

## Impact of Gut Dysbiosis on Child Development by Caesarean Section

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**ABSTRACT:** Caesarean delivery is an important medical procedure, and it is important to understand how this surgery may affect the balance of the child's gut microbiota. This study aims to determine the impact of gut dysbiosis on growth and development for children with Caesarean section. The research method used in this study is a literature study method with a qualitative approach, namely data collection by understanding and studying theories from various literatures related to the research. The results showed that gut dysbiosis can lead to digestive disorders, impaired nutrient absorption, and impaired physical growth. The compromised composition of the gut microbiota leads to a weakened immune system that can make children susceptible to infections and diseases, hindering their overall growth. Thus, medical and nutritionist care is needed to overcome the negative effects of gut dysbiosis in children born by caesarean section.

**Keywords-** Dysbiosis, Caesarean, Child

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### INTRODUCTION

The consequences of gut dysbiosis in infants are uncertain, including in children with caesarean sections. However, strong indirect evidence and limited confirmation of causality suggest that many acute and chronic diseases that increase over time are associated with gut dysbiosis (Underwood et al, 2020). Dysbiosis is a condition where there is an imbalance in the number of microorganisms in the human digestive tract. The main phyla of microorganisms living in the gastrointestinal tract are Firmicutes, Bacteroidetes, Actinobacteria, and Proteobacteria. Under normal conditions, colonies of microorganisms tend to be normal flora that help digest food and maintain the immune system. However, when there is a significant increase in the number of microorganism colonies, the body will begin to experience symptoms of disease. The occurrence of dysbiosis will eventually be able to cause systemic abnormalities, including interference with the process of nutrient absorption which has the potential to cause metabolic abnormalities (Kusuma et al, 2017).

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There is growing evidence that gut microbiota dysbiosis is associated with the pathogenesis of intestinal and extra-intestinal disorders. Intestinal disorders include inflammatory bowel disease, irritable bowel syndrome (IBS), and celiac disease, while extra-intestinal disorders include allergies, asthma, metabolic syndrome, cardiovascular disease, and obesity (Carding et al, 2019). Previous research conducted by (Hegar, 2017). stated that the evidence that can be concluded at this time is that disturbances in the composition of the gastrointestinal microbiota are a cause of disease and not an effect. Many factors can affect the balance of infant gastrointestinal microbiota, so intervention should be done since the fetus. The gastrointestinal tract is already equipped with microbiota that can maintain health, so we only need to take care of it.

In contrast to previous studies, the novelty of this study is to analyze the impact of gut dysbiosis on growth and development for children with cesarean section. In Indonesia, cesarean delivery is not a new thing, as evidenced by the increasing number of cesarean sections in the last 10 years in Indonesia. Based on survey data on childbirth by cesarean section method, in Indonesia the cases increased from 2002 as much as 13.7% and in 2012 as much as 23.1% (Arman, 2018). Based on the results of the Basic Health Research (RISKESDAS) of Indonesia in 2018, the prevalence of caesarean section in childbirth was 17.6%, the highest in the DKI Jakarta area (31.3%) and (6.7%) in the Papua region (Kemenkes RI, 2018).

Delivery by cesarean section is intended for certain medical indications, which are divided into indications for the mother and indications for the baby. Sectio caesarea or cesarean section should be understood as an alternative to delivery when the normal birth canal is no longer possible. The cause of delivery by cesarean section can be due to problems on the part of the mother or the baby. There are two cesarean section decisions, the first is a pre-diagnosed cesarean section decision. Causes include breech babies, some cases of placenta covered mouth, twins, late pregnancy, previous cesarean, and so on. The second is a decision taken suddenly due to the demands of emergency conditions (Mulyawati et al, 2011). However, in the modern era, there has been an increase in the use of Caesarean section not only as an emergency measure but also as a popular alternative to the normal birth process (Sungkar & Basrowi, 2020). Based on the fact that there is an increase in the number of cesarean sections, it is important to conduct various studies with various impacts that are likely to occur. Thus, this study aims to determine the impact of gut dysbiosis on growth and development for children with caesarean section.

## **RESEARCH METHODS**

The research method used in this research is the literature study method with a qualitative approach. Qualitative research aims to gain a deep understanding of human and social problems, not

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to describe the surface of reality as quantitative research does with its positivism (Fadli, 2021). Literature study is a method of collecting data by understanding and studying theories from various literatures related to the research (Adlini et al, 2022). According to Zed in (Supriyadi, 2016) in literature study research, there are at least four main characteristics that writers need to pay attention to, including: First, that the author or researcher is dealing directly with text (nash) or numerical data, not with direct knowledge from the field. Second, library data is "ready to use", meaning that researchers do not jump directly into the field because researchers are dealing directly with data sources in the library. Third, that library data is generally a secondary source, in the sense that researchers obtain material or data from second hand and not original data from the first data in the field. Fourth, that the condition of library data is not limited by time and space. Thus, the data collection in this research is by reviewing and/or exploring various journals, books, or other documents relevant to the research conducted.

## **RESULTS AND DISCUSSION**

Childbirth is the culmination of a series of pregnancy processes. Childbirth is certainly a very extraordinary thing that can happen to every woman, but many women feel confused, indecisive and worried about the pain that arises during the process of giving birth (Fajrini, 2016). Caesarean delivery is the most important operation in obstetrics, and its incidence continues to increase worldwide. It is one of the most frequently performed major operations in obstetric practice intended to save mothers and babies. In turn, reducing maternal and perinatal mortality (Hayati & Kusumawati, 2023). Sectio Caesarea is performed to prevent fetal and maternal deaths due to dangers or complications that will occur if the mother gives birth vaginally. The indications for Sectio Caesarea are broadly divided into two: from maternal factors and fetal factors (Juliathi et al, 2021).

The mode of delivery has an impact on the formation and development of gut microbiota in infants. Caesarean section can cause dysbiosis of the gut microbiota. Caesarean section affects IEC activation and immune system development through various mechanisms. Long-term gut microbiota dysbiosis will lead to some autoimmune and metabolic disorders related to caesarean section. Probiotics can correct gut microbiota dysbiosis and restore gut function, which may be related to the prevention and treatment of cesarean section-related intestinal diseases (Zhang et al, 2021). Birth by caesarean section (CS) is associated with the development of an aberrant gut microbiome and greater disease susceptibility later in life. We investigated whether orally administering maternal vaginal microbiota to CS-born infants could restore their developing gut microbiome in a single-blind randomized placebo-controlled trial (Wilson et al, 2021).

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The infant's gastrointestinal system will provide a new environment for microbial colonization. The microbiota of infants born in normal labor is similar to the microbiota in their mother's vagina in the first 20 minutes of life. The microbiota species found were *Lactobacillus* sp. and *Prevotella* sp. (Hasibuan & Kolondam, 2017). Seeding of the infant's gut microbiome by the mother may occur, but is not a direct transfer from the mother's vaginal microbial community. The impact of CS delivery on the infant's gut community is a delayed effect; this suggests that the influence of surgical delivery is not only on source bacterial diversity but also on colonization efficiency (Mitchell et al, 2020). Differences in delivery methods, namely vaginal and caesarean section, may lead to variations in the colonization of the gut microbiome. This may explain why babies born by caesarean section have a higher risk of allergies compared to babies born by vaginal delivery. This is because there are differences in the composition of protective bacteria in the two methods (Basrowi et al., 2020).

The gut microbiome plays an important role in maintaining overall health and immune function. The gut microbiota actively intervenes against viral infections to maintain the stability and balance of the mucosal site, thus ensuring its survival. On the other hand, pathogenic viruses have developed mechanisms to exploit the host microbiota to support virus spread and immune evasion. Several studies have shown that the gut microbiome has a dual role, both as a guardian and a facilitator in the context of pathogenic virus infection in the gut. Therefore, it is important to consider the complex interactions between viruses, microbiota and immune cells within the host tissue microenvironment to understand how they determine the final outcome of a disease (Fakharian, 2023).

The formation of the gut microbiota has been shown to be influenced by several factors during pregnancy, labor and the neonate period. Evidence describing caesarean delivery (CSD) as one of the most disruptive events during early life has grown in recent years, concluding that CSD results in drastic changes in microbiota formation patterns. When comparing the gut microbiota composition of CSD infants to vaginally delivered (VD) infants, CSD infants show a microbiome that is very similar to that found in the mother's environment and skin, whereas VD infants show a microbiome that is more similar to the vaginal microbiome. Although these changes in normal gut microbiota formation tend to disappear during the first months of life, they still impact health in the medium-to-long term as CSD has been associated with a higher risk of early-life infections and non-communicable diseases, such as: inflammatory diseases, allergies and metabolic diseases. In recent years, this phenomenon has also been studied in other mammals, shedding light on the mechanisms involved in the effects of CSD on host health. In addition, strategies to reverse the disruption in the gut microbiome caused by CSD are currently under development and evaluation. In this review, we discuss recent advances in CSD research, ranging from changes in gut microbiota formation to possible impacts on host health during early life and development (Covian et al, 2021). If there is an imbalance in the gut microbiota, there will be impacts, one of which is gut dysbiosis.

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Gut dysbiosis generally shows a decrease in diversity and a decrease in dominant obligate anaerobic bacteria together with an increase in subdominant facultative anaerobic bacteria or the appearance of unusual aerobic bacteria. These features have surprisingly not been discussed in the context of specific gut physiology, particularly in relation to the normal conditions of anaerobiosis encountered by bacteria in the distal gut. Microbiological observations combined with normal physiological conditions in the gut led to a hypothesis about the role of oxygen in the gut dysbiosis of IBD patients. Increased oxygen causing a disruption in anaerobiosis would provide an ecological selective advantage to facultative anaerobes or even aerobes, allowing them to become more competitive and able to overgrow. Conversely, obligate anaerobic bacteria that are sensitive to oxygen and disadvantaged by its presence will be at a disadvantage (Gois, 2013).

The relationship between microbial composition and disease predisposition is not a cause-and-effect relationship, but the microbiome is a major contributor in many disease conditions, a way that has recently gained the attention of the scientific community. It is evident that the gut microbiota is an integral part of the body's homeostatic function, often having a protective role against disease. Changes in the composition of the gut microbiota can lead to metabolic diseases such as CVD, weakening the homeostatic protective role that these microorganisms play (Lau et al, 2017).

The human gastrointestinal tract serves to digest food and absorb nutrients. It also protects against pathogenic infections as well as maintaining immune tolerance. Undigested food reaches the colon and serves as a substrate for bacterial metabolism. Carbohydrates, proteins and fats are the three main macronutrients that serve as energy sources in human nutrition; they differ greatly in terms of digestibility and, therefore, provide nutrients that are accessible to very different microbiota. The amount and type of macronutrients select for different bacterial growth and produce different metabolites, which have positive or negative effects on the intestinal epithelium and mucosal immune system. Non-digestible carbohydrates are the main type of dietary fiber and certain fiber-degrading bacteria, which produce short-chain fatty acids (SCFAs). SCFAs are generally considered beneficial to gut health under normal conditions. Undigested protein in the range of 10-30% promotes the growth of proteolytic bacteria, which produce SCFAs, branched-chain fatty acids, and several toxic metabolites, including ammonia and hydrogen sulfide (Zhang, 2022). Thus, the impact on the growth and development of children born by caesarean is that their physical growth may be stunted, resulting in lower height and weight than their peers with healthy gut microbiota.

Maintaining gut health is clearly an important key to life. A balanced microbiota (i.e. a healthy micro-ecosystem) is an indispensable ingredient in a healthy gut. Probiotics, live microorganisms that, when administered in sufficient amounts, provide good health benefits to their host (Liao & Nyachoti, 2017).

## **CONCLUSION**

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Based on the results of the study, it was found that gut dysbiosis can lead to impaired digestion, impaired nutrient absorption, and impaired physical growth in children. The compromised composition of the gut microbiota leads to a weakened immune system that can make children susceptible to infections and diseases, hindering their overall growth. Thus, it is necessary to work with medical professionals and nutritionists to overcome the negative effects of gut dysbiosis in children born by caesarean section.

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