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EXPLORING THE IMPACT OF ENVIRONMENTAL FACTORS ON THE HEALTH OF CHILDREN'S BRAINS IN BANJARMASIN CITY

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ABSTRACT

Introduction: This study is motivated by concerns about child health in Banjarbaru City, specifically investigating the effects of environmental factors on toddlers' cognitive well-being. The project aims to investigate the relationship between environmental factors, such as cleanliness, access to unpolluted water and air quality, and the cognitive well-being of children in this area. This research aims to develop a basis for targeted environmental improvement initiatives and disease prevention, specifically regarding children's health. **Methods:** The research methodology involved surveying 150 individuals living in Banjarbaru City and using multiple regression analysis to uncover the relationships between variables. **Results and Discussions:** The results suggest that the cognitive well-being of children is significantly affected by family sanitation, hygiene practices, and air quality. There is a correlation between the education level of mothers, the availability of healthcare resources, and the health status of children. The use of multiple regression analysis confirms the substantial influence of environmental factors on the health of a child's brain. The research findings emphasize the complex relationship between environmental factors, lifestyle, and health history regarding the cognitive health of children in Banjarbaru City. **Conclusions:** Consequently, it is necessary to adopt a comprehensive strategy when designing public health interventions in emerging urban areas

Keywords: child brain health, environmental factors, sanitation, access to clean water, air quality.

Introduction

Exploring the relationship between children's brain health and the environment in Indonesia is still an underdeveloped area of research. While a few investigations have been conducted on the correlation between children's well-being and the environment, more research is needed to examine children's cognitive health, particularly in urban settings such as Banjarbaru. Indonesian cities, such as Banjarbaru, frequently have distinct difficulties with environmental issues and the well-being of children. The combination of rapid population increases, urbanization, and inadequate environmental policies exposes children to various health hazards resulting from hazardous settings. Conducting a thorough and concentrated study on the correlation between environmental factors and children's brain health will significantly

enhance our comprehension of child health dynamics in Indonesia. Additionally, it can facilitate the formulation of more effective policies and targeted interventions.

Prior research has emphasized the significance of environmental influences on the cognitive well-being of children, particularly in swiftly progressing metropolitan regions such as Banjarbaru. The study conducted in 2021 highlighted the significance of favorable physical and social surroundings on the motor development of young children (Derikx et al., 2021). A study by Lopuszanska and Samardakiewicz (2020) showed that exposure to air pollution and contaminated water can adversely affect children's motor function. In addition, research conducted by Orgill-Meyer and Pattanayak (2020) emphasized the significance of environmental sanitation and the availability of uncontaminated water to the cognitive well-being of children. This study investigates the correlation between environmental conditions, including sanitation, availability of clean water and air quality, and children's brain health in Banjarbaru.

This study aims to enhance our comprehension of the impact of environmental influences on children's cognitive well-being in Banjarbaru. Hence, the primary objective of this study is to not only ascertain environmental concerns that could impact the cognitive well-being of children but also to offer valuable perspectives essential for creating more efficient therapies. This research aims to establish a solid basis for implementing specific environmental enhancements and illness preventive measures, particularly in connection to children's health in Banjarbaru, by understanding the correlation between environmental elements and children's brain health.

METHOD

This study utilized a cross-sectional survey methodology in the administrative region of Banjarbaru City. The sample comprised 150 moms with kids aged 24 to 36 months. Data collection was carried out using custom-designed questionnaires that focused on demographic factors, the health status of children, environmental cleanliness, hygiene practices, exposure to harmful substances, and the surrounding environmental circumstances.

The sample selection method was random sampling from the target demographic, specifically moms with toddlers in the vicinity. Data collection was conducted using in-person interviews or online distribution of questionnaires to eligible participants. The gathered data was subsequently subjected to descriptive analysis to fully depict the environmental conditions and the cognitive well-being of youngsters in Banjarbaru City. This study employed inferential statistical analysis and descriptive analysis to investigate the correlation between environmental influences and the cognitive well-being of children. The statistical analysis methods employed may encompass linear regression testing and multiple regression analysis to ascertain the degree to which environmental influences impact the brain health of youngsters. The statistical analysis methodologies utilized will consider control variables, such as lifestyle and health history, to assure more precise outcomes.

RESULTS

The subsequent table presents the attributes of the 150 participants engaged in the investigation.

Table 1. Respondent's characteristics

No	Respondent's Characteristics	Percentage	Frequency
1	Mother's education		
	- Bachelor's degree or equivalent	20%	30
	- High School or equivalent	45%	68
	- Under high school	35%	52
2	Mother's occupation		
	- Bachelor's degree or equivalent	30%	45
	- High School or equivalent	20%	30
	- Under high school	50%	75
3	Access to health service		
	- Easy	70%	105
	- >30 minutes	20%	30

- Community Health	10%	15
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The following table, Table 2, displays the distribution of child health status as determined by the research conducted in Banjarbaru City. This dataset offers a comprehensive summary of the health status of children within the examined group.

Table 2. Child Health Status in the Study Conducted in Banjarbaru City

No	Child Health Status	Frequency	Percentage
1	Good	127	85%
2	Mild	15	10%
3	Chronic	8	5%

Table 2 displays the health status of children in the research done in Kota Banjarbaru. Among the 150 responders, most youngsters, specifically 127 (85%), reported satisfactory health. Fifteen children, including 10% of the total, encounter modest health problems, and a further eight children, accounting for 5%, suffer from chronic health ailments. These data indicate that most children in the sample have favorable health conditions, while a minority face mild and chronic health difficulties. The findings of the toddlers' motor abilities test, depending on several measurable criteria, are presented in Figure 1 below. These test results represent toddlers' level of motor abilities in completing each assessed task.

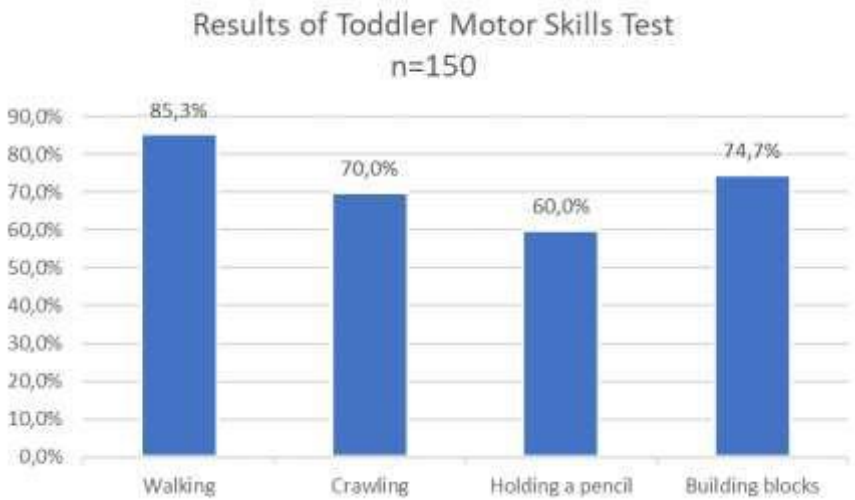


Figure 1. Graph of Distribution of Motor Tests in Toddlers

The findings of the motor test of toddlers demonstrate that most toddlers have good skills in walking, with a proportion of 85%. Despite this, the ability to crawl and wield a pencil revealed slightly poorer outcomes, with consecutive percentages of 70% and 60%. However, when it comes to building blocks, most toddlers have impressive skills, with almost 75% achieving proficiency.

Table 4 offers an overview of the respondents' environmental conditions and hygiene behaviors in Banjarbaru City. Of the 150 respondents who participated in the study, the factors observed included environmental sanitation conditions, hygiene behaviors, and environmental air quality. Table 4 provides a comprehensive overview of the percentages and frequencies associated with each variable.

Table 4. Overview of Environmental Conditions and Hygiene Practices of Respondents in Banjarbaru City

No	Variables	Compliance Percentage	Frequency & status
1	Environmental Sanitary Condition		
	In-house Access to Toilets	80%	120
	Access to Clean Water Sources	90%	135
2	Hygiene Practices		
	Washing Hands with Soap	85%	128
	Maintains Home Cleanliness	70%	105
3	Environmental Air Quality		
	PM10 (<50 µg/m ³)	80%	Good
	NO2 (<40 ppb)	75%	Good
	SO2 (<20 ppb)	85%	Good

Table 4 presents an overview of the environmental circumstances and hygiene behaviors of the participants in Banjarbaru City. 80% of the respondents reported having enough access to a toilet in their homes, whereas 90% reported having access to a clean water supply. Approximately 85% of participants adhere to a consistent practice of handwashing with soap, whereas 70% maintain regular cleanliness in their households. Concerning air quality, most participants resided in settings where the PM10, NO2, and SO2 levels were below the established safety thresholds (80%, 75%, and 85%, respectively). This dataset comprehensively analyzes the environmental conditions and prevalent hygiene habits among participants in Banjarbaru City.

A multiple regression analysis was performed to examine the impact of environmental influences on children's brain health while accounting for other variables such as lifestyle and health history. The findings demonstrated that environmental influences continued to be significant predictors of brain health, even after accounting for control variables. The findings of a multiple regression analysis, shown in Table 5, were used to assess the impact of environmental factors, lifestyle, and health history on the participants' brain health. This analysis aims to determine the degree to which these variables impact brain health and whether their influence remains statistically significant even after accounting for other variables.

Table 5. Multiple Regression Analysis for Environmental Factors, Lifestyle, and Health History of Brain Health

Variables	Regression Coefficients	<i>p</i> -Value	R ²
Environmental factors	-0.35	<0.001	0.45
Life style	0.12	0.076	0.45
Health Histories	0.08	0.212	0.45

The regression analysis table shows that environmental influences substantially influence brain health ($p < 0.001$), as indicated by a negative regression coefficient of -0.35. Consequently, there is a positive correlation between enhanced environmental circumstances and more excellent brain health. Nevertheless, the regression model indicates that lifestyle ($p = 0.076$) and health history ($p = 0.212$) do not significantly impact brain health. The R² value of 0.45 signifies that the regression model can account for 45% of the variation in respondents' brain health, considering the components used in the model.

Discussions

Banjarbaru, similar to several other emerging cities, needs help upholding a robust and unpolluted environment. The results of our study suggest that environmental factors, including environmental cleanliness and air quality, exert a substantial influence on the cognitive well-being of children in this region. While most children reside in circumstances that provide adequate access to household toilets (80%) and clean water sources

(90%), a portion of children nevertheless encounter health problems. This underscores the notion that there may be more elements that can influence youngsters' health. The findings from the analysis of respondent characteristics unveil intriguing patterns that can enhance our comprehension of the context of child health in Banjarbaru. There is a direct relationship between the mother's educational attainment and the child's health status. While without precisely establishing a cause-and-effect relationship, the findings indicate that moms with greater levels of education generally have children with improved health statuses. These results align with the research conducted by Greenaway et al. (2012), emphasizing the fact that educated mothers are more likely to have and use health information.

Furthermore, while the majority of respondents (70%) enjoy convenient access to healthcare services, a minority (20%) encounter difficulties in terms of accessibility, with a significant fraction taking more than 30 minutes to reach healthcare facilities. This underscores the infrastructure obstacles certain regions in Banjarbaru may encounter and the significance of enhancing accessibility to healthcare services. Furthermore, while most children in the sample exhibit favorable health statuses, a small percentage of youngsters now face mild (10%) and chronic (5%) problems. This underscores the significance of not solely concentrating on preventative measures but also on suitable interventions to tackle preexisting health issues. Furthermore, a significant proportion of the mothers surveyed (50%) are engaged in homemaking. This signifies that the responsibility of mothers in overseeing and tending to children's health is substantial. Hence, incorporating homemakers into child health initiatives can serve as a potent approach to enhancing child health in Banjarbaru.

Within children's brain health, the correlation between motor abilities and brain function is central to child development. The results of our study are consistent with other research that suggests a more nuanced correlation between brain health and motor skills in children (Stöckel and Hughes, 2016). The findings of our study confirm a positive association between proficient motor skills and excellent brain health in toddlers residing in Banjarbaru. According to Hapala's (2022) research, engaging in frequent motor skills exercises and physical activities can enhance children's cognitive function. Additionally, Jayasinghe's (2019) studies emphasize the significance of sensory stimulation in developing motor skills. These findings indicate that treatments promoting favorable motor skill development can positively affect their overall brain health.

Nevertheless, it is essential to acknowledge that additional variables can impact this correlation. Research conducted by Beebe (2011) indicates that insufficient sleep patterns or inadequate diet can also impact youngsters' cognitive and physical abilities. Hence, it is imperative to use a comprehensive approach that considers these factors concurrently while formulating efficacious intervention tactics. The findings highlight the intricate correlation between physical abilities and children's cognitive well-being in specific urban development settings, such as Banjarbaru. The significance of adequate sanitation extends beyond mere physical accessibility, as Andrés et al. emphasized (2021). Their research underscores the importance of individual hygiene routines and more nuanced environmental influences. The results of our study are consistent with this research, confirming that family hygiene habits, such as using soap for handwashing (85%) and keeping the household clean (70%), significantly affect child health.

Furthermore, our findings suggest that the presence of particulate matter (PM10), nitrogen dioxide (NO₂), and sulfur dioxide (SO₂) in the environment has an impact on the health of children. This finding aligns with prior research conducted by Suwanwaiphatthana et al. (2010), indicating that air pollution can contribute to various child health problems, such as respiratory ailments and skin diseases. The findings highlight the intricate connection between the physical environment and child health, underscoring the significance of a comprehensive approach to developing public health interventions in Banjarbaru.

The multiple regression analysis emphasizes the substantial impact of environmental influences on brain health. This discovery aligns with prior studies that highlight the beneficial impact of a pristine, unpolluted, and salubrious environment on the cognitive well-being of youngsters (Vella-Brodrick and Gilowska, 2022). For instance, a study conducted by Lopuszanska and Samardakiewicz (2020) suggests a connection between exposure to air pollution and an unhealthy environment and a decline in motor function in children. Nevertheless, it is crucial to remember that lifestyle variables and health history can influence brain health. While lacking substantial statistical significance in our analysis, other research has emphasized the significant influence of healthy lifestyles and health

history on children's motor development and cognitive well-being (Bukvić et al., 2021). While our findings did not demonstrate robust statistical significance for these characteristics, studying their impact on preserving children's brain health remains crucial.

Additional research is required to investigate the underlying mechanisms that connect environmental influences, lifestyle choices, personal health records, and brain health. Enhancing comprehension of these variables enables the development of more efficient therapies to enhance children's cognitive well-being, particularly in less nurturing contexts. Furthermore, longitudinal studies incorporating other assessments of these elements can offer a more profound understanding of the long-term alterations in children's brain health. These results align with the research conducted by Rauh and Margolis (2016), highlighting the significance of longitudinal methods in comprehending the influence of the environment on children's brain well-being.

Additional extensive research is expected to lead to the development of more efficient and enduring intervention strategies aimed at enhancing children's brain health and aiding in the prevention of potentially lethal brain health diseases in the future.

Conclusion

The study's result emphasizes the intricate correlation between environmental factors and the well-being of youngsters in Banjarbaru City. Statistical analysis reveals that sufficient access to sanitation, which encompasses the availability of toilets inside households and clean water sources, is crucial in promoting children's well-being. While most children have sufficient access, some are still facing health problems, highlighting the difficulties in guaranteeing the widespread availability of proper sanitation facilities in the neighborhood. Furthermore, personal hygiene habits such as using soap while washing hands and keeping the household clean have also been found to impact children's health substantially. This emphasizes the need for a comprehensive strategy to promote hygienic behavior within households. In addition, the air quality in the environment, namely the concentrations of particulate matter (PM10), nitrogen dioxide (NO₂), and sulfur dioxide (SO₂), have a substantial impact on the health of children. The data suggest that air pollution is a significant risk factor that demands greater attention in enhancing children's well-being in Banjarbaru City.

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