



Research Article

A Global Look at C-section Births: Rates and Association with Maternal Mortality

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Abstract

The maternal health communities must devote more focus to lowering maternal mortality and neonatal morbidity on a global scale. Caesarean section is one of the most globally monitored maternal health care indicators. Worldwide maternal health care services may face significant difficulties due to both overuse and underuse of CS.

Key words: Caesarean section; Too much too soon; Too little too late; Mortality; Morbidity; Worldwide

Globally, reducing maternal mortality and neonatal morbidity is in dire need of more attention from maternal health communities. In maternal health care, two extreme situations tend to occur: too much too soon (TMTS) and too little too late (TLTL) [1,2]. TMTS is defined as routine overuse of interventions during normal pregnancy and childbirth, while TLTL describes care with insufficient resources or inappropriate and late access to maternity health care [1]. Though TLTL is still an international public health problem, growth in the number of facilities that treat pregnancy and childbirth has introduced new challenges in maternity health care [3]. For instance, over medicalization of childbirth has become common practice in many facilities worldwide. Inappropriate or excessive use of interventions can increase costs and creates harmful risks to women and their babies [3]. Let's look at an example: A second gravida women named Lucy is admitted to the labour ward with no pregnancy complications. Five years ago, Lucy had a Caesarean section (CS) for malpresentation. Thus, Lucy and her health care professionals have planned a CS for this

delivery as well. Lucy's case is an example of TMTS, as repeat CSs are a notable trend worldwide.

Miller et al. (2016) [1] noted that one of the most internationally monitored maternal health care indicators is CS, and it is example of an intervention that can be either TMTS or TLTL. CS is defined as 'the birth of a foetus through a surgical incision on the abdominal wall (laparotomy) and uterine wall (hysterectomy)' [4]. For pregnant woman, Caesarean births may be associated with a sense of relief and/or failure. It is a lifesaving procedure if it is medically indicated; however, it is also associated with long- and short-term neonatal and maternal morbidity [5]. Medical indications for CS and their distributions are available in Appendix 1,2. In the 21st century, CS has become common in obstetric settings, and its global rates have increased alarmingly [6]. Countries vary in their rates of Caesarean births, as do sub-populations within countries [7]. Strom (2013) [7] noted that CS rates vary in both high- and low-income countries. However, the highest rates of CS are reported in middle-income countries, such as Egypt, where the rate of CS is about 55% [1], as seen in Figure 1.

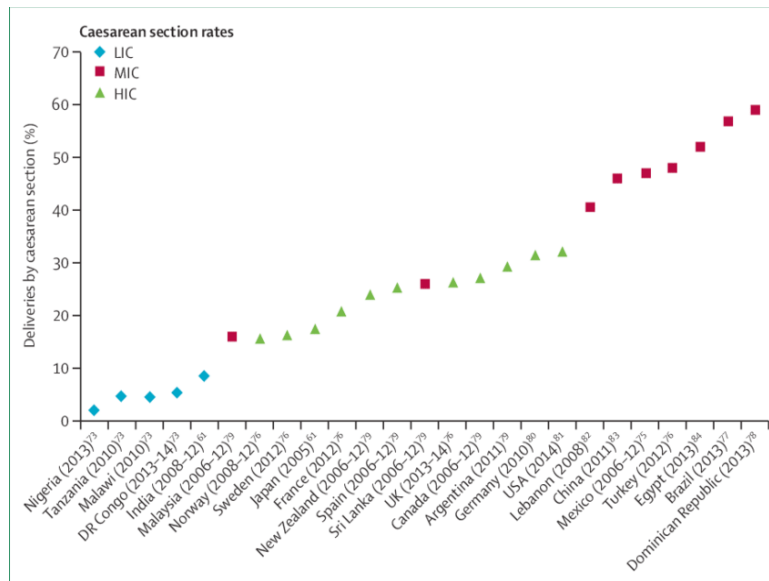


Figure 1: CS rates in high-, middle- and low-income countries (Miller et al. 2016).

Generally, in Asian countries, the rate of CS is higher than in African countries [8] (Figure 2). Saudi Arabia is the largest Asian and Muslim Arab country in the Middle East, with an estimated population of 34.14 million in 2019 [9]. It has a total fertility rate of 3.04 children per female, and 91% of women give birth in health sectors [10]. The most commonly performed procedure in these facilities is CS; its high rates have led to major concerns in the Saudi Arabian health care system in different regions, sectors and even private facilities. Kiwan and Al Qahtani (2018) [11] observed that CS rates had increased significantly, to 80.2%, from 10.6% in 1997. The northern region of Saudi Arabia has the highest CS rates, at 265%, while the lowest are reported in Royal Commission hospitals, at 32.8% [12,13] (Figures 3 and Figure 4). However, only in central Saudi Arabia has there been a large and rapid increase; in Riyadh city, for instance, it rose to 70% for various reasons, such as absence of antenatal care [6]. In the Eastern Province, in contrast, there were 6,890 Caesarean births [14]. Thus, the overall rate of CS in Saudi Arabia has exceeded the acceptable 15% rate advocated by WHO [13].

For comparison, in India, the total rate of CS ranges from 7% to 49% [15], and one hospital showed a rising trend (Appendix 2), from 20.24% to 23.27% over one year [16]. On the other hand, very low Caesarean delivery rates have been observed in African countries, especially in sub-Saharan African countries such as South Sudan, which has a CS rate of only 0.6% [15]; Kenya's CS rate is only 1% [17].

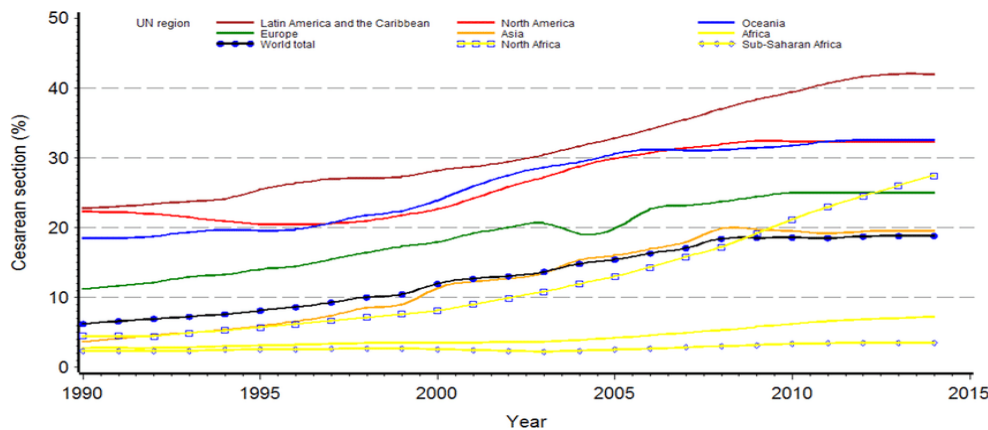


Figure 2: Global and regional trends in CS over time [29].

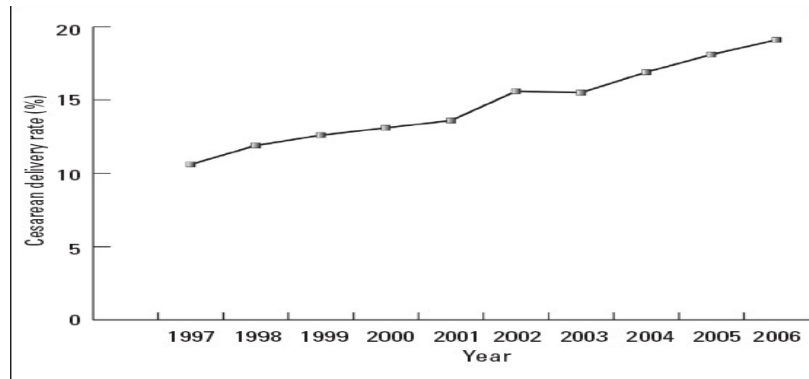


Figure 3: Trend of overall CS rate in Saudi Arabia (1997-2006) [12].

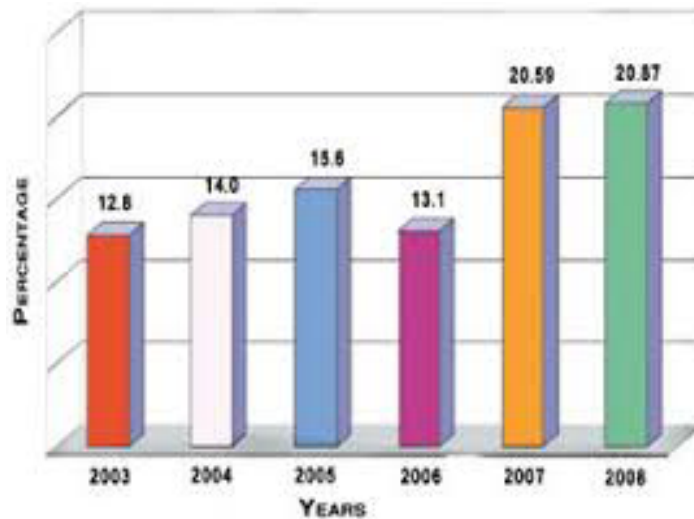


Figure 4: Trends of CS at King Fahad Armed Hospital from 2003 to 2008 (KSA) [13].

Both very high and very low rates of CS are associated with concerns about mortality and morbidity rates worldwide. The rate of maternal morbidity and mortality remains a major health care concern internationally, despite global efforts to improve maternal health outcomes [18]. Globally, approximately 300,000 women die from childbearing-related causes every day, and 99% of them are from middle- and low-income countries [2]. In Saudi Arabia, the estimated maternal mortality rate is 24 per 100,000 live births, while the neonatal mortality rate is approximately 10 per 1,000 live births [10]. The literature has indicated that, compared to vaginal birth, maternal morbidity and maternal mortality, as well as neonatal admission to an Intensive Care Unit (ICU), are higher after CS births [8,15]. According to the WHO (2019) [2], a quarter of all women who died during childbirth worldwide underwent Caesarean deliveries, mostly in low-income countries.

WHO (2015) [19] advocates a CS rate between 10% and 15%, noting that any rate higher than this is not associated with reduced neonatal and maternal mortality rates. In fact, there is an association between both unplanned and planned Caesarean deliveries and adverse maternal and neonatal outcomes, as Caesarean births increase women's risk of death significantly through complications, including bleeding, infection, anaesthetic complications, postpartum thromboembolism and placental complications [20]. On the other hand, Molina, Weiser, Lipsitz et al. (2015) [21] noted that global maternal and neonatal mortality rates did not correlate with higher rates of Caesarean delivery. Therefore, in high-resource settings where CS rates are high, maternal and newborn deaths related to CS are rare [22], as seen in Figures 5 and Figure 6.

In Saudi Arabia, the association between Caesarean births and maternal and foetal death remains unclear. However, maternal and foetal complications, such as Neonatal Intensive Care Unit (NICU) admission, are more common among those who undergo CS [6]. Furthermore, a retrospective cohort study conducted in Saudi Arabia with 4,305 women who gave birth by CS indicated that CS resulted in a death rate of 0.03% among women, while the babies' death rate from CS was 1.9 per 1,000 CS deliveries; 0.80% of infants were admitted to the NICU after CS [23]. In the Netherlands, giving birth by CS triples the likelihood of maternal death when compared to vaginal birth, at approximately 21.9 per 100,000 (0.0219%), versus 3.8 per 100,000 (0.0038%) with vaginal births [22]. Moreover, according to the WHO (2019) [2], a lack of access to CS or inappropriate use of the procedure increase maternal and neonatal death, making mortality rates 100 times higher in low-resource settings. For instance, overall, in low-income countries, the rate of stillbirths in babies born by CS is 56.6 per 1,000 Caesarean births; sub-Saharan Africa has the highest rates (82.5 per 1,000), with perinatal death at 84.7 per 1,000 Caesarean deliveries (WHO, 2019) [2].

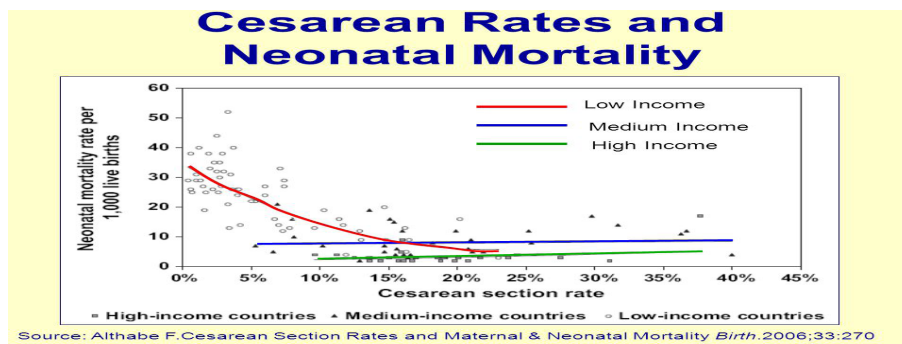


Figure 5: Rates of neonatal death by CS in low-, medium- and high-income countries [24].

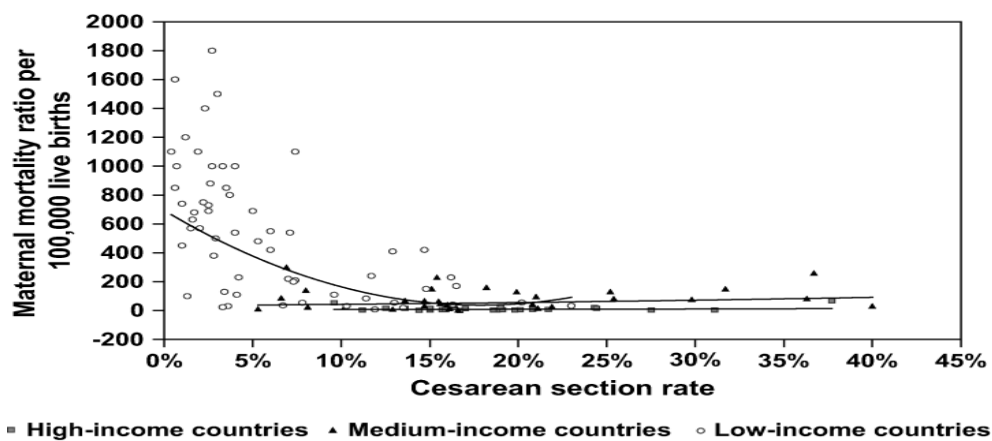


Figure 6: Maternal mortality rates by CS in low-, medium- and high-income countries [24].

Nonetheless, comprehensive emergency obstetrical care, including CS, is crucial to prevent the estimated 287,000 maternal and 2.9 million neonatal mortalities worldwide. CS today is associated with certain population characteristics and correlates with district of residence, socioeconomic status and the level of education of the woman and the household head [25]. The reasons for the increase in CS use are complex and include an increase in the acuity of women giving birth, malpractice liability, an increase in the number of women who have medical complications and scheduling convenience [20]. CS use is 5% more frequent in the richest countries than in the poorest countries, and markedly high CS use is observed in low-obstetric risk deliveries [26]. In Saudi Arabia, CS use is higher among educated women; 83% of women who delivered by CS had a high level of education [17].

Increased maternal age is significantly associated with CS in Saudi Arabia, as is high socioeconomic status [27]. CS was four times more frequent among obese women [17,27]; in Saudi Arabia, the threat to public health due to weight issues is alarming, especially because obesity is more prevalent among women [28]. Moreover, in Saudi Arabia, managing pregnant women through private practice is associated with a significant increase in CS use when compared to governmental practice [6]. Similarly, in Brazil and China, for

instance, CS is six times more frequent in private facilities than in public [26]. In Turkey, Santas and Santas (2018) [4] indicated that CS use is higher with first-time mothers, greater maternal age at childbirth, in women who have health insurance coverage, birth in the private health sectors and women who are wealthy and live in urban areas. Therefore, in high-income countries, it is not only genetic factors and medical complications that lead to greater CS use, but also social factors, including educational status, growth of the private health sector, region and wealth.

Overuse and underuse of CS can pose great challenges in maternal health care services worldwide. Overuse of CS can create harm or, at best, has no benefits. However, absence or underuse of CS can increase perinatal and maternal mortality and morbidity [29]. In Saudi Arabia, CS use is far from the rate advocated by the WHO, which could contribute to many more challenges in maternity health care. The maternal health care system in Saudi Arabia is staffed by professionals recruited from all over the world, such as the South Africa, India, the Philippines, Malaysia, the United Kingdom, the United States, Europe and other Arab countries; childbirth largely occurs in maternal hospitals, and over 97% are attended by international skilled healthcare providers, including midwives, nurses and obstetricians [10]. These professionals have different qualifications, and they may have different training backgrounds, yet they are brought in to meet the needs of the maternity care workforce [10]. Differences in background, culture, religion and beliefs have a great impact on mode of birth, and this may be a reason for Saudi Arabia's non-adherence to the WHO guidelines, resulting in more births by Caesarean. For instance, a lack of communication between women and professionals may bring more challenges in maternal health services since most health care providers are non-Arabic speakers. Furthermore, in Saudi Arabia, deciding to use CS has become easy and more acceptable, among both pregnant women and their obstetricians. Another factor contributing to this push is that many believe that a women's pelvic floor dysfunction can be attributed to vaginal birth [6].

Moreover, increasing birth rates in Saudi Arabia have created new challenges in maternity service, as multiple pregnancies could increase the need for mandatory CS [23]. High birth rates worsen crowding in public maternal hospitals, leading to a move toward private facilities. More than 20% of maternity care services have been provided by the private sector [30], which has led to more frequent use of CS.

Various other factors could force professionals to use CS as alternative to natural birth in Saudi Arabia, such as lack of exercise during pregnancy, lack of health education, absence of antenatal care visits and obesity. Indeed, 60% of Saudi pregnant women are obese, which is a risk factor for many complications that lead to CS. Moreover, lack of movement increases the likelihood of breach

presentation, leading to CS; this may be due in part to difficult weather in Saudi Arabia, especially in the capital cities of Jeddah and Riyadh (which have the highest CS rates), since temperatures reaches 50 °C in the summer [14]. Furthermore, approximately 10% of pregnant women request CS because they fear childbirth, increasing elective CS rates three to six times [31]. In Saudi Arabia, such requests have become an obsession, especially among the younger generation, to maintain beauty. Among those who request CS, 45% do so to protect their external genitalia, including the vagina, from changing and expanding during the vaginal birth process [32].

On the other side, unfortunately, CS plays an economic role, and some professionals request CS without indication to get more money, particularly in private facilities. This sometimes ends with life-threatening medical errors. A report by Alshammari (2013) [33] for the International Arabic Economic Newspaper looked at several hospitals in Riyadh city. The results indicated that, "Do you want it a CS?" was the first question posed to women by professionals; this was because of the price of each CS ranged from 10 to 15 thousand SRs, both in private and governmental hospitals. Furthermore, Jahlan, et al. [34] found that some women who gave birth by CS were dissatisfied because their rights had been violated, as they had not been given any choice. It is important to give women enough evidence-based information during birth, particularly those who request a Caesarean birth. Giving women evidence-based information enables them to trust the professionals and make informed decisions about their birth process [35]. Unfortunately, most health care providers do not adhere to NICE's guidelines for offering women an opportunity to share in the decision-making regarding mode of delivery. Considering women's voices and focusing on empowering women during childbirth is important, as women in Saudi Arabia are expected to leave all-important decisions to nurses and doctors [34].

One of WHO's key priorities is improving maternal health and reducing maternal mortality. Therefore, a worldwide effort has been implemented to improve maternal health care (WHO 2019) [2], with the aim of providing high-quality maternal health care for all women and reducing maternal death by 2030 to fewer than 70 deaths per 100,000 live births [36]. Globally, increasing rates of CSs have concerned public health care providers and feminist groups, as this creates more reasons for maternal deaths. In response, in 1980, equal pay was instituted for all types of delivery, but this only led to a temporary reduction in CS [37]. Therefore, other interventions have been implemented worldwide to reduce the rate of CS [29]. For instance, in Brazil, the Ministry of Health and state administrations signed an agreement to decrease the frequency of CS to 25%; this policy has shown a notable effect, as the proportion of Caesarean births has decreased from 32% to 23% [37]. Furthermore, another intervention (OptiBIRTH) is being

implemented across European countries to improve maternal health birth services and optimise childbearing by promoting and increasing the rate of vaginal birth after Caesarean delivery from 25% to 40% through enhanced women-centred maternity care [38]. OptiBIRTH is feasible and safe across health settings, as it focuses on both women and their partners and professionals, including obstetricians and midwives. This enhances quality of life among women in the postnatal period [39]. Furthermore, Clarke et al. (2015) [38] reported that application of this intervention (OptiBIRTH) across Europe could avoid the 160,000 unnecessary CSs that occur each year with an external annual cost of more than 150 million dollars. Looking back at Lucy's case, it is important to encourage, empower, engage and involve her in her care through evidence-based practice to reduce the likelihood of a repeated CS (Clarke et al. 2015) [38]. Furthermore, there is global investment in training health care providers, reducing the fear of litigation and eliminating financial incentives for CS, as well as increasing midwife-led care, as this is associated with safer outcomes, higher proportions of physiological births and lower health care costs [39]. WHO (2012) [40] has implemented educational programmes for staff, including obstetricians, and notes that obstetricians must take responsibility in avoiding any unnecessary CS.

Antenatal classes are essential, and studies have found that about 10% of Caesarean births could have been prevented by attending antenatal visits [41]. Moreover, it is important to provide educational sessions for women and their partners during pregnancy, as this increases their willingness to birth naturally and reduces CS use, as well as enhancing the quality of maternity care and women's satisfaction. Proper care would include, for instance, providing education about natural childbirth, preparing women with training in relaxation techniques and breathing, and offering psychoeducation to women who have tocophobia (WHO 2018) [42]. Furthermore, managers and decision makers at hospitals could play an important role in reducing unnecessary CS, so effective medical leadership is important to ensure that CS will only be used if there is an indication (Betrán et al. 2018).

In summary, CS is a lifesaving procedure when performed with indication, but there is a trend of increasing Caesarean births without indication worldwide. The highest rates were reported in middle- and high-income countries, with much variation among regions and hospitals. Non-adherence to the recommended CS rate leads to increased maternal and neonatal mortality and morbidity. Although there are many interventions and global initiatives to improve maternity care and reduce CS use, further attention, intervention and research on the reason behind the increase in CS use are needed.

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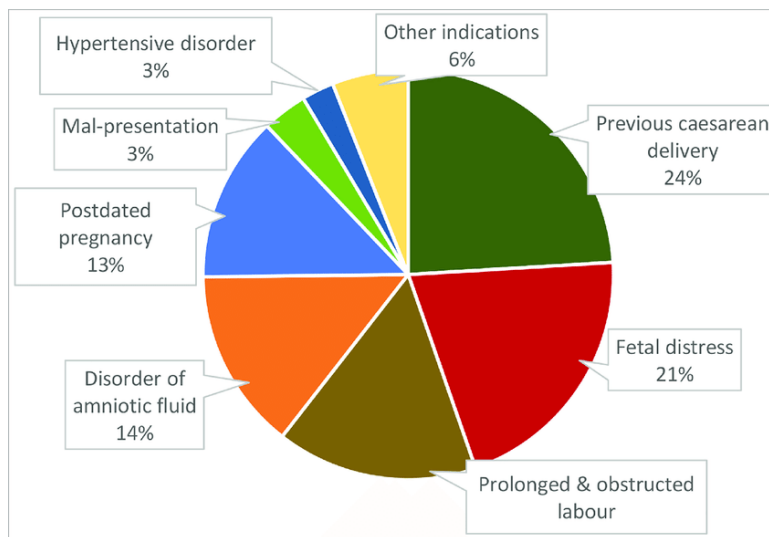
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Appendices

Absolute indications	Relative indications
Absolute disproportion	Failure to progress in labour (prolonged labour, secondary arrest)
Chorioamnionitis (amniotic infection syndrome)	Pathological cardiotocography (CTG)
Maternal pelvic deformity	Previous Caesarean section
Eclampsia and HELLP syndrome	
Foetal asphyxia or foetal acidosis	
Umbilical cord prolapse	
Placenta previa	
Abnormal lie and presentation	
Uterine rupture	

Appendix 1: Absolute and Relative Indications for CS [43].



Appendix 2: Distribution of CS indications [44].

Year	Caesarean Sections	Total Deliveries
2005	1,229 (20.24%)	6071
2006	1,416 (20.35%)	6957
2007	1,482 (21.99%)	6738
2008	1,740 (21.57%)	8066
2009	1,756 (23.27%)	7543

Appendix 3: Trends in CS, 2005-2009, in tertiary care obstetric hospital (Coastal India) [16].