The basic knowledge pertaining to CS delivery was dichotomized into “inadequate” or “adequate” level.

Main outcome measure: Inadequate basic knowledge of CS that was defined as having a total correct score of ≤ 2 out of a maximum potential score of 5.

Results: Of the 9,209 females, 6,063 ever-married females were included with a mean age of 32.95 ± standard deviation (SD) 8.35 years. The mean lifetime parity was 2.85 ± SD 1.69 children. Over a half (53.4%) of females had an inadequate basic knowledge of CS. The inadequate knowledge of CS was concentrated among females who aged ≤ 20 years (56.2%) or >35 years (55.5%), with primary education or below (60.6%), living in rural areas (55.7%), “not at all” were reading newspapers or magazines (54.2%) on a weekly basis, nulliparous females (67.7%), and females with ≥ 3 children (54.4%). After adjusting for potential confounders, females who were “not at all” reading newspapers or magazines on a weekly basis, experienced vaginal delivery only (aOR: 2.80, 95% CI, 2.13-3.67), or nulliparous females (aOR: 2.03, 95% CI, 1.79-2.30), were more likely to have the inadequate knowledge of CS.

Conclusions: Basic knowledge pertaining to CS delivery among Egyptian females is low. Robust national level programs to promote knowledge on modes of birth delivery are warranted, particularly in socially deprived populations.

Keywords: Caesarean Section; Deliveries; Vaginal; Misconceptions

Introduction

Caesarean section (CS) deliveries have been increasing worldwide, placing it as one of the most common surgical procedures in the world, particularly in high- and middle-income countries [1]. CS is necessary when vaginal delivery fails to progress as in case of prolonged labor, fetal distress, or abnormal fetal presentation [1]. CS can cause serious complications, disability or death, particularly in poor-resource settings [1]. CS delivery costs more and requires longer hospitalization than vaginal delivery [2,3]. Although, CS delivery is two to three times more expensive than the vaginal delivery [4,5]; it has become widely acceptable without being aware of its adverse consequences [6].

Different reasons are linked to the global rise of CS deliveries. Late marriage, advanced maternal age, decline in home-based deliveries, parity, low education attainment, previous CS and place of delivery, are common underlying reasons [6-8]. Moreover, a multi-country facility-based survey that analyzed 286,565 deliveries found that 1.0% of CS deliveries were performed either on mothers’ request or without any medical indications [9]. Females are increasingly inclined to opt for the CS delivery due to fear of labour pain, concerns about the date of birth, or the belief that delivery by CS ensures protection of the baby's brain [10].

Educated patients and those who are aware of their health conditions are able to actively participate in shared decision-making [11,12]. A large proportion (71%) of females in India, who underwent CS, had no role in the decision-making process and accepted the decision of the attending physician for the CS [13]. Lack of knowledge...
In Egypt, the population-based proportion of CS deliveries has risen from 17.8% in 2000 to 59.7% in 2014 [14], placing it at the highest rank in the world. CS deliveries in Egypt further exceeded CS documented in Brazil (45.9%) [1], Jordan (30.3%) [7] and Saudi Arabia (25%) [15]. This unjustifiable high proportion of CS deliveries has attracted the attention of the media outlets. In 2015, the “Middle East Eye”, an online newspaper published an article on the observable rise in CS deliveries in Egypt to draw public attention to this public health phenomenon. This article was titled “Born by knife: In Egypt, c-sections are sold as the only way to give birth” [16]. According to this article, a vaginal birth would cost the Egyptian female 800 Egyptian pounds (100$US) versus USD$500 for a CS delivery [16]. Different sociodemographic and obstetric factors were linked to this increase in Egypt, but a shift towards birth delivery in the private health care facilities was the main driver [14].

Given the documented rise of CS in Egypt, it is very critical to assess the level of females' basic knowledge pertaining to CS delivery for improving maternal and child health. The present study investigated the level of basic knowledge regarding CS delivery and identified factors associated with an inadequate basic knowledge related to CS delivery among a nationally representative sample of the Egyptian females.

Materials and Methods

Data source

Data were obtained from the Egypt Health Issues Survey 2015 (EHIS-2015) that was executed from May to September, 2015 [17]. This survey shared the same national sample as the EDHS-2014 [18]. Detailed information related to the procedures and methodologies implemented in the EDHS-2014 [18] and the EHIS-2015 [17] can be found elsewhere.

The EHIS-2015 was designed specifically to collect data on a number of Egypt's key communicable and non-communicable health issues [17]. In addition, it investigated several reproductive health care issues including modes of birth delivery and females' knowledge pertaining to CS delivery [17], as the proportion of CS deliveries is steadily rising in Egypt [18] and other countries in the region [7,19-21].

The total sample size in EHIS-2015 was 16,671 individuals with a self-reported age range of 15-59 years. This study included 6,063 females aged 15-49 years who responded “yes” to the question “have you ever heard of the practice 'caesarean section'?” Men (7,462), never-married females (1,809) and those who never heard of CS delivery were excluded. Flow of sample selected is presented in Figure 1.

Measures

The EHIS-2015 collected information on different characteristics of females. Variables that have been theoretically and empirically linked to females’ knowledge towards mode of birth delivery were included [13,22,23]. Age of females at the time of last childbirth was categorized as ≤ 20, 21-25, 26-30, 31-35, and >35 years. Education attainment was defined as “completed primary or below” or “completed secondary or above”. Having an income-producing job or business was reported as yes or no/unemployed. Place of residence was categorized into urban or rural. Response to the frequency of reading newspapers or magazines, listening to the radio, accessing internet, or watching television was categorized into not at all, at least once a week, or less than once a week for each of these four measurements.

The information on woman's obstetric characteristics included lifetime parity (nulliparous, 1-2, or ≥ 3 children), current pregnancy status (yes or no/unsure), and the number of previous CS deliveries (nulliparous, only vaginal delivery, 1-2, or ≥ 3). Females were further inquired about the reason of the most recent CS delivery. The response was recorded as follows: previous CS, pregnancy-related complications, labour-related complications, multiple births (twins/triples), on mother's demand, and other reasons or the woman did not recall/did not know the exact reason of CS being performed, categorized in one category (others/don't know).

Females' knowledge of CS delivery

The “inadequate knowledge” pertaining to CS was the outcome of interest. In the EHIS-2015, the knowledge of females regarding CS delivery was assessed using five statements on a three-point Likert-scale (agree=1, disagree=0, or don't know=0 (Table 1), with the highest potential total score of “5” and the lowest potential total score of “0”.

Based on the total score, females were dichotomized into having “inadequate knowledge” (score=0-2) or “adequate knowledge” (score=3-5). The reliability related to internal consistency of the knowledge statements was investigated using Cronbach’s alpha coefficient (Cronbach’s α). The Cronbach’s α was 0.822.

| Statements                                                                 | Response         |
|---------------------------------------------------------------------------|-----------------|
| Delivery by CS is less painful than vaginal delivery                       | Agree = 1       |
| Delivery by CS is safer for the baby than a vaginal delivery               | Disagree = 0    |
| Delivery by CS is more convenient for mothers because they can schedule   | Do not know = 0 |
| when their baby will be born                                              |                 |
| Delivery by CS is more risky for a mother than a vaginal delivery          | Agree = 1       |
| If a mother delivers one baby by CS, she can have any future babies       | Disagree = 0    |
| vaginally if she wants                                                    | Do not know = 0 |

Table 1: Knowledge of CS delivery statements as collected in the 2015 Egypt Health Issues Survey.
Quantitative analyses

Descriptive statistics were presented as weighted frequencies and percentages (%) for the measured variables. Weighted frequencies and percentages of females according to their response to each knowledge statement of CS delivery were also recorded. The knowledge-score (inadequate/adequate) was further stratified by the number of previous CS deliveries. The difference in the knowledge-score by strata was assessed using $\chi^2$ analyses. A sampling weight was developed by EDHS-2014 according to the sample allocation. Weighted analysis was conducted to adjust for the complex household survey design including potential over-sampling or under-sampling and to ensure the actual representativeness of the survey results at the national and cluster level.

Bivariable and multivariable logistic regression analyses were conducted to investigate associations of the measured characteristics with the inadequate knowledge regarding CS delivery. The inadequate knowledge was given a code of “1” and the adequate knowledge a code of “0”. To control for potential confounding, all variables that showed significant associations ($p<0.05$) with the inadequate knowledge in the bivariate analysis were simultaneously included in the multivariable models. The variable woman’s “lifetime parity” was excluded from multivariable model because of a significant collinearity with the variable “previous number of CS deliveries”, as both variables included the nulliparous females.

Analyses were performed using the statistical software package IBM SPSS Statistics version 23. A two-tailed $P$ value of $\leq 0.05$ was selected to determine statistical significance.

Results

Table 2 presents the proportion of females with an inadequate basic knowledge of CS delivery among different sociodemographic and obstetric characteristics. The mean age of females at their last birth was $32.95 \pm 8.35$ standard deviation (SD) with over half (55.7% $\pm 1.25$ 95%CI) of females were $>30$ years old. Approximately one-third (32.8%) of females completed primary or below education. The majority (86.1%) of females were unemployed or had no income-producing business. More than two-thirds (67.2%) were residing in rural areas. A substantial proportion of females reported “not at all” reading newspapers or magazines (62.8%), listening to radio (72.1%), or accessing the internet (83.9%) on weekly basis, while almost all of them (97.6%) were watching television at least once a week.

|                           | N  | % ± 95% CI   | Inadequate knowledge | P-value |
|---------------------------|----|-------------|----------------------|---------|
|                           |    | % ± 95% CI  |                      |         |
| All                       | 6,063 | 100 | 53.4 ± 1.26 |         |
| Socio-demographics        |     |             |                      |         |
| Age at last birthday      |     |             |                      |         |
| (mean = 32.95 ± SD 8.35 years) |     |             |                      |         |
| ≤ 20                      | 369 | 6.1 ± 0.60 | 56.2 ± 5.06 | $<0.001$ |
| 21-25                     | 862 | 14.2 ± 0.88 | 53.4 ± 3.33 |         |
| 26-30                     | 1,452 | 23.9 ± 1.07 | 50.3 ± 2.57 |         |
| 31-35                     | 1,074 | 17.7 ±0.96 | 52.3 ± 2.99 |         |
| >35                       | 2,306 | 38.0 ± 1.22 | 55.5 ± 2.03 |         |
| Education attainment      |     |             |                      | $<0.001$ |
| Completed primary or below| 1,989 | 32.8 ± 1.18 | 60.6 ± 2.15 |         |
| Completed secondary or above| 4,074 | 67.2 ± 1.18 | 50.5 ± 1.54 |         |
| Have an income-producing job/business |     |             |                      | 0.132†   |
| Yes | 37 | 0.6 ± 0.19 | 43.2 ± 15.96 |
| No/ unemployed | 5,219 | 86.1 ± 0.87 | 53.8 ± 1.35 |
| Missing | 807 |

| Residence | <0.001 |
| Urban | 1,987 | 32.8 ± 1.18 | 48.8 ± 2.20 |
| Rural | 4,076 | 67.2 ± 1.18 | 55.7 ± 1.52 |

| Reading newspaper/magazine | <0.001 |
| Not at all | 3,808 | 62.8 ± 1.22 | 54.2 ± 1.58 |
| At least once a week | 236 | 3.9 ± 0.49 | 36.1 ± 6.13 |
| Less than once a week | 489 | 8.1 ± 0.69 | 32.3 ± 4.14 |
| Missing | 1,530 |

| Listening to the radio | <0.001 |
| Not at all | 4,374 | 72.1 ± 1.13 | 58.2 ± 1.46 |
| At least once a week | 1,139 | 18.8 ± 0.98 | 47.6 ± 2.90 |
| Less than once a week | 548 | 9.0 ± 0.72 | 27.5 ± 3.47 |

| Accessing the internet | <0.001 |
| Not at all | 5,087 | 83.9 ± 0.93 | 55.6 ± 1.37 |
| At least once a week | 738 | 12.2 ± 0.82 | 42.0 ± 3.56 |
| Less than once a week | 238 | 3.9 ± 0.49 | 42.9 ± 6.29 |

| Watching television | <0.001 |
| Not at all | 61 | 1.0 ± 0.25 | 55.0 ± 12.48 |
| At least once a week | 5,917 | 97.6 ± 0.39 | 53.8 ± 1.27 |
| Less than once a week | 86 | 1.4 ± 0.30 | 27.4 ± 9.43 |

| Obstetric history | <0.001 |
| Lifetime parity (mean = 2.85 children ± SD 1.69) |
| Nulliparous | 385 | 6.4 ± 0.62 | 67.7 ± 4.67 |
| 1-2 | 2,298 | 37.9 ± 1.22 | 49.6 ± 2.04 |
| ≥ 3 | 3,380 | 55.7 ± 1.25 | 54.4 ± 1.68 |

| Currently pregnant | 0.004 |
| Yes | 483 | 8.0 ± 0.68 | 59.8 ± 4.37 |
| No/ Unsure (only 34 women) | 5,546 | 92.0 ± 0.68 | 52.9 ± 1.31 |

| Number of previous CS (mean = 0.8 ± SD 1.08) | <0.001 |
| Nulliparous | 385 | 6.4 ± 0.19 | 67.7 ± 4.67 |
| Only vaginal delivery | 3,189 | 52.6 ± 1.26 | 60.8 ± 1.69 |
| 1-2 | 1,955 | 32.3 ± 1.18 | 42.7 ± 2.19 |
| ≥3 | 534 | 8.8 ± 0.71 | 38.8 ± 4.13 |
Reason for the most recent CS\(^*\) (N = 2,489)\(^*\)

| Reason for the most recent CS\(^*\) | Agree n (%) | Disagree/do not know n (%) | Missing data n (%) |
|-----------------------------------|-------------|----------------------------|-------------------|
| Previous CS\(^*\) | 1,037 | 41.7 ± 1.94 | 41.5 ± 3.00 | <0.001 |
| Pregnancy-related complications\(^\d\) | 719 | 28.9 ± 1.78 | 39.5 ± 3.57 |
| Labour-related complications\(^\d\) | 602 | 24.2 ± 1.68 | 47.8 ± 3.99 |
| Multiple birth (twins/triples) | 36 | 1.4 ± 0.46 | 41.7 ± 16.11 |
| On mother's demand | 59 | 2.4 ± 0.60 | 26.7 ± 11.29 |
| Others/do not know | 37 | 1.5 ± 0.48 | 32.4 ± 15.08 |

\(^*\)Occurred within 5 years prior to the survey, includes women reported more than one reason, for example, if the women reported had previous CS with problems during the most pregnancy, she was categorized in the "previous CS" group. \(^\d\) 292 of previous CS were accompanied by different pregnancy- or labour-related complications. \(^\d\) include eclampsia, pre-eclampsia, placenta previa, placenta acreta, fetal mat-presentation, or others. \(^\d\) include obstructed labour, prolonged labour, fetal distress, or others. \(^\p\) P value extracted from Fisher’s exact test.

CS: Caesarean Section; SD: Standard Deviation; CI: Confidence Interval

Table 3: Distribution of women according to their response to the 5 knowledge statements of CS delivery, Egypt 2015.

| Statements | Expected answer | Agree n (%) | Disagree/do not know n (%) | Missing data n (%) |
|------------|----------------|-------------|----------------------------|-------------------|
| Delivery by CS is less painful than vaginal delivery | Agree | 1,880 (31.0) | 4,183 (69.0) | 0 |
| Delivery by CS is safer for the baby than a vaginal delivery | Agree | 2,323 (38.3) | 3,740 (61.7) | 0 |
| Delivery by CS is more convenient for mothers because they can schedule when their baby will be born | Agree | 3,335 (55.0) | 2,727 (45.0) | 0 |
| Delivery by CS is more risky for a mother than a vaginal delivery | Agree | 3,946 (65.1) | 2,117 (34.9) | 0 |
| If a mother delivers one baby by CS, she can have any future babies vaginally if she wants | Agree | 2,661 (43.9) | 3,393 (56.0) | 9 (0.1) |
| Mean ± SD | 2.33 ± 1.40 |

The mean parity was 2.85 ± 1.69 children per woman. Only 6.4% ± 0.62 of females were nulliparous and more than a half (55.7% ± 1.25) were multiparous with a lifetime parity of ≥ 3 children. Of the total sample, 41.1% reported at least one previous CS delivery with the mean number of previous CS deliveries 0.80 ± 1.08. The proportion of CS deliveries further increased to 43.8% after excluding nulliparous females. Of the reported CS deliveries, 2.5% were demanded by mothers.

Over a half (53.4% ± 1.26 95%CI) of the Egyptian females had the inadequate basic knowledge of CS delivery. The prevalence of inadequate knowledge of CS was concentrated among young females aged ≤ 20 years (56.2%) or older females aged >35 years (55.5%), females who completed primary education or below (60.6%), living in rural areas (55.7%), or females who were "not at all" reading newspapers or magazines (54.2%), listening to the radio (58.2%), accessing the internet (55.6%), or watching television (55.0%), on a weekly basis. More than two-thirds (67.7%) of nulliparous females and more than a half (54.4%) of multiparous females with ≥ 3 children had the inadequate knowledge of CS. Almost 60.0% of currently pregnant females, 67.7% of nulliparous females, and 60.8% of females who had the vaginal delivery had the inadequate knowledge of CS.

Results of the knowledge statements are shown in Table 3. The overall mean knowledge score was 2.33 ± 1.40. Of the total sample, 647 (10.7%) females gained "0" score and only 289 (4.8%) females responded correctly to all statements (data not shown). The highest percentage (65.1%) of correct response was to the statement "delivery by CS is riskier than a vaginal delivery" followed by 55.0% to the statement "delivery by CS is more convenient for mothers because they can schedule when their baby will be born". Only 31.0% of females agreed that "delivery by CS is less painful than vaginal delivery". More than a half of females (56.0%) reported disagree/do not know on the statement about the possibility of vaginal delivery after the previous CS delivery.

The crude and adjusted association between measured characteristics of females and the inadequate basic knowledge of CS are shown in Table 4. In crude analysis, the inadequate knowledge of CS delivery was significantly associated with completing primary education or below, living in rural areas, "not at all" reading newspapers or magazines, watching TV, or accessing the internet on a weekly basis, being a currently pregnant woman, being a nulliparous or a woman who experienced vaginal delivery only. In the multivariable
model, only three factors retained their significance with the inadequate knowledge of CS; “not at all” reading newspapers or magazines weekly; being a nulliparous woman (aOR, 2.80); or being a woman with only vaginal delivery (aOR, 2.03) (p<0.001 for all).

|                          | Crude OR (95% CI) | Adjusted OR (95% CI) |
|--------------------------|-------------------|----------------------|
| **Socio-demographics**   |                   |                      |
| Age at last birthday, years |                   |                      |
| ≤ 20                     | 1.00              | 1.00                 |
| 21-25                    | 0.89 (0.69-1.14)  | 1.06 (0.80-1.40)     |
| 26-30                    | 0.79 (0.63-0.99)² | 1.07 (0.82-1.40)     |
| 31-35                    | 0.85 (0.67-1.08)  | 1.19 (0.90-1.58)     |
| >35                      | 0.97 (0.78-1.21)  | 1.13 (0.86-1.48)     |
| **Education attainment** |                   |                      |
| Completed primary or below | 1.00             | 1.00                 |
| Completed secondary or above | 0.65 (0.58-0.73)⁶ | 0.84 (0.69-1.03)     |
| **Have job or business** |                   |                      |
| No                       | 1.00              | -                    |
| Yes                      | 0.66 (0.35-1.30)  | -                    |
| **Residence**            |                   |                      |
| Rural                    | 1.00              | 1.00                 |
| Urban                    | 0.76 (0.68-0.84)⁶ | 0.88 (0.77-1.00)     |
| **Reading newspaper/magazine** |               |                      |
| Not at all               | 1.00              | -                    |
| At least once a week     | 0.47 (0.36-0.63)⁶ | 0.57 (0.43-0.77)⁶    |
| Less than once a week    | 0.40 (0.33-0.49)⁶ | 0.43 (0.35-0.53)⁶    |
| **Listening to the radio** |                 |                      |
| Not at all               | 1.00              | -                    |
| At least once a week     | 0.65 (0.57-0.74)  | -                    |
| Less than once a week    | 0.27 (0.22-0.33)  | -                    |
| **Watching television**  |                   |                      |
| Not at all               | 1.00              | 1.00                 |
| At least once a week     | 0.95 (0.57-1.59)  | 1.16 (0.52-2.59)     |
| Less than once a week    | 0.31 (0.15-0.63)§ | 0.47 (0.17-1.30)     |
| **Accessing the internet** |                 |                      |
| Not at all               | 1.00              | 1.00                 |
| At least once a week     | 0.58 (0.49-0.67)⁶ | 0.89 (0.74-1.06)     |
| Less than once a week    | 0.60 (0.46-0.78)⁶ | 0.78 (0.59-1.03)     |
| **Obstetric history**    |                   |                      |
showed an adequate knowledge. In a country with over a half of annual "knowledge" of basic aspects of CS delivery, a substantial proportion of CS delivery among females. However, these findings among females in Egypt; the country that has by far the highest prevalence of the inadequate basic knowledge of CS delivery observed among Egyptian females was mainly due to the misconception of a large proportion of females having the adequate knowledge of CS. While over a half of the Egyptian females had an "inadequate knowledge" of basic aspects of CS delivery, a substantial proportion showed an adequate knowledge. In a country with over a half of annual deliveries are being CS (59.7%) [18], it is reasonable to find this noticeable proportion of females having the adequate knowledge of CS. However, the inadequate knowledge of CS delivery observed among Egyptian females was mainly due to the misconception of a large proportion of females on three main aspects of basic knowledge of CS delivery. This high proportion of females conceived that the delivery by CS is (1) more painful; (2) less safe for the baby than vaginal delivery, and (3) females cannot give vaginal birth after the previous CS. The observed low proportion of Egyptian females who agreed on that CS delivery is less painful than vaginal delivery is almost parallel to findings from Iran in 2014 [23] and in 2005 [22]. This highlights that the misconception about basic aspects of CS are prevalent among Egyptian females. With more than 90% of Egyptian females receiving at least one ANC visit during their pregnancy [18], it is very critical to seize this opportunity for raising awareness about modes of birth delivery among females. However, these findings do not signify promoting of CS over vaginal delivery due to the less painful and safer characteristics of CS, but to change females' misconceptions about CS delivery by (1) promoting vaginal birth after CS and (2) providing mothers with an informed and shared-decision on the mode of their birth delivery.

While the majority of the observed CS deliveries were attributed to pregnancy- or labor-related complications, a significant proportion of CS was attributed to the previous CS delivery and 2.4% were on mother's request. In 2014, there were an estimated 2,717,000 deliveries in Egypt [24], 87% of these deliveries (2,363,790) were institutional-based deliveries [18]. With an institutional-based CS prevalence of 67.3% reported in 2014 [18], out of the 2,363,790 institutional-based deliveries, there were an estimated 1,590,830 caesarean deliveries in Egypt. In this study, with 2.4% of CS deliveries were performed on mother's demand and 41.7% were performed due to a previous CS, an estimated 701,556 CS deliveries would be unnecessary and could be avoided. Trial of labor after caesarean (TOLAC) is a reported method to avoid repeated elective CS delivery [25,26]. A systematic review showed that the success rate of TOLAC after one CS was 76.5% and after two CS deliveries was 71.7% [27]. Robust programs to promote TOLAC among medical practitioners and among Egyptian females are necessary to reduce number of unnecessary caesareans.

From the economic perspective, this estimated number of 701,556 potentially avoidable CS deliveries would save a total of $US350,778,000, considering a cost of $US500 per CS delivery [16]. Out of this estimated cost, $US178,896,780 were out-of-pocket payments considering that 51% of health care expenditures coming out of the pockets in Egypt [28]. It is evident that the rise in CS deliveries burdens families with more financial expenses in a country where 44% of the population is living on less than $US2 dollars a day [28]. The estimated number and cost of these avoidable caesareans substantially increases considering 4.3% of CS deliveries were performed on mother's demand among mothers with only one CS [17]. This proportion of potentially avoidable CS deliveries might be attributed to

**Discussion**

This study measured the basic knowledge pertaining to CS delivery among females in Egypt; the country that has by far the highest proportion of CS deliveries in the region. The study also explored the prevalence of the inadequate basic knowledge of CS delivery according to different female's sociodemographic and obstetric characteristics. The analyses indicated that a high proportion of Egyptian females had no basic knowledge of CS delivery. This inadequate knowledge of CS was concentrated among females of different sociodemographic strata and obstetric characteristics. Having the inadequate basic knowledge of CS was independently associated with "not at all" reading newspapers or magazines on a weekly basis, never experienced childbirth, or never having a CS delivery.

While a half of the Egyptian females had an "inadequate knowledge" of basic aspects of CS delivery, a substantial proportion showed an adequate knowledge in the region. In a country with over a half of annual deliveries being CS (59.7%) [18], it is reasonable to find this noticeable proportion of females having the adequate knowledge of CS. However, the inadequate knowledge of CS delivery observed among Egyptian females was mainly due to the misconception of a large proportion of females on three main aspects of basic knowledge of CS delivery. This high proportion of females conceived that the delivery by CS is (1) more painful; (2) less safe for the baby than vaginal delivery, and (3) females cannot give vaginal birth after the previous CS. The observed low proportion of Egyptian females who agreed on that CS delivery is less painful than vaginal delivery is almost parallel to findings from Iran in 2014 [23] and in 2005 [22]. This highlights that the misconception about basic aspects of CS are prevalent among Egyptian females. With more than 90% of Egyptian females receiving at least one ANC visit during their pregnancy [18], it is very critical to seize this opportunity for raising awareness about modes of birth delivery among females. However, these findings do not signify promoting of CS over vaginal delivery due to the less painful and safer characteristics of CS, but to change females' misconceptions about CS delivery by (1) promoting vaginal birth after CS and (2) providing mothers with an informed and shared-decision on the mode of their birth delivery.

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**Table 4: Crude and adjusted factors associated with an inadequate basic knowledge of CS delivery (N= 4,527)**

| Lifetime parity | Crude OR (95% CI) | Adjusted OR (95% CI) |
|-----------------|------------------|----------------------|
| ≥ 3             | 1.00             | 1.00                 |
| 1-2             | 0.82 (0.74-0.92) | -                    |
| Nulliparous     | 1.75 (1.40-2.19) | -                    |

| Currently pregnant | Crude OR (95% CI) | Adjusted OR (95% CI) |
|-------------------|------------------|----------------------|
| Yes               | 1.00             | 1.00                 |
| No/Unsure         | 0.76 (0.63-0.92) | 0.86 (0.68-1.08)     |

| Previous number of CS deliveries | Crude OR (95% CI) | Adjusted OR (95% CI) |
|---------------------------------|------------------|----------------------|
| ≥ 1 CS delivery                 | 1.00             | 1.00                 |
| Only vaginal delivery           | 2.15 (1.93-2.39) | 2.80 (2.13-3.87)     |
| Nulliparous                     | 2.61 (2.32-3.65) | 2.03 (1.79-2.30)     |

*Total women included in multivariable model was 4,527 with full information for all included variables

1Multivariable model included variables showed significant association in bivariate analysis (age at last birthday, education attainment, residence, reading newspaper/magazine, watching television, accessing the internet, currently pregnant, and previous number of CS deliveries), excluding "lifetime parity" due to collinearity with "previous number of CS deliveries". P<0.05, §P = 0.001, ¶P<0.001; CS: caesarean section; OR: odds ratio, CI: confidence interval.
high prevalence of inadequate knowledge of CS among Egyptian females. Empowering females with correct knowledge of CS might contribute to a significant decline in CS deliveries in a poor-resource setting.

Present findings provide an informative guidance on the most influential means to raise public awareness about the knowledge pertaining to CS delivery. Females, who were reading newspapers or magazines, at least once or less than once a week, were more likely to have an adequate knowledge of CS. This implies that written media outlets constitute the main source of CS knowledge. The media article highlighted concerns about the rising CS in Egypt, might also contributed to disseminating the knowledge, as it covered some risks associated with CS delivery [16].

Ability to comprehend and absorb health messages from written media outlets might also explain differences in the knowledge of CS observed according to the education attainment and place of residence; females with higher education attainment or those residing in urban areas were less likely to have an inadequate knowledge of CS in crude analysis. Residents of urban settings are more likely to have better incomes and an easy access to paper and electronic newspapers and magazines. This observed role of the written media outlets must be complemented with robust public awareness programs through engaging more public media means as key actors to raise public awareness regarding CS delivery. This finding is of particular importance that would support the efforts of the Health Ministry of Egypt to halt the ongoing rise in CS [29].

As expected, previous experiences of CS delivery were associated with having an adequate basic knowledge of CS. Nulliparous or females delivering births vaginally were more than two-time at higher likelihood to have an inadequate knowledge of CS. These two strata of females are less likely to experience maternal health outcomes and to seek health care. Nevertheless, the worrisome finding here is that almost one-third of females having at least one CS are still having an inadequate basic knowledge of CS. Indeed, this highlights a potential inadequacy in the provided information to females who might undergo CS delivery; in particular, in a country where 90.3% of pregnant females received at least one ANC visit [18].

This study has several limitations. The cause-and-effect relationship between the knowledge of CS delivery and selected factors cannot be established due to the cross-sectional nature of the EHIS-2015. The analysis is limited by the structure of CS knowledge-related statements in the EHIS-2015. These CS knowledge-related statements were very basic. Assessing the level of CS knowledge requires more well-defined and structured statements that inquire about indications of CS delivery and risks associated with undergoing this surgical procedure. Moreover, some of the statements are not sufficiently well-defined. For instance, one of the statements did provide more information about what kind of risks for mother that could be associated with undergoing CS delivery. In future studies, designing more well-defined statements about the pros and cons of different modes of birth delivery would help in getting more insights about whether females have correct knowledge of CS. Nevertheless, our analyses are indicative of the basic knowledge of CS among Egyptian females and the need for more effective and targeted CS awareness efforts.

Conclusion

In a country with a high rate of CS deliveries, this study demonstrated an apparent lack of basic knowledge pertaining to CS delivery among Egyptian females. In such setting, having a shared and well-informed decision about the most appropriate mode of birth delivery emphasizes the need for educating pregnant females about the pros and cons of modes of birth delivery. Written media outlets and previous experiences of childbirth appeared to be influential in disseminating correct knowledge of CS. However, to reach more Egyptian females with the correct knowledge of CS, particularly nulliparous and females with only vaginal delivery, who might opt out for or medically undergo CS delivery in the future, designing robust nationally-based programs to promote knowledge on modes of birth delivery are warranted.

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Authorship and contributor ship

RHA conceived and designed the study. RHA retrieved the data. RHA with FA analysed the data and interpreted the results. RHA wrote the manuscript, FA commented on and contributed to the revision of drafts and final version of the article.

Details of ethics approval

The protocol for the EHIS-2015 was approved by the Scientific and Research Ethics Committee of the Ministry of Health and Population of Egypt and the Institutional Review Board of the ICF International. As a part of the EHIS-2015, the survey team took informed consents from the survey participants. Institutional ethical clearance from the research ethical committee of the United Arab Emirates University was not needed given the utilization of publicly available data.

References

1. World Health Organization. Caesarean sections should only be performed when medically necessary. Available: http://www.who.int/mediacentre/news/releases/2015/caesarean-sections/en/. Accessed January 4, 2018, 2016.
2. Allen VM, O’Connell CM, Farrell SA, Baskett TF (2005) Economic implications of method of delivery. Am J Obstet Gynecol 193: 192-197.
3. Allen VM, O’Connell CM, Baskett TF (2006) Cumulative economic implications of initial method of delivery. Obstet Gynecol 108: 549-555.
4. Amu O, Rajendran SI, Bolaji I (1998) Should doctors perform an elective caesarean section on request? Maternal choice alone should not determine method of delivery. Brit Med J 317: 463-465.
5. Norman B, Crowhurst JA, Plaat F (1999) Elective caesarean section on request. All types of anaesthesia carry risks. BMJ 318: 120.
6. Leung GM, Lam TH, Thach TQ, Wan S, Ho LM (2001) Rates of cesarean births in Hong Kong: 1987-1999. Birth 28: 166-172.
7. Al-Rifai R (2014) Rising cesarean deliveries among apparently low-risk mothers at university teaching hospitals in Jordan: analysis of population survey data, 2002-2012. Glob Health Sci Pract 2: 195-209.
8. Hopkins K (2000) Are Brazilian women really choosing to deliver by cesarean? Soc Sci Med 51: 725-740.
9. Souza JP, Gülmezoglu A, Lumbiganon P, Laopaiboon M, Carroli G, et al. (2010) Cesarean section without medical indications is associated with an increased risk of adverse short-term maternal outcomes: the 2004-2008 WHO Global Survey on Maternal and Perinatal Health. BMC Med 8: 71.
10. Lei H, Wen SW, Walker M (2003) Determinants of caesarean delivery among women hospitalized for childbirth in a remote population in China. J Obstet Gynaecol Can 25: 937-943.
11. Coulter A, Parsons S, Askham J (2008) Where Are the Patients in Decision-Making About Their Own Care? Copenhagen, Denmark.
12. Griffith R (2012) Making patients active participants in their own treatment decisions. Br J Nurs 21: 1354-1355.
13. Ajeet S, Jaydeep N, Nandkishore K, Nisha R (2011) Women's Knowledge, Perceptions, And Potential Demand Towards Caesarean Section. National Journal of Community Medicine 2: 244-248.
14. Al Rifai RH (2017) Trend of caesarean deliveries in Egypt and its associated factors: evidence from national surveys, 2005-2014. BMC Pregnancy Childbirth 17: 417.
15. Wahabi H, Fayed A, Esmaeil S, Alzeidan R, Elawad M, et al. (2016) Riyadh Mother and Baby Multicenter Cohort Study: The Cohort Profile. Plos One 11.
16. http://www.middleeasteye.net/in-depth/features/born-knife-egypt-s-birthing-business-c-sections-are-sold-only-option-586089653
17. Ministry of Health and Population, E-ZaAE, ICF (2015) International Egypt Health Issues Survey 2015. Cairo, Egypt and Rockville, Maryland, USA.
18. Ministry of Health and Population, E-ZaAE, ICF (2014) International Egypt Health Issues Survey 2015. Cairo, Egypt and Rockville, Maryland, USA.
19. Huster KM, Patterson N, Schlipperoord M, Spiegel P (2014) Cesarean sections among Syrian refugees in Lebanon from December 2012/January 2013 to June 2013: probable causes and recommendations. Yale J Biol Med 87: 269-88.
20. Al-Kadri HM, Al-Anazi SA, Tamim HM (2015) Increased cesarean section rate in Central Saudi Arabia: a change in practice or different maternal characteristics. Int J Womens Health 7: 685-692.
21. Al-Kubaisy W, Al-Rubea W, Al-Naggar RA, Karim A, Mohd Noor NA (2014) Maternal obesity and its relation with the cesarean section: a hospital based cross sectional study in Iraq. BMC Pregnancy Childbirth 14: 235.
22. Aali BS, Motamedi B (2005) Women's knowledge and attitude towards modes of delivery in Kerman, Islamic Republic of Iran. East Mediterr Health J 11: 663-672.
23. Ghotbi F, Sene AA, Azargashb E, Shiva F, Mohtadi M, et al. (2012) Women's knowledge and attitude towards mode of delivery and frequency of cesarean section on mother's request in six public and private hospitals in Tehran, Iran, 2014. J Obstet Gynaecol Re 40: 1257-1266.
24. http://www.unicef.org/egypt/UNICEF_2015_Children_in_Egypt_Statistical_Digest(2).pdf
25. Rosen MG, Dickinson JC, Westhoff CL (1991) Vaginal birth after cesarean: a meta-analysis of morbidity and mortality. Obstet Gynecol 77: 465-470.
26. Rageth JC, Jazi C, Grosenbacher H (1999) Swiss Working Grp Obstet Gynecologic Inst. Delivery after previous cesarean: A risk evaluation. Obstet Gynecol 93: 332-337.
27. Tahseen S, Griffiths M (2010) Vaginal birth after two cesarean sections (VBAC-2)-a systematic review with meta-analysis of success rate and adverse outcomes of VBAC-2 versus VBAC-1 and repeat (third) cesarean sections. Bjog-Int J Obstet Gy 117: 5-19.
28. http://www.globalsurance.com/health-insurance/egypt/
29. http://www.madamasr.com/news/health-ministry-considers-limiting-caesarean-operations