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LEGAL REVIEW OF CHILD NUTRITION HEALTH REGARDING THE CHALLENGES OF STUNTING IMPLICATIONS IN CHILDREN WITH SPECIAL NEEDS IN RURAL AREAS THROUGH THE UTILIZATION OF ARTIFICIAL INTELLIGENCE

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Keywords

Artificial Intelligence, Child Nutrition, Children with Special Needs, Rural Areas, Stunting

ABSTRACT

Children with special needs are vulnerable in rural areas to nutrition problems, including stunting, due to limited access to health services and minimal nutrition knowledge. Article 11 of Law No. 17 of 2023 on Health emphasizes the responsibility of the Central and Local Governments to provide access to healthcare facilities and health education. In this case, the utilization of artificial intelligence (AI) can help monitor, diagnose, and intervene more effectively against stunting through accurate data analysis and timely recommendations. The objective of this study is to analyse the legal challenges related to child nutritional health, especially stunting in children with special needs in rural areas, and explore the potential of utilizing AI in addressing this issue. The research method used is normative juridical, using a statutory approach and an analytical approach. The results show that children with special needs in rural areas face various challenges in accessing health services and nutritional information. Limited access, lack of community knowledge about the importance of nutrition, and lack of effective intervention programs are the main obstacles. On the other hand, the use of AI can help in early detection and treatment of stunting through health data analysis, and provide appropriate intervention recommendations. The use of artificial intelligence has great potential in improving the effectiveness of child nutrition health programs and reducing stunting cases among children with special needs in rural areas. Collaboration between the government, health institutions, and technology is needed to implement this solution effectively and sustainably.

INTRODUCTION

Children are important in a family, so children's health is very important. Children from birth into the world are already the subject of law and should not be deprived of their rights (Amelia, 2023). Child health problems represent a significant challenge in the Indonesian health sector. The state of children's health is a reflection of the nation's overall well-being, as the younger generation possesses the potential to drive continued national advancement. Consequently, child health concerns are accorded a high priority in national development planning (Muttaqin, 2022). Maintaining health must start early. Maintaining health must start early because children's physical and mental health greatly affects their growth and development, both in social and educational terms.

Stunting represents a significant nutritional challenge globally, particularly in low-income and developing countries. Stunting is a significant public health concern due to its association with an increased risk of morbidity and mortality, suboptimal brain development, delayed motor development, and stunted growth. Stunting is defined as a form of growth faltering resulting from the accumulation of nutritional inadequacies that occur during the period from pregnancy to 24 months of age. This situation is further compounded by the absence of sufficient opportunities for catch-up growth (Mustika & Syamsul, 2018).

Stunting is the biggest health problem in Indonesia, a chronic malnutrition problem characterized by thinness and short stature. Patients with stunting are generally vulnerable to disease, have below-normal intelligence levels and low productivity. The high prevalence of stunting in the long term will result in economic losses for Indonesia (Said & Rahmah, 2024). Stunting is defined as a condition in which a child is smaller than other children of the same age due to nutritional deficiencies experienced by the fetus or infant during the first 1,000 days of life. Stunting represents one of the most prevalent forms of chronic nutritional deficiency, resulting from inadequate nutritional intake during critical developmental periods. This is typically the result of an inadequate diet that fails to meet the nutritional requirements of the body (Putri et al., 2023).

Stunting is the result of a complex interplay of factors, including inadequate nutritional care practices, a lack of maternal knowledge about health and nutrition before and during pregnancy and after childbirth. The most efficacious interventions to reduce the prevalence of stunting must be implemented during the first 1,000 days of life (HPK) of children under five. The most effective interventions have been those related to child feeding practices and maternal nutrition (Ramayulis et al., 2018). Stunting is a significant public health concern due to its association with an elevated risk of morbidity and mortality, as well as suboptimal brain development, which in turn leads to delayed motor development and impaired mental growth.

In Indonesia, stunting, a condition in which children experience impaired growth due to chronic malnutrition, has become a significant health problem, especially in rural areas. A review of data from the Ministry of Health indicates that the prevalence of stunting in Indonesia remains relatively high. This has long-term implications for children's quality of life, including reduced cognitive capacity and physical health. This condition is even more complex when stunted children also belong to the group of children with special needs, who require more attention in terms of nutritional health.

Children's nutritional health is a fundamental element in supporting optimal physical and mental growth. One nutritional health issue of serious concern in Indonesia is stunting, a condition of growth failure caused by chronic malnutrition. The impact of stunting on children impairs not only physical but also cognitive development, which can have long-lasting consequences on their quality of life in the future. Among the vulnerable groups exposed to the risk of stunting, children with special needs have particular challenges.

In the case of child nutrition problems (stunting) sometimes experienced by children with special need. Children with special needs are defined as children who are significantly different in several important dimensions of human functioning. Those who are physically, psychologically, cognitively, or socially inhibited in achieving their goals or needs and potential to the fullest. (Arkam, 2022). Meanwhile, according to Ilahi, children with special needs are those with temporary or long-term special needs, thus requiring more specialized educational services. Needs can be abnormal or congenital or due to economic, political, social problems, emotional distress, or deviant behaviour. The term "special needs" is used to describe children who have a disorder and are different from normal children in general. (Ilahi, 2013).

In rural areas, the challenges in handling stunting in children with disabilities are greater due to various factors, such as limited access to quality health services, lack of medical personnel specially trained to handle children with disabilities, and low community knowledge regarding proper nutrition. These problems require comprehensive solutions, including the support of modern technology such as artificial intelligence (AI). AI has great potential in monitoring nutritional status, analysing diets, and providing appropriate nutritional recommendations according to children's individual needs, even in areas with limited resources (Muttaqin. et al., 2023)

Artificial Intelligence (AI) is a renewable innovation that has become a global trend. The International Telecommunication Union and the World Health Organization (WHO) have collaborated to organize a workshop related to the implementation of AI in the world of health. AI is machine learning that can diagnose treatment and make health intervention decisions based on digital data.

The development of AI raises 3 potentials for AI in the field of public health, namely as a prediction of disease outbreaks, optimization of vaccine and drug manufacturing, and as international risk communication. (Davies., 2019).

Utilizing artificial intelligence in the health sector, especially in addressing stunting in children with disabilities in rural areas, opens up new opportunities for improving the effectiveness of interventions. With AI-based systems, health workers can identify potential nutrition problems early, provide more targeted interventions, and engage families and local communities in efforts to improve children's health (Utami et al., n.d.). However, legal implications arising from the use of AI technologies in healthcare must be considered, including the protection of children's personal data, legal liability in the event of misdiagnosis or recommendation, and regulations that support the safe and effective adoption of these technologies (Primasatya, 2024). Therefore, a legal review of the challenges and implications of stunting in children with special needs through the use of artificial intelligence is an urgency in itself. This is expected to be the basis for formulating policies that protect children's rights and ensure that the use of technology runs in accordance with applicable legal norms in Indonesia.

The objective of this study is to analyse the legal challenges related to child nutritional health, especially stunting in children with special needs in rural areas, and explore the potential of utilizing AI in addressing this issue. The research contribution of this study lies in its focus on the intersection of legal, health, and technological perspectives to address stunting in children with special needs, particularly in rural areas. By analyzing legal challenges surrounding child nutritional health, the study sheds light on existing gaps and barriers in the current legal framework that may hinder effective interventions. Furthermore, by exploring the potential of artificial intelligence (AI) to improve health outcomes for this vulnerable population, the research highlights innovative approaches for leveraging technology to address complex health and legal issues. This study contributes valuable insights for policymakers, healthcare providers, and legal practitioners seeking to create inclusive, technology-supported solutions for child health in underserved communities.

METHODS

The methodology employed in this study was normative juridical research, utilizing secondary data sources. The research involved a literature review and legal document analysis, focusing primarily on Law No. 17 of 2023 on Health and Presidential Regulation No. 72 of 2021 on Accelerating the Reduction of Stunting, as well as secondary legal materials, including legal doctrines, academic literature, and scientific articles. The research process began with identifying relevant regulations and legal documents, followed by the systematic collection and qualitative analysis of legal materials, examining how these relate to the legal issues under study. Data analysis was conducted qualitatively, observing and correlating data with pertinent regulations and legal principles. Data collection included library research, examining and analyzing statutory provisions related to health law, and drawing from both written and unwritten legal principles.

RESULTS

Legal Challenges Related to Child Nutrition Health, Especially Stunting in Children with Special Needs in Rural Areas

Nutritional issues constitute a significant challenge in Indonesian society, with a considerable impact on the quality of human resources (HR). Stunting is a chronic form of malnutrition that results from a prolonged deficiency in nutritional intake. It leads to growth disorders in children, manifesting as a lower or shorter height than what would be expected for their age (Nurlaela Sari et al., 2023).

Child nutritional health issues, especially stunting, are a major concern in Indonesia's health development efforts. Stunting, which is caused by chronic malnutrition from pregnancy through the first two years of a child's life, impacts not only on physical health but also on cognitive development. This condition is even more critical when experienced by children with special needs, who already have certain physical or mental limitations. For these children, appropriate nutritional interventions are essential, as they require special attention in nutrition to support optimal development.

Rules and policies regarding stunting have been outlined for a long time through Presidential Regulation Number 72 of 2021 concerning Acceleration of Stunting Reduction and are strong enough to be a basic and national reference that can be used by provincial and district / city governments to accelerate the reduction of nutrition problems. However, at that time it was felt that there was still a lack of resonance in the implementation of the program (Peraturan Presiden (Perpres) Nomor 72

Tahun 2021 Tentang Percepatan Penurunan Stunting, 2021). In formulating policies and programs, the government cannot do it alone, it must involve many actors, in order to get different perspectives, so that the least impactful solution is found. The concept of governance has shifted the role of the state, not that it is lost but requires the state to interact with other actors (Koiman, 2003).

A number of studies have demonstrated that the factors contributing to stunting include low energy intake, infectious diseases, male gender, low maternal education, lack of exclusive breastfeeding, low protein intake, low paternal education, and working mothers. Additionally, infants born to mothers with a gestational age below 20 years are at an elevated risk of having a low birth weight (Jendela, 2018). Furthermore, inadequate nutritional intake among adolescent girls who are pregnant and low rates of exclusive breastfeeding for up to six months by their mothers contribute to the prevalence of stunting. Inadequate complementary feeding (MP-ASI) also plays a role in this phenomenon (Mugianti et al., 2018). In addition, the factors that cause stunting: first, low access to food in terms of the amount and quality of nutrition that occurs since the child is in the womb; second, poor sanitation and behavior patterns that are not clean and healthy; and third, there are problems with parenting patterns applied by parents in feeding practices for infants and toddlers, as well as a lack of complete developmental stimulation in children from an early age (BKKBN OFFICIAL, 2022a). Lack of access to clean water also affects stunting (Awaludin, 2019).

In children with special needs, it is important to do early detection at the earliest level of education, especially by PAUD educators or teachers. It is necessary to distinguish between normal children and children with special needs based on their knowledge of classification and a list of behaviors that indicate the presence of child growth and development disorders and even stunting. Teachers who already have children suspected of having special needs need to make observations in schools and play environments as well as conduct interviews with caregivers to strengthen the data. The last step in early detection that teachers need to do is write a referral letter to an expert for further examination and treatment (Hamdan et al., 2021).

It is necessary to provide specific interventions so as not to cause infants to experience malnutrition, both malnutrition, malnutrition can even become stunting which has permanent consequences on cognitive and physical children, so that the most appropriate step in overcoming stunting is through prevention efforts, so one of the efforts to provide nutritional interventions for toddlers in order to prevent stunting is through animal protein-based diet education, to provide nutrition to the brain and increase height, namely animal protein which contains complete essential amino acids, is easier to digest and plays a role in preventing slowing body growth. The main things that need to be done in efforts to overcome stunting are monitoring nutritional status correctly, running a referral system and carrying out appropriate nutritional interventions (Info Sehat FK UI, 2020).

The obstacles for a child with special needs are basically not only the specificity itself, but also the right family and environment in assisting their growth and development. Because the risk of stunting in children with special needs will arise when parents do not apply proper parenting and developmental stimulation, then when the diet is poor as well as the sanitation and PHBS conditions applied daily. Stunting in children with special needs will risk adding to the obstacles and development experienced by the child (BKKBN OFFICIAL, 2022b).

Addressing stunting among children with disabilities, especially in rural areas, faces complex legal challenges. Some of the key challenges include:

1) Limited Access to Health Services: Children with special needs in rural areas often face limited access to quality health services, especially regarding growth and nutrition monitoring. Inadequate health facilities in remote areas are a barrier to providing appropriate nutrition interventions for stunted children (Firdaus et al., 2024). Health facilities in rural areas are generally limited, and access to special health programs is often difficult. Health workers also often lack specialized training in working with children with special needs, so the care provided is often inadequate (Saragih, 2020).

   The availability of medical personnel trained in handling children with stunting and adequate health facilities are the main obstacles. Although the government has issued various policies to reduce the prevalence of stunting, their implementation in rural areas is often hampered by limited resources (Mangkurat, 2024). Law No 17 of 2023 on Health states that every child has the right to optimal health services, including special services for

children with disabilities. However, in practice, the gap between policy and implementation in the field is still high.

2) Lack of specific regulations on nutrition for children with disabilities: Currently, there is no specific regulation on nutrition for children with disabilities in Indonesia (Zamjani, 2019). Although there are general policies covering child health, the specific needs of children with disabilities are not optimally accommodated in national nutrition policies. In fact, children with disabilities require different nutritional interventions compared to other children, especially in relation to higher nutritional requirements and more complex care. This lack of specific regulations creates a legal vacuum that can lead to a lack of attention to children with disabilities in national nutrition programs.
3) Social and Legal Constraints in Community Nutrition Education: Many people in rural areas are still not educated about the importance of good nutrition, especially for children with disabilities. It is a challenge for the government to ensure that correct nutrition information reaches the community. However, social barriers, such as misguided traditional beliefs or limited access to health information, often prevent the implementation of these policies in rural areas. In addition, the absence of strict sanctions for those who fail to fulfil children's nutritional rights is also an inhibiting factor (Weraman, 2024).

   In addition, the lack of health resources and access to professionals, such as nutritionists and doctors, in rural areas exacerbates this problem. Many parents do not realize that children with disabilities require special nutrition and additional health care that can help improve their child's quality of life. The low level of education and understanding of health among parents of children with disabilities in rural areas is also a major obstacle to addressing stunting and other nutritional problems in children with disabilities.
4) Inter-Agency Coordination in Handling Stunting: Another challenge is coordination between government agencies, both at the central and local levels, in handling stunting in children with disabilities. The duties and authorities of various agencies, such as the Ministry of Health, Ministry of Social Affairs and local governments, must run in synergy for the stunting response program to be effective (Mulyani et al., 2024). Unfortunately, there are often overlapping policies and a lack of coordination, which causes the designed programs to not run optimally. The need for synchronization of regulations between agencies is urgent so that the handling of stunting in children with disabilities in rural areas can be more effective.

The stunting prevention program that has been implemented in Indonesia has not been able to have an optimal impact on the prevalence of stunting in Indonesia. This is due to various obstacles found in the field. This condition is exacerbated by the lack of synchronization of regulations among various government agencies. Each agency has different guidelines and regulations, which often do not support each other. As a result, programs such as nutrition counseling or distribution of nutritious food for stunted children are often partial and not comprehensive. Better synchronization between the regulations governing stunting and nutrition for children with disabilities is needed, as well as confirmation of the roles of each agency so that they can work synergistically to provide appropriate services for children with disabilities in rural areas.

Potential Utilization of Artificial Intelligence (AI) in Overcoming Stunting in Children with Special Needs in Rural Areas

Stunting represents a significant public health concern, particularly in developing countries such as Indonesia. As indicated by data from the Ministry of Health, the prevalence of stunting in Indonesia is projected to reach approximately 24.4% by 2022, with higher rates observed in rural areas (Kementerian Kesehatan, 2021). Stunting has been demonstrated to impact not only children's physical growth but also their cognitive development and learning abilities. Children who are stunted are at an elevated risk of developing long-term health complications, including a reduction in future productivity and an increased likelihood of developing chronic illnesses.

By 2023, the prevalence of stunting in Indonesia has dropped to 21.6% from 24.4% in the previous year (Kementerian Kesehatan, 2023). This decline is a result of the government's efforts in addressing nutrition issues across the country, especially in rural areas. Stunting is a serious problem as it not only affects children's physical growth, but can also hinder their cognitive development and learning ability, potentially lowering future productivity and increasing the risk of chronic diseases.

Stunting is a significant health problem in Indonesia, especially in rural areas. To effectively improve stunting management, innovative strategies that utilize the latest technology are needed (Yusuff et al., 2024). One potential strategy is the development of an artificial intelligence (AI)-based Android application specifically designed for Rural Community Institution (RICI) cadres. This application can be an effective tool in detecting, monitoring and managing stunting cases in rural communities (Utami et al., n.d.). Stunting is a condition in which a child's physical growth is stunted due to chronic malnutrition, recurrent infections, and unfavourable environmental factors.

Children with special needs, their characteristics are often related to mental limitations in the areas of reasoning, planning, and judgment, which have an impact on adaptive adjustments, such as conceptual, social, and practical skills needed in daily life (Tasse et al., 2012), Children with special needs are also at higher risk of stunting due to their more complex nutritional and care needs. Therefore, the use of technology, especially artificial intelligence (AI), can be an innovative solution to overcome this problem. Artificial Intelligence (AI) has enormous potential in helping efforts to overcome stunting (Wahyudi, 2023), especially for children with special needs in rural areas. AI can provide technology-based solutions that are more efficient, adaptive, and scalable in addressing issues related to child nutrition (Mukhtafi et al., 2023), especially children with disabilities who require special attention. Here are some potential uses of AI in addressing stunting in children with disabilities in rural areas:

1) Monitoring and Early Detection System: One of the main challenges in overcoming stunting is late detection, especially in rural areas with minimal health facilities. AI can be used to create a nutrition monitoring system and early detection of stunting in children with disabilities through applications or medical devices equipped with sensors (Utami et al., n.d.). AI can collect data from children with disabilities, such as weight, height, diet and physical activity levels, and then analyse the data to detect early signs of stunting. With continuous monitoring, AI can provide early warnings to health workers or families if there is a risk of stunting, so that interventions can be carried out more quickly. Utilizing this AI-based system also allows the data collected to be integrated into the national health information system, so that decision-making at the policy level can be more data-driven and relevant to local conditions (Wisesa, 2023). This technology can overcome geographical constraints and lack of health workers in rural areas, while ensuring that children with disabilities get the necessary nutritional monitoring.
2) Personalized Nutrition Plan: Children with disabilities often have very specific nutritional needs depending on their medical or physical condition. For example, a child with cerebral palsy or autism may require a different diet than other children. (Riswari et al., 2022). AI can be used to develop personalized nutrition plans, according to each child's condition and needs. Using health data and nutrition information, AI algorithms can analyse a child's food intake patterns and provide optimal dietary recommendations to prevent malnutrition or stunting. In addition, AI can help identify suitable foods for children with special needs, such as allergies or intolerances to certain foods. Thus, parents and health workers in rural areas can more easily design appropriate diets, without having to conduct expensive or difficult-to-reach medical consultations.
3) Improving the Effectiveness of Nutrition Extension Programs: One of the challenges in rural areas is the lack of access to accurate information on child nutrition and health, especially for children with disabilities. AI can help provide a more effective and locally-tailored education platform. Through AI-equipped apps or chatbots, rural communities can get information on the importance of good nutrition, how to prepare nutritious meals with locally available ingredients, and how to make the most out of their food (Fitri et al., 2022) and how to handle children with special needs. AI-based educational applications can also be developed to assist local health workers in providing targeted counseling. AI can personalize counseling materials based on the demographic conditions and special needs of each region, so that the information provided is more relevant and easily understood by the local community.
4) Optimization of Food Aid Distribution and Nutrition Interventions: AI also has great potential in optimizing the distribution of food aid and nutrition interventions in hard-to-reach rural areas. Using predictive algorithms, AI can help map areas most at risk of stunting and plan food aid distribution more efficiently. AI can identify areas with the highest stunting rates in children with young children, and determine the most appropriate type of

intervention, such as supplementary feeding or nutritional supplements. In addition, AI can monitor food availability in rural areas and design optimal logistics distribution, so that food aid arrives on time and according to local needs (Aulia et al., 2024). This is particularly important in the context of areas that are hard to reach by transportation infrastructure, where manual interventions are often delayed or inefficient.

5) Training and Development of Health Workers: AI can be used to increase the capacity of health workers in rural areas through remote training and technology-based simulations (Taryudi et al., 2019). Using AI technology, health workers can gain access to the latest information on managing stunting in children with disabilities, as well as participate in interactive virtual training. AI can also be used to simulate various clinical situations that health workers may encounter in rural areas, so that they are better prepared to provide optimal services to children with disabilities. This training can be done through AI-based applications equipped with specialized educational modules on nutrition, medical interventions and managing children with disabilities. In this way, geographical constraints and limited access to in-person training can be overcome, and rural health workers can still be adequately equipped to handle cases of stunting in children with disabilities.
6) Stunting Data Prediction and Analysis: AI can also be used to predict future stunting trends based on historical data and identified patterns. By analysing the available data, AI can provide insights into areas at high risk of stunting in children with disabilities and help formulate more proactive policies. This technology can be used by the government to design more targeted and evidence-based interventions, so that stunting can be addressed in a more structured and measurable way. With AI-based predictions, the government can also assess the effectiveness of programs that have been implemented, as well as evaluate and adjust policies more quickly. (Salsabila et al., 2024). This will have a significant impact on stunting prevention efforts, especially in rural areas which have different characteristics and challenges compared to urban areas.

CONCLUSION

Legal challenges in Indonesia, particularly in addressing stunting among children with special needs in rural areas, require a more inclusive approach to policy formulation and implementation. Artificial intelligence (AI) has the potential to accelerate early detection, personalize nutrition interventions, and optimize food aid distribution. However, it requires appropriate regulatory support, investment in rural technology infrastructure, and increased digital literacy in the community. Future research should explore specific frameworks for integrating AI in public health policies to improve child nutrition, examine practical requirements and regulatory adjustments, and investigate the effectiveness of AI-based training programs for rural health workers. Additionally, evaluating case studies of AI implementation in similar public health contexts can provide comparative insights for AI policy development in Indonesia.

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