

**Original Research**

# A Quantitative and Qualitative Investigation of Factors Associated with Caesarean Section Deliveries in Sri Lanka Assessing National Trends and Views of Local Healthcare Professionals in Colombo in 2015

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**Article information**

**Received:** December 9<sup>th</sup>, 2022; **Revised:** December 29<sup>th</sup>, 2022; **Accepted:** January 11<sup>th</sup>, 2023; **Published:** January 16<sup>th</sup>, 2023

**Cite this article**

Perera Y. A quantitative and qualitative investigation of factors associated with caesarean section deliveries in Sri Lanka assessing national trends and views of local healthcare professionals in Colombo in 2015. *Emerg Med Open J.* 2023; 9(1): 1-9. doi: [10.17140/EMOJ-9-166](https://doi.org/10.17140/EMOJ-9-166)

## ABSTRACT

### Background

A caesarean section (CS) is an operation to deliver a baby through incisions made to the mother's abdominal wall and uterus, either before or after labor has started. An emergency CS is performed for certain medical indications such as placenta praevia or umbilical cord prolapse, and it most frequently occurs once labor has started. Elective CS are planned CS. They could be performed for non-medical reasons such as maternal request.

### Aim

CS rates in Sri Lanka have been rising over the past decades. This study investigates reasons for the rise in CS rates through qualitative and quantitative analyses.

### Methods

Qualitative data analysis involved interviews which were conducted in a teaching hospital in Colombo, Sri Lanka. Twenty (20) healthcare professionals in Obstetrics and Gynecology were interviewed. A semi-structured questionnaire, consisting of 15 opened and closed questions, was the basis for the interview. Quantitative analysis was performed on Demographic and Health Survey (DHS) data from 2006-2007. Variables included mother's age, education level and residence. Chi-squared ( $\chi^2$ ) and regression analysis using statistical package for the social sciences version (SPSS) was performed to determine if these variables were associated with CS.

### Results

From qualitative analyses of the interviews, the main themes identified were the healthcare professionals' views on causes of the rising CS rates, parties involved in the decision-making process, benefits and risks of elective CS and availability of support or alternative options. Quantitative analysis of DHS data showed variables such as residence, province, and education level were significantly associated with CS ( $p<0.01$ ). Urban residences, living in Colombo and extremes in education levels had the greatest likelihood of a CS. Age, although statistically not significant, is clinically important as literature reviewed showed that CS tend to be more prevalent in extremes of age.

### Conclusion

Analysis revealed the importance of factors associated with CS. Targeting areas that showed the greatest prevalence of CS is an effective strategy to address rising rates.

### Keywords

Caesarean section (CS); Sri Lanka; Obstetrics and Gynecology; Maternal Health; Public Health.

## INTRODUCTION

The definition of a caesarean section (CS) is an operation to deliver a baby through incisions made to the mother's abdominal wall and uterus, either before or after labor has started.<sup>1</sup> Rising cae-

sarean section rate (CSR) is a concern, especially in countries like Sri Lanka where resources and funding are limited. World Health Organization (WHO) recommend a CSR of between 10-15%,<sup>2,3</sup> which reflects the prevalence of maternal complications advanced levels of obstetric care can effectively address. Unfortunately, CSR

in Sri Lanka (SL) have been rising significantly as rates were 8.4% in 1988,<sup>4</sup> increasing to 13.3% in 1998 and 30.6% in 2007.<sup>5,6</sup> Moreover, in 2007, 66.6% of all CS occurred in private hospitals.<sup>7</sup>

The department of Obstetrics and Gynaecology (O&G) in a teaching hospital in Colombo, felt this was a pertinent issue as a similar rise in CSR had been noted in the hospital. As staff and resources are already stretched, effectively identifying methods to reduce CSR would enable staff and facilities to be optimally utilized. Compared to normal vaginal delivery (NVD), caesarean section delivery (CSD) are less economical due to greater costs, higher incidence of maternal and fetal complications, longer hospital stays, neonatal intensive care unit (NICU) admissions and loss of productivity.<sup>8,9</sup>

Complications associated with CSD compared to NVD include fatality, infection, hemorrhage, ileus, adhesions, injury to the bladder, laceration to the fetus and several more. On average, there was an approximate complication rate of 5% with elective CS and 15% with emergency CS.

According to literature reviewed, factors that influence the decision-making for a CS include the involvement of HCPs, socioeconomic status of the women, greater cultural acceptability, maternal age and the availability of information.<sup>10</sup> Other factors included maternal age, education level and residence of the mother. Analysis of quantitative Demographic and Health Survey (DHS) data from 2006-07 was performed to validate these variables and assess their influence on CSD.

A rise in elective CS was also frequently being attributed to a greater number of maternal CS requests without medical indications. Studies revealed that this maternal request often stemmed from tocophobia, the perception that CS is safer than NVD or the need for choice and control.<sup>11</sup> In SL, a study showed that maternal request contributed to 38% of the CSR.<sup>12,13</sup>

## Aims

CSR in SL have been rising over the past few decades. This study investigates reasons for the rise in CSR by analyzing both qualitative and quantitative data from SL. The main aim of the study was to analyze the factors that were associated with CS in an attempt to elucidate why CSR are rising in SL.

Anecdotally, Healthcare professionals (HCPs) reported that they have been seeing a rise in CS. In government hospitals, the CS rate has risen from 14.4% in 1999 to 24% in 2007. Through the interviews, the HCPs awareness and understanding about the prevalence of CS was explored. As CSR in SL have been rising, the interview attempted to uncover the reasons for this rise according to the HCPs and to see if this correlates with research and literature reviewed prior to the interviews. Literature from SL suggested that the escalating CSR was concerning and it was necessary to conduct research to provide evidence-based approaches to reduce the CSR.

Statistical analysis of DHS data enabled the demographic characteristics and variables to be analysed to establish if a

correlation with CSD existed.

## Study Setting

One of the largest government teaching hospitals in Colombo with over 1,000 beds and 2,300 staff. Annually, it treats approximately 150,000 inpatients and 75,000 outpatients. The O&G department consists of 5 consultants, 1 senior registrar, 2 registrars, 5 senior house officers, 4 medical officers, 23 midwives and nurses.

Typically, there is a senior house officer physically present on labour ward to oversee all the women going into labour and step in if any problems arise. If issues do occur, a senior registrar or consultant can be contacted for advice or asked to attend.

Uncomplicated births are managed by the midwives, with no doctor intervention. Midwives will also be present for support in births that need a doctor to intervene. The department consists of 3 wards: antenatal, postnatal and gynaecology, which totals 79 beds. There is a separate labour ward that has 9 beds. The department provides maternity care, high-risk obstetric care, gynaecological care and specialised consultant-led clinics such as colposcopy, subfertility and family planning. In SL, government institutions such as public hospitals operate from 7 am to 4 pm.

## METHODS

### Qualitative Data

Over a period of 6-weeks (5 January to 13 February 2015), 20 HCPs in the field of O&G were interviewed to obtain qualitative data. These consisted of 10 midwives and 10 doctors. To recruit HCPs, information about the number and seniority of doctors and midwives was obtained from staff records in the department office. They were then approached to see if they were interested to take part in the study. Demographic information about the HCPs was obtained to provide context when analyzing their responses. These included age, occupation and number of years in this role.

Interviews were mostly conducted during lunch periods and occasionally before work. Approximately 12 HCPs needed to be interviewed to discontinue data collection as saturation was reached.

A semi-structured questionnaire was used as the basis for the interview. The questionnaire consisted of 15 questions that included both opened and closed questions with space for elaboration.

### Quantitative Data

Quantitative analysis was performed on SLDHS data in 2006-07 to identify variables that were significantly associated with CS deliveries. This was the most recent DHS that was conducted in SL (Appendix A).

### Appendix A – DHS Definitions

The definition of an Urban Sector is any area administered by

Municipal and Urban councils. An Estate Sector consists of all plantations that are 20 acres or more in extent and with ten or more resident laborers. A Rural Sector is any area that is not urban or estate.

For Province and District analysis, information was gathered from 20 districts throughout SL. Five (5) districts in the Northern province were excluded (Jaffna, Kilinochchi, Mannar, Vavuniya and Mullativu). The other provinces included in the analyses comprised of the following districts:

1. Western province: Colombo, Gampaha, Kalutara
2. Southern province: Galle, Matara, Hambanthota
3. Sabaragamuwa province: Rathnapura, Kegalle
4. Uva province: Badulla, Moneragala
5. Central province: Kandy, Matale, Nuwara Eliya
6. Eastern province: Amapara, Batticaloa, Trincomalee
7. North-Central province: Anuradhapura, Polonnaruwa
8. North-Western province: Puttalam, Kurunegala

The survey was conducted by the Department of Census and Statistics in SL for the Ministry of Healthcare and Nutrition. The survey was designed to assess the impact of interventions made by the Ministry of Healthcare and Nutrition in improving the quality and efficiency of healthcare services in SL as a whole. The questionnaire had two main sections, namely, a household section and a section on women and children.

A total of 21,600 housing units were selected for the sample, from which 21,357 households were located, and 20,317 were occupied at the time of the survey. Of those existing households, 19,862 were successfully interviewed, yielding a household response rate of 98 percent. The number of eligible women identified from the households was 15,068 and of those, 14,692 were successfully interviewed (74%).

Detailed information was collected from all married or formerly married women aged 15-49-years and about their children, aged five-years and below at the time of the survey. Married or formerly married women are referred to as 'ever-married' in the Sierra Leone Demographic and Health Survey (SLDHS).

Analysis was carried out by examining responses from women who responded to the question on delivery by CS. The outcome for the question 'Was (NAME) delivered by a caesarean section?' was either 'Yes' or 'No'. Out of the 14,692 women interviewed in the DHS survey, 8,624 women responded to the question on CS. 6,650 (77.1%) women responded with 'No' and 1,974 (22.9%) of them responded with 'Yes'.

All data which pertained to CS was included in the analysis. Analysis was performed on the most recent birth that the woman had. Missing data consisted of women who had not responded to this question and they were excluded from analysis. A limitation of the questionnaire was that it did not separately analyse elective and emergency CS. Therefore, a distinction between the two could not be made to see if either had a greater association to CSD.

## RESULTS

### Qualitative Results

**Reasons for the Rise in Caesarean Section Rate:** To gauge the overall trend in CSR, HCPs were asked to estimate the total number of CS deliveries that occur monthly. The response for estimated number of monthly CS varied between 50-250 with an average value of 123. The overall response from HCPs indicated that over the last 10-years, CSD have increased in their opinions. Statistical data in the teaching hospital showed that between 2012 to 2014, the average number of CSD was 111 each month.

### The common reasons for the rise in CSR extracted from the interviews included:

- *'Technology, facilities and improvements have enabled antenatal complications to be diagnosed earlier. More mothers may be advised for an elective CS to avoid anticipated complications when previously, some of these complications may not have been noticed and a NVD attempted.'*<sup>14</sup>
- *'Maternal comorbidities may make a CSD more likely.'*<sup>15,16</sup> For example, obesity and hypertension.
- *'Patients may have the misperception that a VD is associated with more complications and pain.'*<sup>16</sup>
- *'Mothers with a previous CS tend to be offered a subsequent elective CS to avoid the adverse complications associated with impending uterine rupture.'*
- *'Rising rates could be due to more CS being performed in the private sector. Some patients may request for a CS since they are able to afford the extra expenses associated with CSD.'*<sup>17</sup>

Of the reasons they provided, fear of vaginal delivery and patients with a previous CS were the most consistent with the literature reviewed.

This was a thought-provoking response received from several HCPs. Since most of the literature reviewed previously was from studies conducted in the United Kingdom (UK), perhaps these technological advances were already present for a significantly longer-time but were a fairly recent introduction in SL. This may have led to more diagnoses of complicated pregnancies and recommendations of CS to avoid potential adverse consequences.

Statistical data in the teaching hospital where the HCPs were interviewed showed that between 2012 to 2014, the average number of emergency CS per month was 59. Midwives estimated the monthly average of emergency CS to be 65 whilst doctors estimated it to be lower at 44. This difference could be attributable to the different levels of involvement in emergency CS since midwives tend to take care of patients who are having a normal delivery whereas consultants would be more involved with CSD, especially the emergencies.

Hospitals in SL follow NICE guidelines.<sup>18</sup> In general, most HCPs were aware of the circumstances that necessitate an emergency CS, for example placental abruption or uterine rupture.

These reasons may not warrant an emergency CS as National Institute for Clinical Excellence (NICE) guidelines provide

alternatives to deal with these challenges before an emergency CS can be attempted. Ensuring that HCPs are familiar with the factors that necessitate an emergency CS could reduce the number of unnecessary emergency CS being recommended and performed.

Research conducted prior to the study showed an association with rises in CSR and elective CS.<sup>19,20</sup> The monthly estimate for both doctors and midwives was similar with doctors averaging 89 elective CS deliveries per month and midwives averaging 85. Data obtained from the hospital showed that the monthly average number of elective CS from 2012-2014 was 52, which is lower than the estimates by the HCPs. The majority of HCPs interviewed said that elective CSR have increased over the last decade. Perhaps this overestimation is due to the influence of the rising CSR and the perception that this rise is more prevalent than it actually is.

### In their opinions, the main reasons for the rise include:

- ‘Mothers who prefer an elective CS opt for private treatment if an elective CS is not available through the public sector where resources are limited. With more patients choosing this route, CSR have risen. Addressing the CSR in private hospitals would be an effective method to bring the overall national CSR down, especially in primigravid mothers’.
- ‘Increased recognition of foetal and maternal problems’.
- ‘Fear of vaginal delivery. Common reasons for this stems from fear of pain or damaging the baby. Reasons as to why the patient is fearful should be explored so that she can be counselled appropriately to address her concerns and worries’.
- ‘A previous CS makes subsequent CSD more likely. Research prior to the interviews showed that this was a significant issue and addressing this could greatly aid bringing down the CSR’.

With regards to a mother requesting for CS without medical indications, counselling and appropriate advice should be given to the mother to uncover their reasons, concerns and worries.

Some HCPs agreed that patient choice is important and their requests should not be ignored entirely. Unfortunately, due to the strained resources in government hospitals, mothers who request for a CS without a medical indication may not be likely to have their requests granted. This may explain the significant rise in CSR seen in private hospitals which contributes to the overall rising rates.<sup>21</sup> Strategies to deal with this could include understanding why these mothers prefer a CS and discuss the risks and benefits to make them more comfortable with the delivery and hopefully accept a NVD.

**Parties Involved in the Decision-Making Process:** All consultants showed the greatest involvement in deciding the mode of delivery (MOD) for the patient. Interestingly, medical officers and house officers showed great variability with some indicating minimal involvement whereas others saying that they were more involved. Perhaps being more in contact with the patients on the wards on a daily basis enables the medical officers to build a good relationship with them. Hence, they are more understanding and aware of the patient’s situation and needs. On the other hand,

junior medical staff may not have as much skills and expertise to make a judgement on the most appropriate MOD since they have fewer years of experience comparatively. This could lead to some patients unnecessarily being recommended a CSD.

Midwives interviewed had been working in their roles for between 5-25-years. The midwives interviewed showed different levels of involvement, with a neutral involvement overall. The midwives were mainly based in the delivery room and dealt with patients undergoing NVD. Therefore, their influence in deciding MOD may only involve patients who initially planned to have a NVD but required a CS after the onset of labour due to complications such as failure to progress or meconium-stained amniotic fluid.

Many parties are involved when making the decision of MOD. Consultants have a greater level of expertise and experience, as well as knowledge and skill in dealing with difficult or complicated deliveries. Junior doctors play an important role too. Midwife involvement was minimal as the majority of the midwives interviewed stated that MOD is most influenced by doctors.

Only one participant stated that alongside decisions made by doctors, the patients and their families might also contribute as they can voice their concerns and preferences. The entire multidisciplinary team needs to be involved to have the patient’s best interest at heart.

Majority of the HCPs stated that there is limited involvement by the women’s partners due to the lack of resources. HCP also explained that patients rarely contest their doctors’ advice. There may be greater involvement by partners in the private sector since patients are able to pay for their own treatment.

**Support and alternative options available to mothers:** To address the rising CSR, alternative strategies can be explored before a CSD is attempted. This ensures that CS are being used appropriately.

All HCPs said that counselling and antenatal clinics would be beneficial to the decision-making process when mothers request for a CS without medical indications. For example, a fear of pain could be dealt with by the availability of epidurals during labor.

Access to information gives patients more awareness about the risks and benefits of each MOD. Moreover, both antenatal clinics and counselling increase the contact of HCPs with the patient. This ensures that the patient’s progress in the pregnancy can be monitored.

In the teaching hospital, forceps or vacuum can be employed to assist the delivery of the fetus. Statistics for the teaching hospital showed that from 2012 to 2014, the average number of deliveries that used forceps was 4.7 per month while vacuum was 5.3 per month. Instrumental deliveries carry greater risks such as perineal tears to the mother or cephalhaematoma to the foetus.<sup>22,23</sup>

Specifically addressing the issue of breech deliveries,

attempting a vaginal delivery (VD) is a good strategy to avoid CS. Consultants or senior registrars have more expertise and skills to deal with these challenging deliveries. Hence, having greater senior staff involvement enables the situation to be assessed and approached more conservatively. Alternatively, external cephalic version can be attempted to rotate the fetus into the correct presentation, facilitating a NVD.<sup>24</sup>

Pain-relief options available included intramuscular pethidine injections, epidurals and oral pain-relief such as

paracetamol, tramadol or diclofenac. Pain-relief is important as it provides reprieve to patients who are fearful of labor due to the pain. If effective pain-relief is not available, some patients may be motivated to request for an elective CS.

### Quantitative Results

Before logistic regression analysis was performed, basic cross-tabulation and Chi-squared analysis was conducted on the DHS data and computed in Table 1. The total number of responses

**Table 1.** Basic Information of Variables

Variables	Total (8624)	%	Vaginal Delivery		CS Delivery		
			No.	%	No.	%	
Education Level	Before Grade I	469	6.2	369	78.7	100	21.3
	Grade I-6	3747	49.8	2763	73.7	984	26.3
	Grade 7-10	1157	15.4	950	82.1	207	17.9
	Grade 11	584	7.8	473	81.0	111	19.0
	Grade 12	396	5.3	326	82.3	70	17.7
	Grade 13	475	6.3	365	76.8	110	23.2
	Degree or above	580	7.7	437	75.3	143	24.7
	None	117	1.6	87	74.4	30	25.6
	Total	7525	100	5770	76.7	1755	23.3
Sector	Missing	1099					
	Urban	1747	20.4	1218	69.7	529	30.3
	Rural	5931	69.2	4632	78.1	1299	21.9
	Estate	898	10.5	757	84.3	141	15.7
	Total	8576	100	6607	77.0	1969	23.0
	Missing	48					
Province	Western	2302	26.8	1609	69.9	693	30.1
	Southern	1074	12.5	821	76.4	253	23.6
	Sabaragamuwa	704	8.2	539	76.6	165	23.4
	Uva	791	9.2	642	81.2	149	18.8
	Central	1269	14.8	989	77.9	280	22.1
	Eastern	1037	12.1	872	84.1	165	15.9
	North-Central	585	6.8	479	81.9	106	18.1
	North-Western	814	9.5	656	80.6	158	19.4
	Total	8576	100	6607	77.0	1969	23.0
Age	Missing	48					
	15-19	161	1.9	126	78.3	35	21.7
	20-24	839	9.9	662	78.9	177	21.1
	25-29	1538	18.2	1206	78.4	332	21.6
	30-34	1639	19.4	1258	76.8	381	23.2
	35-39	1531	18.2	1165	76.1	366	23.9
	40-45	1413	16.8	1078	76.3	335	23.7
	45-49	1314	15.6	998	76.0	316	24.0
	Total	8435	100	6493	77.0	1942	23.0
Key: No.=Number	Missing	189					

was 8624. Overall, 23.0% of women had a CSD whilst 77.0% had a VD. 'Education Level' analysis revealed the greatest CSD from the 'Grade 1-6' group (26.3%) and the lowest from the 'Grade 7-10' group. Within the 'Urban Sector', a much higher 30.3% of women had a CSD compared to lower rates of 21.9% in 'Rural' and 15.7% in 'Estate Sectors'. 'Province' analysis revealed that the 'Western' province had the highest of 30.1% women having a CSD. Colombo, the capital, is included in the 'Western' province. The 'Eastern' and 'Uva' provinces had the lowest of 15.9% and 18.8% respectively.

Univariate and multivariable analysis was performed on the DHS data and results were computed into Table 2. From 'Education Level', the 'Grade 1-6' (odds ratio (OR) 1.16, CI 0.92-1.47) and 'None' (OR 1.23, CI 0.76-2.00) groups showed the most significant association with a CSD ( $p<0.01$ ). The 'Degree or above' group had an OR of 1.13 (CI 0.84-1.52), indicating that they were also more likely to have a CSD. The OR from these 3 groups decreased when multivariable analysis was performed, indicating a less strong association with CSD.

For 'Sector' analysis, the OR for 'Urban', 'Rural' and 'Estate' was 1.00, 0.65 (CI 0.63-0.83) and 0.43 (CI 0.38-0.64)

respectively ( $p<0.01$ ). This confirms that CSD are more likely in an 'Urban Sector', followed by 'Rural' and 'Estate'.

'Province' analysis revealed the 'Western' (OR 1.00) and 'Sabaragamuwa' (OR 0.88, CI 0.71-1.10) Provinces as the most strongly associated with CSD ( $p<0.01$ ). The 'Eastern' province (OR 0.50, CI 0.40-0.62) showed the lowest odds of CSD ( $p<0.01$ ).

Variables with a significant correlation with delivery by CS were 'Sector' ( $p<0.01$ ), 'Province' ( $p<0.01$ ), and 'Education Level' ( $p<0.01$ ). 'Age' did not show a significant correlation ( $p>0.05$ ); however, 'Age' may have a clinical importance when deciding whether a CS delivery is appropriate.

## DISCUSSION AND CONCLUSION

Qualitative data showed that the CSR are rising and that it is a concern. Quantitative data analysis using statistical package for the social sciences (SPSS) showed that the 'Sector', 'Province' and 'Education Level' were significantly associated with the numbers of CSD.

DHS statistical analysis showed that 'Urban Sectors' and

**Table 2. Univariate & Multivariable Analysis of Variables**

	Univariate Analysis 95% C.I.			Multivariable Analysis 95% C.I.			Sig.	
	O.R.	Low.	Upp.	O.R.	Low.	Upp.		
Education Level	Before Grade 1	1.00		1.00			<0.01	
	Grade 1-6	1.31	1.04	1.66	1.16	0.92	1.47	0.22
	Grade 7-10	0.80	0.62	1.05	0.83	0.63	1.09	0.18
	Grade 11	0.87	0.64	1.17	0.87	0.64	1.19	0.39
	Grade 12	0.79	0.56	1.11	0.81	0.58	1.15	0.24
	Grade 13	1.11	0.82	1.51	1.07	0.78	1.46	0.67
Sector	Degree or above	1.21	0.90	1.62	1.13	0.84	1.52	0.42
	None	1.27	0.80	2.04	1.23	0.76	2.00	0.39
	Urban	1.00		1.00			<0.01	
Province	Rural	0.65	0.57	0.73	0.73	0.63	0.83	<0.01
	Estate	0.43	0.35	0.53	0.49	0.38	0.64	<0.01
	Western	1.00		1.00			<0.01	
Age	Southern	0.72	0.61	0.85	0.82	0.69	0.99	0.03
	Sabaragamuwa	0.71	0.58	0.86	0.88	0.71	1.10	0.26
	Uva	0.54	0.44	0.66	0.70	0.56	0.88	<0.01
	Central	0.66	0.56	0.77	0.82	0.68	0.98	0.03
	Eastern	0.44	0.36	0.53	0.50	0.40	0.62	<0.01
	North-Central	0.51	0.41	0.65	0.61	0.47	0.78	<0.01
	North-Western	0.56	0.46	0.68	0.68	0.55	0.84	<0.01
	15-19	1.00					0.88	
	20-24	0.96	0.64	1.45	0.86	0.55	1.33	0.48
	25-29	0.99	0.67	1.47	0.91	0.60	1.39	0.68
	30-34	1.09	0.74	1.61	0.96	0.63	1.46	0.85
	35-39	1.13	0.76	1.68	0.98	0.64	1.49	0.92
	40-45	1.12	0.75	1.66	0.96	0.63	1.46	0.85
	45-49	1.14	0.77	1.69	1.00	0.65	1.52	0.99

Key: OR=Odds Ratio; CI=Confidence Interval; Low.=Lower; Upp.=Upper; Sig.=Significance

the 'Western' province had the greatest association with CSD. 'Urban Sectors' are more likely to have better access to healthcare as well as more advanced facilities to deal with complicated pregnancies. Hence, more women who require a CS for medical indications will be able to undergo the procedure. Moreover, private hospital facilities are more prevalent in these settings, which could cater to women who want a CS despite a lack of medical indications.

'Education Level' was associated with delivery by CS. The greatest likelihood of a CS delivery was found at both extremes of education levels. At the lower end, the highest odds ratios were seen in the 'Grade 1-6' and 'None' groups. At the upper end, the 'Grade 13' and 'Degree or above' groups had the highest odds ratios as well.

From multivariable analysis, 'Education Level' and 'Sector' were shown to be independent of each other. The lower the education level, the stronger the association with a delivery CS, regardless of the sector.

It is important to address the rising CSR as CSD do have a significant morbidity associated with them. Studies have shown that there is a 5.6 times greater risk of postpartum haemorrhage following a CS compared to a vaginal delivery.<sup>24</sup> Following a CS, adhesions account for a 3.5 times increased occurrence of chronic abdominal pain compared to after a NVD. Having an elective CS also increases the risk of hospitalisation due to wound complications or infections by 2.3-3.5 times.<sup>25</sup> A study in SL ranked surgical site infections as the most debilitating postpartum complication with an estimated productivity loss of 19.3-days.<sup>26</sup> The patient's perception that CS deliveries are safer than NVD need to be clarified by providing evidence-based information on risks and benefits associated with the CS.

By avoiding a CS in patients presenting with their first pregnancy, the likelihood of CS in subsequent pregnancies is greatly reduced. Studies have shown that 76% of women with a previous CS proceed to having another CSD in subsequent pregnancies.<sup>27</sup> A third of all elective CS comprise women who have had a previous CS. Studies have also shown that the uterine scar interferes with placental implantation and prevents the placenta from moving to the upper segment as the uterus expands.<sup>28</sup> This may lead to an increased risk of placental abruption and placenta previa in subsequent pregnancies. Uterine rupture increases the risk of perinatal death, neonatal neurological impairment or a hysterectomy.<sup>29</sup> As long as there are no medical indications for a CS, encouraging the patient to opt for a NVD at their first pregnancies defines their subsequent reproductive life.

A study in SL showed that maternal request for CS without medical indications contributes to 38% of the CSR seen which significantly contributes to the rising rates.<sup>30</sup> Consequences of a CS extend throughout the woman's reproductive life, especially if the CS being requested is for her first pregnancy. Having a CS significantly increases the chance that subsequent pregnancies will require another CS.<sup>31</sup> Therefore, reasons for the request should be explored with the multidisciplinary team.

Greater support for patients is an excellent way to address the rising CSR and attempt to encourage more patients to choose a NVD. Evidence has shown that consultant obstetricians' presence and midwifery continuity of care significantly reduced the CSR and increased vaginal birth after caesarean section (VBAC) attempts.<sup>32</sup> A study in London demonstrated a lack of awareness regarding sources of information and support available. Ninety-eight percent (98%) of those interviewed stated that information concerning labour and delivery was important and should be provided.<sup>33</sup>

Finding alternative strategies to deal with difficult deliveries can also help reduce the CSR. For example, breech deliveries are often delivered *via* elective CS to reduce morbidity and mortality to the foetus and mother. However, by increasing the usage of external cephalic version (ECV), a NVD might be performed. Moreover, by training staff in vaginal breech deliveries, these patients can avoid going for a CS. A study in London showed 33.2% of attempted ECV succeeded whilst 66.8% remained non-cephalic. If ECV failed, women are more likely to have a CS. Data has shown that 71.9% of these women had an elective CS and 18.3% had an emergency CS.<sup>34</sup>

Instrumental deliveries were a strategy mentioned from the qualitative interviews to reduce CSR. This employs the use of a vacuum or forceps to assist the mother in delivering the baby. However, a study in SL demonstrated that second stage CS are rising due to failed instrumental deliveries. The overall failed instrumental delivery rate was 16% and it was mostly due to a lack of consultant presence and involvement of junior staff.<sup>35</sup> Consultants have greater experience and expertise in dealing with complicated deliveries as compared to junior medical staff. Hence, increasing consultant involvement may aid the situation. Ventouse deliveries were associated with a greater failure rate and were more likely to progress to CS compared to forceps delivery.<sup>36</sup> The complications and risks to the mother and neonate are more significant if instrumental delivery fails. Addressing this issue will help reduce the rates of second stage CS.<sup>36</sup>

A study by WHO in 2011 revealed in lower-income and middle-income countries, there is difficulty in identifying specific determinants of CSD.<sup>37</sup> However, the greatest increase in CSR was seen in less developed countries. Using the Robson classification, analysis of changes in characteristics of the obstetric populations was undertaken to evaluate trends in CSR. The study showed that one-third of the all CS were by nulliparous women and one-quarter were by women who previously had a CS. In SL, the average change in CSR per year was 2.8% between 2004-2011 indicating that the threshold for CS has decreased.<sup>38</sup>

Greater usage of CS without medical indications is potentially harmful to the mother and neonate. For example, increasing the necessity for subsequent CSD in future pregnancies. The study considers fear of litigation, morbidity related to VD and increased favourability for CSD among mothers as alternative reasons for the rise in CSR. Moreover, the rates of labour induction have greatly increased in recent years which may have a correlation with the rising CSR.<sup>39</sup>

Strategies to tackle the rising CSR in SL could focus on identifying variables that are strongly associated with CSD, such as those identified in the DHS analysis and educating patients as well as HCPs on the benefits and risks associated with CSD.<sup>40</sup>

## CONCLUSION

CSR in SL have been rising greatly over the past few decades. Conducting qualitative and quantitative analysis identified reasons and factors associated with CSD. These included residence in an Urban sector and the Western province, extremes in education level and mothers with a previous CS.

Addressing the rising CSR is pivotal, especially in SL where resources and staff are stretched. Reducing CSD will also reduce the adverse maternal and neonatal risks associated with them and positively influence future pregnancies.

## INSTITUTIONAL REVIEW BOARD PERMISSION

Not needed.

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