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Exploring the Long-Term Effects: The Impact of Caesarean Sections on Children's Health

Dr. Saba Fadhil Abbas[1], Dr. Murtadha Yaseen Taha[2], Dr. Omar Salman Sabbar[3], and Dr. Ali Qais Abdulkafi[4]

[1]M.B.Ch.B., D.O.G. \ (Obstetrics & Gynecology), Iraqi Ministry of Health, Babylon Health Department, Imam Ali General Hospital, Babylon, Iraq

[2]M.B.Ch.B., C.A.B.P \(Pediatric) ,Ministry of Higher Education and Scientific Research, University of Basrah, College of Medicine, Almawani Teaching Hospital, Basrah, Iraq

[3]M.B.Ch.B., C.A.B.P \(Pediatric) ,Iraqi Ministry of Health, Basrah Health Directorate, Basrah Children Specialty Hospital, Basrah, Iraq

[4]M.B.Ch.B., D.C.H. \ (Pediatrics), Iraqi Ministry of Health, Kirkuk Health Department, Kirkuk Teaching Hospital, Kirkuk, Iraq

Abstract: The objective of this study was to evaluate the long-term complications associated with caesarean section deliveries in children. A cross-sectional study was conducted on 130 patients from a cohort of pregnant Iraqi women. The data was gathered from a number of different hospitals in Iraq over the course of two years, from 2023 to 2024. A questionnaire was distributed to the patients. Those who provided written consent for the publication of the research. The primary objectives of the questionnaire were to ascertain the long-term health complications affecting both the mother and the child. The results obtained from the questionnaire are as follows. The study cohort comprised 130 patients with a mean age of 28.2 ± 4.2 years and a mean body mass index (BMI) of 29.9 ± 3.1. The patients were divided into two groups: general (53.8%) and spinal (46.2%), with anesthesia ranging from general to spinal. The health outcomes of children post-Caesarean section were analyzed statistically, revealing a direct correlation between surgical procedures and neurodevelopmental disorders. Nine patients exhibited neuropsychological and cognitive development deficits, while asthma was the least prevalent problem.

Keywords: Caesarean Sections, Children's, Health, Cognitive, Complications, Anesthesia.

INTRODUCTION

Caesarean sections are a common surgical procedure universally provided for women in this geographical area. It is noteworthy that there has been no significant reduction in maternal or infant mortality rates in conjunction with an increase in the incidence of caesarean sections. The World Health Organization (WHO) has established a recommended range of 10-15% for the proportion of caesarean sections performed [Molina, G, *et al*., 2015; Thomas, S. *et al*., 2016; Shah, A, *et al*., 2009]. The primary motivations for women to undergo caesarean sections are the fear of labour pains and the simultaneous concern for the safety of the baby to be born [Villar, J, *et al*., 2006; Lumbiganon, P, *et al*., 2010]. As the prevalence of caesarean sections increases, so too does the likelihood of complications following the procedure. The global perinatal mortality rate is 19 per 1,000 live births.

[Souza, J. P, *et al*., 2010; Motomura, K, *et al*., 2017] The impact of the mode of birth on the health of boys and girls is a topic of increasing international interest, particularly the consequences of birth by caesarean section. It is beyond dispute that caesarean sections are life-saving interventions for women and newborns when there are medical reasons to justify them. However, there is cause for concern regarding the worrying scenario of an increase in caesarean sections, especially those that do not require medical indications. In our country, the rate of caesarean sections is 40.9% in public health and 69% in private health, placing us among the countries with the highest rates of caesarean section operations. [Lin, H-C. *et al*., 2004] The World Health Organization has expressed concern about the increase in caesarean section births and the potential negative consequences for maternal and child health. [Barber, E. L. *et al*., 2011]

There is evidence to suggest that in the short term, caesarean section is associated with hypothermia, impaired lung function, and changes in metabolism and blood pressure. Furthermore, there are adverse effects on health in the medium and long term. Although some studies have indicated that caesarean sections may increase the risk of asthma, type 1 diabetes, obesity, inflammatory bowel disease, juvenile arthritis, and leukaemia in children, other studies have not confirmed these associations [Johnson, C. *et al*., 2017]. This is according to a recent systematic review. A meta-analysis of randomised controlled trials and prospective cohort studies has demonstrated that children born by caesarean section exhibit an elevated risk of developing asthma up to the age of 12 years and obesity up to the age of 5 years, in

***Corresponding Author:** Dr. Saba Fadhil Abbas

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comparison to children born vaginally. A population-based cohort study conducted in Australia revealed no correlation between caesarean section and the development of asthma [Campbell, O. M. *et al*., 2006]. However, the study did indicate that infants delivered via caesarean section exhibited a heightened susceptibility to respiratory and other infections, atopic dermatitis, and metabolic disorders up to the age of five during the study follow-up period when compared to those born vaginally [Keag, O. E. *et al*., 2018].

PATIENTS AND METHOD

Contributing to providing causal evidence and providing causal estimates of the impact of medically unjustified caesarean sections on children's health, as data for all parts were collected in several different hospitals in Iraq and for a period from 2023 to 2024, where 130 patients were collected from Iraqi women, with ages ranging from 20 to 35 years.

A cross-sectional demographic study was conducted on a cohort of Iraqi women aged between 20 and 35. The objective was twofold: firstly, to determine the effects of caesarean section on the quality of life of children in the future, and secondly, to ascertain the negative effects and long-term complications on children. The study was designed using a random sampling method from multiple hospitals in Iraq. A cross-sectional study was established in accordance with this principle, whereby primary data were collected on variables such as age, height, weight, body mass index, comorbidities, type of anaesthesia used for caesarean section, and type of education.

The present study evaluated potential future complications, including adverse effects, the future weight of the child, and the Apgar score.

The Apgar score is a summary measure of a newborn's health status. It comprises five dimensions: skin colour, reflexes, respiration, pulse, and muscle strength. The overall score ranges from 1 to 10. The observed effect was minimal, amounting to a single point at the upper end of the scale. This effect does not result in further adverse health outcomes, such as the need for intensive care or assisted ventilation. This is in contrast to previous studies that simply compared caesarean sections and vaginal deliveries.

The Apgar score for caesarean sections has been observed to potentially exacerbate respiratory difficulties in the newborn by increasing the likelihood of amniotic fluid entering the lungs. Additionally, it is postulated that hormones released during childbirth in response to stress contribute to the development of the nervous system. It is hypothesised that a caesarean section alters the process of birth, resulting in babies exhibiting poorer reflexes and muscle tension at the time of birth. Conversely, it is postulated that one of the mechanisms by which caesarean sections affect the health of infants is that they are not exposed to the microbes present in the maternal vaginal canal. This has implications for the development of the immune system, which can be linked to a number of health issues, including asthma, allergies, metabolic problems, and obesity.

In this study, all data extracted from patients were subjected to statistical analysis using the IBM SOFT SPSS 22 software, in addition to Microsoft Excel 2013. This enabled the identification of the true value, the arithmetic mean, frequency, and statistical relationships, thus enabling the determination of whether the research objective was directly or inversely proportional to the stated hypothesis.

RESULTS

The table below presents the ages of the patients included in this study. The statistical analysis revealed that the true value and the arithmetic mean of the patients' ages were 28.2±4.2.

A mathematical equation was used to calculate the body mass index (BMI) based on weight and height, resulting in a mean value of 29.9 ± 3.1.

With regard to anesthesia, patients were divided into two groups. The first group underwent general anesthesia (53.8%), while the second group received spinal anesthesia (46.2%).

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Table 1: Demographic and general characteristics of the patients who responded: 130 patients

Variable	Details
Age	
Mean ±SD	28.2±4.2
BMI	
Mean ±SD	29.9±3.1
Type of surgical	
CS F (P%)	130 (100)
Type of anesthesia used	
General F (P%)	70 (53.8)
Spinal anesthesia F (P%)	60 (46.2)
QOL	
Mean ±SD	55.9±6.2
Education	
Primary	30 (23.07)
Secondary	45 (34.6)
College	29 (22.3)
High	26 (20)
Previous pregnancies	
yes	40 (30.7)
no	90 (69.23)
Comorbidities	
Diabetes type 2	41 (31.5)
Hypertension	39 (30)
Kidney disease	30 (23.07
Obesity	20 (15.3)

Table 2: Medical health outcomes related to pregnancy

Variable	Details
Weight (In Kg)	
Mean ±SD	61.14 (± 7.2)
Number of antenatal visits	
Mean ±SD	3.11 (± 1.3)
BW	
Mean ±SD	3165.4±400

From a medical perspective, a caesarean section may result in long-term complications for both the mother and the fetus. "For the mother, this is a significant surgical procedure, necessitating the administration of. Anesthesia carries inherent risks, and the mother is immobilized during the postoperative period, increasing the likelihood of venous thromboembolism." Furthermore, the mother may be at risk of severe bleeding during childbirth, which could result in the development of anemia in the longer term as a consequence of undergoing a caesarean section.

Table 3: Evaluating the outcomes of caesarean section complications in pregnant women

Variable	Details, f (p%)
Fever	4 (3.07)
Pulmonary edema	5 (3.8)
Bleeding	9 (6.9)
Anemia	6 (4.6)
Prolonging the length of stay in the hospital	20 (15.3)
Increased need for blood transfusion	4 (3.07)
Low APGAR scores	33 (25.3)

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Table 4: Health outcomes for children and knowing the type of problems experienced after a cesarean section

Variable	F (p%)	Cs (OI)	P-value
Risk of neurodevelopmental disorders	10 (7.69)	1.9 (1.4-2.8)	0.05
Cognitive development	8 (6.1)	1.2 (0.7-1.6)	0.045
Neuropsychological development	9 (6.9)	1.54 (1.23-1.982)	0.088
diabetic	6 (4.6)	1.22 (0.9-1.4)	0.0945
asthma	5 (3.8)	1.12 (0.72-1.443)	0.9585

Table 5: The final results indicate birth-related risk factors

v	Details
Low birth weight (<2.5 kg)	19 (31.5)
IVF treatment used f (p%)	4 (3.07)
Multiple births f (p%)	3 (2.3)
Head circumference of child (Z-score)[g] f with value	4 for (−0.262±1.2)
Length of baby when born (Z-score)[g] f with value	5 for (0.054±1.43)
Blood pressure medication during pregnancy f (p%)	6 (4.6)
Diabetes medication during pregnancy f (p%)	12 (9.2)
Antibiotic medication during pregnancy f (p%)	7 (5.3)
Weeks of gestation, mean (SD)	38.1 (2.2)

DISCUSSION

A caesarean section is a surgical procedure in which the abdominal wall and uterus are incised to facilitate the extraction of the fetus [Excellence, NIfHaC, 2018]. A caesarean section is a relatively common surgical procedure that can be performed with either general or epidural anesthesia (spinal anesthesia). Despite its status as a major surgical procedure, a caesarean section is considered safe for both the mother and the infant. Spinal anesthesia, also referred to as spinal anesthesia, differs from general anesthesia, which encompasses the entire body. [Grivell, R. M. *et al*., 2011] It differs from the anesthesia typically employed for most routine surgical procedures. The procedure lasts between one and a half to two hours and is administered to a woman in the event of a caesarean section for childbirth if she is diagnosed with heart disease or high blood pressure [Fuglenes, D. *et al*., 2011].

The date for a caesarean section is typically not determined until the 39th week of pregnancy. A caesarean section at the 37th week of pregnancy, or what is known as premature birth, may cause children to suffer from serious complications, including breathing disorders, low blood sugar levels, and a poor ability to maintain body temperature [Torloni, M. *et al*., 2013].

Jaundice, or the discoloration of the skin, mucous membranes, and sclerae, is a common complication of neonatal intensive care. Feeding difficulties are also a common occurrence in this population. Additionally, children may experience developmental delays, particularly in speech, up to the age of two [Masciullo, L. *et al*., 2020; Otkjær, A. *et al*., 2019].

The potential complications of a caesarean section include those related to anesthesia, hemorrhage, infections, thrombophlebitis, accidental lesions of the bladder or other abdominal organs, skin scar anomalies, respiratory distress of the newborn, and an increased risk of placental implantation defects in subsequent pregnancies.

A study [Hansen, A. *et al*., 2008; Hobbs, A. *et al*., 2016] revealed that the incidence of postpartum hemorrhage among women who underwent cesarean section was three times higher than among those who delivered vaginally. Furthermore, the mortality rate associated with cesarean sections is four times higher than that associated with vaginal delivery. However, this higher risk is due in part to the underlying conditions that require a cesarean section rather than to the procedure itself. Furthermore, it is important to consider that a cesarean section may result in increased pain, lengthen recovery time, increased reliance on medications, and change options for subsequent pregnancies.

A caesarean section, defined as a birth that occurs within the abdomen through an incision in the uterine wall, is a surgical procedure. Despite the current high level of safety, the practice inevitably entails risks to the health of the woman and her unborn child. These risks must be weighed against

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the potential dangers associated with vaginal birth in similar circumstances.

Previous studies have identified two categories of risk: those pertaining to the mother, particularly the methods of placenta implantation in subsequent pregnancies, and those affecting the infant. In terms of the mother, subsequent pregnancies carry a risk of 1-4% of placenta previa. A linear increase of up to 10% has been observed following four caesarean sections (CS). The placenta is positioned differently in the uterus prior to birth, situated in front of the cervical canal through which the fetus will emerge. Consequently, the placenta is situated in the lower portion of the uterus, partially or entirely covering the internal orifice through which the fetus is expelled. As labour commences, the placenta is separated as a result of uterine contractions, which can precipitate significant bleeding.

Furthermore, there is a 25% risk of placenta accrete, whereby the placenta abnormally sinks into the uterine wall and then incompletely detaches during transfer. This results in rebreeding, which may lead to a hemorrhage. Furthermore, it necessitates the emergency removal of the uterus. The risk of complications rises to 65% in cases where multiple CT scans have been performed, with a significant risk of maternal mortality (up to 7%). It is for this reason that irrespective of cost (CT scans are significantly more expensive than vaginal birth), our nation also advocates for vaginal birth, reserving CT scans for cases where medical indications are the primary motivation.

Tables 4 and 5 present the health outcomes of children and the types of problems they face following the caesarean section, where statistical analysis was conducted to identify the most prevalent long-term issues experienced by children. The risk of neurodevelopmental disorders was A logistic regression analysis revealed a direct correlation between the surgical procedure employed and the incidence of neurodevelopmental disorders, with an odds ratio of 1.9 (95% CI 1.4–2.5) for the Cs (OI). A negative value of -2.8 was observed for the neuropsychological development score of nine patients, with a logistic regression value of 1.54 (1.23-1.982). This was followed by a value of 1.2 (0.7-1.6) for cognitive development, also with a logistic regression. The least frequent problem was asthma, which occurred in five patients.

CONCLUSION

In this study, the risks of cesarean sections were identified on the long-term impact on children. We conclude from the absence of a strong and clear effect, that is, a direct relationship between the cesarean section and the quality of life of children. Despite the presence of complications, they were found to be minor, and this indicates its safety and that the cesarean section and its effect depend on the health factors to the mother.

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