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Traffic Card Media with Jigsaw Method: Improving Knowledge, Attitude, and Sanitation Hygiene for Stunting Prevention

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ABSTRACT

Indonesia continues to face significant challenges in reducing stunting rates, particularly in rural areas. The primary contributing factors include a lack of parental knowledge, unsupportive lifestyle attitudes, and poor environmental sanitation. Nutrition education plays a crucial role in raising mothers' awareness of stunting. This study sought to evaluate mothers' knowledge, attitudes, and sanitation hygiene practices regarding toddlers aged 24 to 60 months while incorporating traffic card media and the jigsaw method in group discussions to strengthen these factors for effective stunting prevention. It adopts a quantitative research design with a one-group pretest-posttest approach. The study was conducted in the working area of the Wapunto Health Center from July to October 2023. A simple random sampling technique was used, involving 21 respondents. Data were analyzed using a non-parametric Wilcoxon test. The pretest and posttest average scores for each variable were as follows: knowledge (67.95 to 81.95), attitude (61.43 to 80.05), and sanitation hygiene (80.95 to 90.95), indicating an overall improvement. The p-values were < 0.05 for all variables, with knowledge and attitude each at p = 0.000 and sanitation hygiene at p = 0.002, demonstrating a significant effect of the intervention. Traffic card media proves to be an effective educational tool for increasing public awareness of stunting prevention by improving knowledge, attitudes, and sanitation hygiene practices.

Keywords: Attitudes; Jigsaw; Knowledge; Sanitation Hygiene; Stunting; Traffic Card

INTRODUCTION

Stunting is a global health issue that hinders human development, particularly in children. Currently, an estimated 162 million children under the age of five are stunted. Stunting is a condition of chronic malnutrition that occurs during a child's growth and development, beginning early in life—from pregnancy until birth (Komang et al., 2023). The primary factor contributing to stunting is inadequate nutritional intake in pregnant women, particularly Chronic Energy Deficiency (KEK), as well as insufficient nutrition during pregnancy. If left unaddressed, it is predicted that by 2025, approximately 127 million children under the age of five will be stunted (UNICEF, 2023).

The impact of stunting extends beyond physical growth, affecting cognitive development, productivity, and overall quality of life in the future. Therefore, preventing and addressing stunting is a critical priority in efforts to improve human resource quality globally, especially in developing countries such as Indonesia (Global Nutrition Report, 2020).

According to data from Rokom (2023), the prevalence of stunting in Indonesia has shown a fluctuating trend, despite national efforts to reduce it. In 2022, the prevalence of stunting in Indonesia reached 21.6%, meaning that approximately one in five children under five was stunted. This figure decreased from 24.4% in 2021 but remains above the World Health Organization (WHO) tolerance threshold of 20%. In Southeast Sulawesi Province, the prevalence of stunting in 2023 was 24.4%, surpassing the national average. One of the areas with the highest prevalence in the province is Muna District, where the rate reached 30.2% (Indah & Malik, 2024).

The determinants of stunting include feeding practices, cultural and ethnic factors, delayed initiation of breastfeeding, maternal knowledge and understanding of breastfeeding and infant nutrition, family planning practices, pregnancy spacing, vaccinations, and parental education (Aramico et al., 2020). Several factors contribute to stunting, such as limited maternal knowledge about nutrition, poor sanitation, and inadequate hygiene practices. Preventing stunting requires multi-sectoral interventions, including educational approaches aimed at improving maternal knowledge, attitudes, and behaviors related to family health management (Black et al., 2013).

Dearden et al. (2023) demonstrated that social and behavioral change communication (SBCC)-based interventions can significantly improve knowledge, attitudes, and practices (KAP) related to sanitation, nutrition, and child care, as seen in Tanzania's efforts to reduce stunting prevalence. The SBCC intervention had a positive impact on KAP related to stunting prevention. These findings underscore the importance of well-structured programs in enhancing public health and preventing stunting.

Nutrition education plays a crucial role in shaping knowledge and attitudes to increase mothers' awareness of nutrition for children under five and promote healthy dietary habits through traffic card media. The selection of this media serves as an effective learning tool for mothers, facilitating efficient and practical education. The jigsaw method, which employs a cooperative learning model or focus group discussion (FGD), is expected to enhance knowledge, attitudes, and hygiene practices related to stunting prevention. An initial survey in the Wapunto Health Center area revealed that the jigsaw method had never been utilized for stunting prevention. Additionally, the lack of proper maternal behavior in addressing stunting highlights the need for innovative educational approaches to improve knowledge, attitudes, and hygiene practices using engaging and effective methods.

This study aimed to assess the level of knowledge, attitudes, and sanitation hygiene practices among mothers with toddlers aged 24 to 60 months while utilizing traffic card media combined with the jigsaw method in group discussions to enhance these aspects for effective stunting prevention. This study holds significant value in stunting prevention efforts, particularly in the Wapunto Health Center area, by focusing on enhancing mothers' knowledge, attitudes, and hygiene practices. Stunting is a critical health issue that demands effective educational interventions, and this study presents an innovative solution through the integration of traffic card media and the jigsaw method. The novelty of this research lies in the adaptation of the jigsaw method—traditionally used in cooperative learning—to the field of health education. This approach has never been applied before in the Wapunto Health Center area, making it a groundbreaking strategy for stunting prevention. Furthermore, the combination of interactive visual media (traffic cards) with participatory methods like jigsaw fosters a more engaging and effective educational experience. This study contributes to the development of a conceptual framework on the effectiveness of traffic card media and the jigsaw method in improving mothers' knowledge, attitudes, and hygiene practices. The findings are expected to provide recommendations for health workers and policymakers in designing innovative educational interventions. Additionally, this study aligns with government initiatives to reduce stunting to 14% by 2034 through participatory and community-based educational strategies (Ministry of Communication and Digital Affairs of Indonesia, 2021).

LITERATURE REVIEW

According to Bloem, stunting is a form of growth failure (growth faltering) resulting from prolonged nutritional inadequacies that persist from pregnancy until the child reaches 24 months of age. This condition is further exacerbated when catch-up growth is insufficiently balanced, leading to long-term developmental issues (Margawati & Astuti, 2018). Children are categorized as stunted if their length or height falls below -3 standard deviations (SD) from the median of the World Health Organization (WHO) Child Growth Standards for their respective age and sex (De Onis & Branca, 2016).

Stunting, characterized by impaired growth and development in children under five due to chronic malnutrition and recurrent infections, has direct causes that can be classified into two main categories: inadequate nutrient intake and infectious diseases. The first 1,000 days of life (HPK) are a critical period in which proper nutrition plays a fundamental role in determining a child's growth trajectory. Inadequate intake of essential nutrients, such as protein, iron, zinc, and vitamin A, during pregnancy and lactation, significantly impacts fetal and infant development, leading to stunted growth.

Research by Vaivada et al. (2020) found that increased parental education serves as a strong predictor of improved child growth. Among the underlying determinants of stunting, reductions in open defecation rates, improvements in sanitation infrastructure, and increased access to key maternal health services—such as optimal antenatal care and childbirth at a health facility or with a skilled midwife—contribute significantly to better child growth outcomes. However, the degree to which these factors influence stunting rates varies substantially across different countries. At a more direct level, changes in maternal characteristics, including parity, spacing between pregnancies, and maternal height, have been linked to modest reductions in stunting prevalence.

Research conducted by Olo et al. (2021) highlights that environmental factors, particularly water and sanitation conditions, significantly influence the incidence of stunting. Poor access to clean drinking water, inadequate water treatment, improper sanitation practices, lack of latrine ownership, open defecation behaviors, and the

improper disposal of toddler feces have all been associated with an increased prevalence of stunting among young children in Indonesia.

Similarly, research by Nasution and Susilawati (2023) found that the Water, Sanitation, and Hygiene (WASH) factor plays a crucial role in stunting prevalence, particularly in coastal areas. Unsafe water sources, open defecation practices, and inadequate handwashing habits contribute to the heightened risk of stunting in these regions. Moreover, research examining maternal attitudes toward stunting prevention efforts revealed that among 56 mothers who demonstrated a positive attitude toward stunting prevention, 76.8% actively engaged in effective preventive measures. This study confirmed a significant relationship between maternal attitudes and proactive efforts to prevent stunting in toddlers (Arnita et al., 2020).

Toddlers, defined as children aged 0-59 months, experience a rapid phase of physical growth and cognitive development, requiring both sufficient quantity and high-quality nutrients to support these processes. However, due to their heightened vulnerability to malnutrition, toddlers are particularly susceptible to nutritional deficiencies if their dietary needs are not adequately met. Food consumption plays an essential role in a child's physical and cognitive development, significantly affecting their overall nutritional status. Proper nutrition is vital to ensuring optimal physical growth and intellectual development, underscoring the importance of dietary adequacy during early childhood (Ariani, 2017).

Knowledge factors encompass education, as higher education is expected to enhance human capital by increasing knowledge. Age also plays a crucial role, as it is closely linked to an individual's level of knowledge and experience. Additionally, work experience and occupation contribute significantly to knowledge acquisition, as individuals who are employed typically possess more practical knowledge and expertise compared to those who are not. Another important factor is access to information. Knowledge is not solely obtained through formal education but can also be acquired through various sources such as interactions with friends, family, and exposure to print and electronic media (Kurniati, 2022).

Research by Alkaff et al. (2022) found that increased knowledge among pregnant women, breastfeeding mothers, and mothers of children under five was accompanied by a greater willingness to adopt a clean and healthy lifestyle. Nutrition education provided by village health cadres, combined with health promotion media and hands-on demonstrations of proper handwashing techniques and healthy, balanced meal preparation, played a crucial role in enabling these women to make behavioral changes related to hygiene and health. This education also encouraged mothers of toddlers to adopt preventive behaviors against stunting. Education-based interventions using health media significantly raised awareness among mothers about the importance of environmental hygiene, including proper handwashing with soap and ensuring access to clean drinking water. Health promotion media is an effective tool for disseminating health-related messages. Additionally, interactive games are widely recognized for their ability to support optimal growth and development in children (Jatmaika, 2019).

Game-based media is particularly effective when tailored to specific target audiences, promoting group-based learning and direct participation in activities. One example of an educational game is the use of traffic cards, which serve as an engaging tool to enhance toddlers' knowledge and attitudes toward nutrition, ultimately influencing their dietary intake. Such media can be utilized as part of stunting prevention education. Interactive card games offer unique advantages by facilitating face-to-face engagement among peers, family members, and even healthcare professionals, making them a valuable resource for health education.

According to Raodah et al. (2023), one of the key strategies to prevent stunting is equipping mothers with sufficient knowledge. When mothers are well-informed, they are more likely to practice effective parenting techniques that promote optimal child growth and development. Conversely, a lack of knowledge can hinder proper childcare practices. Knowledge significantly influences behavior, and well-structured educational media can effectively improve both knowledge and attitudes. When designed thoughtfully, media interventions can successfully convey important messages and reach their intended audience.

Amador and Mederer (2013) describe the jigsaw method as a cooperative learning approach that emphasizes group collaboration by dividing participants into small teams, each responsible for different segments of the learning material. This method fosters a sense of shared responsibility and enhances engagement. Research conducted by Kusuma (2018) demonstrated that the jigsaw method is highly effective, as it encourages cooperation and teamwork among participants. Observations of respondents indicated that this approach promotes active participation and knowledge sharing within groups, making it a valuable educational tool.

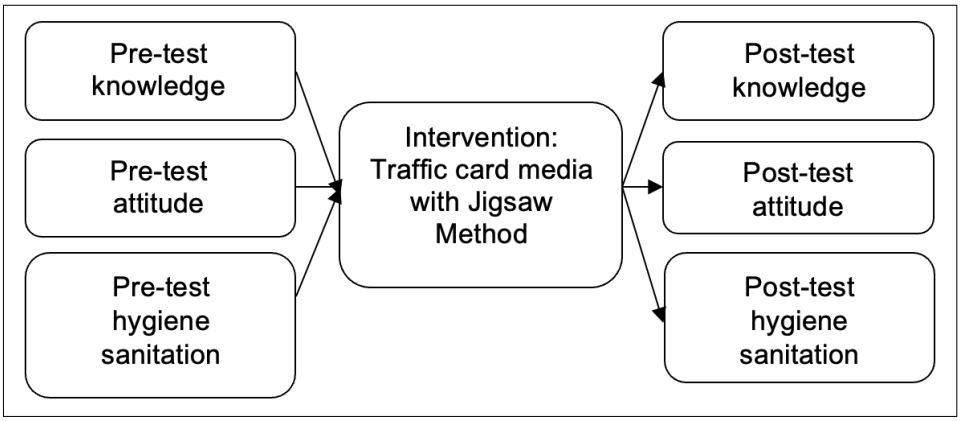
Traffic card media, when combined with the jigsaw method, presents an innovative alternative for delivering health education, particularly to mothers of toddlers. This interactive and accessible approach enhances comprehension and engagement, making health education more effective, especially in communities with a high prevalence of stunting. The findings of this research can inform policymakers in developing educational interventions that leverage interactive media to enhance public health knowledge and promote preventive behaviors. By incorporating the jigsaw method, health education initiatives can foster long-term improvements in knowledge, attitudes, and sanitation practices. Community-based health counseling programs using the jigsaw method and traffic card media can significantly improve awareness, hygiene practices, and overall sanitation, ultimately contributing to the prevention of stunting.

The formulated hypotheses in this study are as follows:

H1: Traffic card media with a jigsaw method approach can increase knowledge about preventing stunting in toddlers;
H2: Traffic card media with a jigsaw method approach can increase positive attitudes towards preventing stunting in toddlers;
H3: Traffic card media with a jigsaw method approach can improve hygiene and sanitation practices in preventing stunting in toddlers.

Based on the hypothesis proposed, the research model can be presented as follows in Figure 1.

Figure 1. Research Model



RESEARCH METHOD

This research is a quantitative study employing a one-group pre-test-post-test design, where a pre-test is conducted before the treatment and a post-test after the treatment. The study was conducted from July to October 2023. The population consisted of 74 mothers of toddlers. The sample size was determined using the Slovin formula and selected through a simple random sampling method, resulting in 21 participants. The respondents' criteria included mothers of toddlers (aged 1–5 years) who were willing to participate and resided in the Wapunto Health Center area. Before conducting the analysis, a normality test was performed. The criteria for normality were an asymptotic significance (Asymp. Sig.) value greater than 0.05 for a normal distribution and less than 0.05 for an abnormal distribution. If the data distribution was not normal or the t-test assumptions were not met, the Wilcoxon test was applied (Dahlan, 2014).

RESULTS

Table 1. Descriptive Statistics Example (N =21)

Variables	n	(%)
Mother's Age		
15-24 years	3	14.3
25-34 years	9	42.9
35-44 years	9	42.9
Work		
Housewife	21	100
Mother's Education		
Elementary School	8	38.1
Junior High School	3	14.3
Senior High School	10	47.6
College	0	0.0
Gender		
Woman	21	100
Man	0	0
Total	21	100

Source: Primary Data (2023)

The results in Table 1 showed that the majority of mothers were in the age range of 25-34 years and 35-44 years, nine people (42.9%) respectively, and only three people (14.3%) from the age group of 15-24 years. The group has all mothers who work as housewives. Most mothers have completed high school; there are 10 people (47.6%),

followed by those who have completed elementary school, and there are eight people (38.2%). Only a few mothers have completed junior high school; there are three people (14.3%), and no mothers have a college degree, indicating a low level of higher education among mothers. These data show that every respondent is a woman, indicating that the focus is on mothers.

Table 2. Characteristics of Toddlers Based on Age and Gender

Variables	n	(%)
Age		
24-36 months	16	76.2
37-60 months	5	23.8
Gender		
Man	13	61.9
Woman	8	38.1
Total	21	100

Source: Primary Data (2023)

From the data in Table 2, it can be seen that the majority of toddlers aged 37-60 months are 16 people (76.2%), indicating that this age group is more than the 24-36 month age group of 5 people (23.8%). While gender, male toddlers, numbering 13 people (61.9%), are more dominant than female toddlers, numbering eight people (38.1%).

Table 3. Distribution, Knowledge, Attitudes, and Sanitation Hygiene Before and After Being Given Traffic Card Media Using the Jigsaw Method

Variables	n	(%)	Mean	SD	Min-Max	95%CI (Lower Upper)
Pre-Test						
Knowledge						
Good	1	4.8	67.9	10.735	50-88	63.06-72.83
Enough	12	57.1				
Not enough	8	38.1				
Attitude						
Good	1	4.8	61.42	10.23	45-82	56.76-66.08
Enough	8	38.1				
Less	12	57.1				
Sanitation Hygiene						
Good	6	28.6	80.9	7.003	70-90	77.76-84.14
Enough	15	71.4				
Less	0	0.0				
Post-Test						
Knowledge						
Good	11	52.4	81.9	6.960	70-90	78.78-85.12
Enough	10	47.6				
Less	0	0.0				
Attitude						
Good	8	38.1	80.04	6.296	70-90	77.18-82.91
Enough	13	61.9				
Less	0	0.0				
Sanitation Hygiene						
Good	17	81.0	90.9	7.003	80-100	87.76-94.14
Enough	4	19.0				
Not enough	0	0.0				

Source: Primary Data (2023)

The results in Table 3 showed that pre-test knowledge in the good category was only owned by one respondent (4.8%). Most of them had sufficient knowledge (57.1%), while 38.1% had insufficient knowledge. The average knowledge score was 67.9, with a standard deviation of 10.735 (confidence interval 63.06-72.83). After the intervention, the majority of respondents had good knowledge (52.4%), and the rest (47.6%) had sufficient knowledge. The mean score increased to 81.9 with a standard deviation of 6.960 (confidence interval 78.78-85.12). In pre-test attitude variables, as many as 4.8% of respondents had a good attitude, 38.1% had a moderate attitude, and 57.1% had a poor attitude. The mean attitude score was 61.42, with a standard deviation of 10.23 (confidence interval 56.76-66.08). Good attitude increased to 38.1%, while 61.9% had moderate attitude. The mean attitude score increased to 80.04 with a standard deviation of 6.296 (confidence interval 77.18-82.91). The pre-test good sanitation hygiene variable was owned by 28.6% of respondents, and 71.4% had sufficient sanitation hygiene. The mean score was 80.9, with a standard deviation of 7.003 (confidence interval 77.76-84.14). The post-test of good sanitary hygiene increased to 81%, while 19% had sufficient sanitary hygiene. The mean score increased to 90.9 with a standard deviation of 7.003 (confidence interval 87.76-94.14).

Table 4. Normality Test Per Variable

Variables	Statistic	Shapiro-Wilk	
		Df	Sig.
Knowledge			
Pre-test	0.738	21	0.000
Pos-test	0.640	21	0.000
Attitude			
Pre-test	0.713	21	0.000
Post-test	0.620	21	0.000
Sanitation Hygiene			
Pret-est	0.570	21	0.000
Post-test	0.484	21	0.000

Source: Primary Data (2023)

The normality test in Table 4 obtained a p-value before and after being given the traffic card education jigsaw method of 0.000 each. This means that the data is not normally distributed, so the test analysis uses non-parametric with the Wilcoxon test.

Table 5. Statistical Analysis of Knowledge, Attitude, and Sanitation Hygiene Before and After Receiving the Traffic Card Media Treatment Jigsaw Approach

Methods	Variables	Wilcoxon Test	p-value
Traffic Card Jigsaw Method	Knowledge	-3626.[b]	0.000
	Attitude	-3.755[b]	0.000
	Sanitary Hygiene	-3.051[b]	0.002

Source: Primary Data (2023)

The results in Table 5 showed the Wilcoxon test on the variables of knowledge attitude of 0.000, while hygiene sanitation was 0.002. The test provisions if the p-value <0.05, then H0 is rejected and Ha is accepted. This indicates that there is a significant difference in knowledge, attitudes, and sanitary hygiene practices before and after the intervention.

DISCUSSION

The purpose of this study was to assess the level of knowledge, attitudes, and sanitation hygiene practices among mothers with toddlers aged between 24 and 60 months. The

results indicated that most respondents were in the age ranges of 25–34 years and 35–44 years. This suggests that the majority of respondents are in the active phase of childcare, during which their role is crucial in ensuring the health and hygiene of their children. Additionally, all respondents in this study were housewives, highlighting their full responsibility for managing the home environment, including maintaining hygiene and sanitation standards. Their role as primary caregivers underscores the importance of equipping them with adequate knowledge and skills to uphold proper sanitation practices.

Education also played a significant role in this study. The majority of respondents had attained education up to the senior high school level (47.6%), which may influence their understanding and awareness of the importance of hygiene maintenance. Higher education is generally associated with a better comprehension of health and hygiene, facilitating the implementation of more effective sanitation practices. These findings suggest that hygiene education should be further enhanced, particularly for mothers with secondary education, to help them develop a deeper understanding of disease prevention and incorporate effective hygiene practices into their daily routines. Mothers play a pivotal role in ensuring hygiene and sanitation at home, particularly when caring for children under five. The age and education levels of mothers are critical factors in determining the quality of sanitation practices they implement. Therefore, targeted educational interventions are necessary to enhance mothers' awareness and ability to maintain a clean home environment, ultimately contributing to the improved health of their children.

According to research conducted by Rokhaidah (2021), the average age of mothers with toddlers was 32.41 years, with the majority having a secondary education and being unemployed. The average age of toddlers was 30.39 months, with most being female and having a normal nutritional status based on height-for-age (TB/U). The results of the bivariate analysis revealed that, on average, mothers had a fairly good level of knowledge about stunting. Their attitudes and behaviors toward stunting prevention were positively correlated with employment status and age but did not show a significant correlation with education level, stringency, or age (p-value = 0.305).

Maternal education plays a crucial role in stunting incidence. Mothers with higher levels of education tend to have better access to information regarding child health and nutrition, which supports the implementation of appropriate parenting practices, including ensuring adequate nutritional intake and maintaining a clean environment. The study findings demonstrated a significant improvement in maternal knowledge following an intervention using traffic card media based on the jigsaw method. Well-informed mothers are more capable of identifying stunting characteristics, understanding its causes and long-term impacts, and taking preventive measures. The questionnaire used in this study assessed mothers' comprehension of both the short- and long-term effects of stunting, as well as its causative factors, such as chronic malnutrition during the first 1,000 days of life and exposure to an unhygienic environment. These insights emphasize the need for continuous health education efforts to enhance maternal awareness and promote effective stunting prevention strategies.

Before the intervention, only 4.8% of respondents demonstrated good knowledge. However, after implementing the traffic card media intervention using the jigsaw method, a substantial improvement was observed, with 52.4% of respondents exhibiting good knowledge. Maternal knowledge about nutrition and health plays a crucial role in influencing feeding practices. The findings indicated that mothers who possessed a strong understanding of nutrition were less likely to have stunted children, reinforcing the importance of targeted educational interventions.

Following the introduction of educational media interventions, such as traffic cards, there was a notable increase in maternal knowledge levels. The mean maternal knowledge score rose to 81.9 (SD = 6.960), with scores ranging from a minimum of 70 to a maximum of 90. This substantial improvement highlights the effectiveness of the intervention in enhancing maternal understanding, moving it into the "good" category. Statistical analysis confirmed the significance of this change, as evidenced by a p-value of 0.000 ($p < 0.05$), demonstrating that the educational media intervention had a positive and statistically significant impact on improving maternal knowledge.

Research conducted by Arnita et al. (2020) highlights that maternal attitudes have a significant influence on efforts to prevent stunting in toddlers. This finding aligns with Lawrence Green's theory, which posits that health behaviors are shaped by predisposing factors such as knowledge, attitudes, and beliefs. Positive maternal attitudes towards stunting prevention—such as exclusive breastfeeding and ensuring adequate nutrition for toddlers—are instrumental in mitigating the risk of stunting. However, the study also found that maternal knowledge alone did not have a significant relationship with stunting prevention efforts. This discrepancy may be attributed to external factors such as limited access to healthcare services or inadequate support from the surrounding environment. Even when mothers possess high levels of knowledge, the absence of a supportive healthcare system and community engagement can hinder the effectiveness of stunting prevention initiatives. Therefore, knowledge must be complemented by positive attitudes and robust support from health professionals to optimize stunting prevention efforts.

Further research by Rahmawati et al. (2020) found that maternal education and active participation in posyandu (integrated health service posts) serve as protective factors against stunting. Conversely, larger family sizes and having a third or later-born child increase the risk of stunting. Mothers with lower educational attainment are less likely to comprehend the significance of nutrition and healthcare, which in turn affects toddler growth and development. This finding reinforces the crucial role of maternal education in shaping both knowledge and attitudes toward child health. Prior studies have also established a correlation between education level and health knowledge (Notoatmodjo, 2010), further emphasizing the necessity of improving educational outreach programs for mothers.

Maternal attitudes towards stunting prevention encompass various aspects, including parenting practices, exclusive breastfeeding, and regular monitoring of child growth and development at posyandu centers. Based on questionnaire data, maternal behaviors such as bringing children to posyandu and actively participating in health counseling sessions showed marked improvements following the intervention. The results indicated a significant positive shift in attitudes, as only 4.8% of respondents demonstrated good attitudes before the intervention. However, after the intervention, this proportion increased to 38.1%. Additionally, maternal attitudes toward feeding practices and environmental hygiene were identified as critical factors influencing child nutrition. The study results showed that these attitudes significantly improved after mothers received education through the traffic card media intervention. This further underscores the strong relationship between maternal attitudes and children's nutritional status, reaffirming the need for continuous educational efforts to enhance maternal engagement in stunting prevention strategies.

Before the intervention, the mean maternal attitude score was 61.42, with a standard deviation (SD) of 10.23. The range of maternal attitude scores at this stage varied from a minimum value of 45 to a maximum value of 82. After the intervention, there was a significant increase in the mean maternal attitude score, which rose to 80.04, with a

standard deviation (SD) of 6.296. The range of scores after the intervention also shifted, with a new minimum value of 70 and a maximum value of 90. This considerable increase indicates that the educational media utilized in the intervention was highly effective in fostering positive maternal attitudes toward hygiene, nutrition, and child care. The effectiveness of the intervention was further reinforced by statistical test results, which showed a significance value (p) of 0.000 ($p < 0.05$). This confirms that there was a statistically significant difference in maternal attitudes before and after the intervention. Therefore, it can be concluded that the intervention successfully contributed to enhancing positive maternal attitudes, which is a crucial factor in sustaining improved child health outcomes.

The findings of Brillianti et al. (2022) revealed that prior to receiving educational interventions, only 22.5% of respondents had sufficient knowledge about stunting, while the majority, 77.5%, had poor knowledge. However, following an educational intervention delivered through WhatsApp, group discussions, and leaflet distribution, all respondents (100%) demonstrated a significant improvement in knowledge. This substantial increase highlights the effectiveness of interactive-based educational media, such as traffic cards, in influencing behavioral change. Research by Rokhaidah (2021) further supports the importance of innovative educational approaches in enhancing community awareness, particularly among mothers, regarding child nutrition. These findings are highly relevant to health programs aimed at reducing stunting in Indonesia and provide strong recommendations for implementing more accessible and widespread health education initiatives.

Environmental hygiene and proper sanitation play a crucial role in safeguarding children's health. To enhance mothers' awareness and practices related to hygiene and sanitation, educational interventions utilizing traffic card-based media have proven to be effective. This method significantly improved mothers' understanding of essential hygiene practices, such as regular handwashing and the use of clean drinking water. Prior to the intervention, only 28.6% of mothers adhered to good hygiene and sanitation practices. However, after the intervention, this percentage rose significantly to 81%. This positive transformation was also reflected in the mean score of sanitation hygiene practices. Before the intervention, the mean score stood at 80.9 (SD = 7.003, min = 70, max = 90), whereas post-intervention, it increased to 90.9 (SD = 7.003, min = 80, max = 100). These results indicate that the traffic card method not only raises awareness but also fosters tangible behavioral changes. The statistical analysis further validated these findings, with a significance value ($p < 0.05$) of 0.002, confirming a significant difference in sanitation hygiene practices before and after the intervention. The use of traffic cards successfully enhanced mothers' understanding of proper sanitation practices, such as washing hands before feeding children, using clean water, and maintaining a hygienic environment.

Research conducted by Prasetyo and Asfur (2021) indicates that toddlers living in areas with poor environmental sanitation are four times more likely to experience stunting than those in areas with good sanitation. Stunting can be mitigated by increasing access to clean water and sanitation facilities while maintaining overall environmental hygiene. Access to clean water plays a critical role in preventing the spread of diseases, which, in conjunction with sanitation and hygiene, significantly impacts children's nutritional and overall health status, particularly in preventing undernutrition. The findings of Maliga et al. (2022) further emphasize this connection, revealing that 60% of stunted children were female and that 40% fell within the age range of three to four years. With a significance value of <0.001, the study demonstrated a strong correlation between stunting and sanitation risk. It also found that sanitation conditions in the study area were categorized as high to very high risk, contributing substantially to the prevalence of stunting. The

study quantified the influence of sanitation on stunting, reporting that poor sanitation accounted for 60% of the risk.

Furthermore, research by Zairinayati and Purnama (2019) identified a significant relationship between sanitation factors, such as the type of latrine and water source, and the incidence of stunting. Children using flush toilets were found to have a higher risk of stunting compared to those using cleaner sanitation facilities. Additionally, households that obtained their water supply from tap water demonstrated better outcomes in stunting prevention compared to those relying on well water. Meanwhile, the study found no significant association between helminthiasis (intestinal worm infections) and stunting, suggesting that broader environmental factors, such as sanitation and access to clean water, have a greater impact on children's nutritional status.

The findings of Apriyani et al. (2023) indicated that among the study participants, 22 individuals (73%) did not experience stunting, while 21 participants (70%) had access to good sanitation. The statistical test results revealed a p-value of 0.632, suggesting that despite the observed prevalence of stunting, there was no statistically significant relationship between sanitation conditions and the incidence of stunting in children. Research conducted by Ernawati (2022) highlighted the crucial role of maternal knowledge in stunting prevention, emphasizing that increasing mothers' awareness is a key factor in addressing this nutritional issue. The study demonstrated that a combination of health promotion media is more effective in disseminating information, as it engages multiple senses, thereby enhancing information retention and comprehension. Consequently, the research advocates for the use of diverse print and electronic media to reach a broader audience and maximize the effectiveness of health messages.

Interventions utilizing educational media, such as traffic cards combined with the jigsaw method, have been proven effective in enhancing mothers' knowledge, attitudes, and sanitation hygiene practices in stunting prevention. The jigsaw method, which fosters interaction and collaboration, enhances comprehension and facilitates the exchange of information among mothers, making learning more engaging and impactful. Educational media serves as a strategic tool to elevate public health literacy by ensuring that critical health-related knowledge is more accessible and comprehensible. The results of the analysis indicate a significant positive impact of using educational media, as demonstrated by the substantial difference observed between groups that utilized these learning tools and those that did not.

The implications of this study are substantial for initiatives aimed at improving maternal knowledge, attitudes, and sanitation hygiene practices, particularly in the context of raising children under five. The intervention using traffic card media, combined with the jigsaw method, was highly effective in strengthening these three aspects. Notably, respondents were not merely passive recipients of information but actively participated in the learning process, enabling them to internalize and apply the knowledge more effectively. This underscores the potential of interactive and participatory educational approaches as powerful strategies for increasing health awareness and promoting better practices among mothers, especially those with lower levels of formal education. These findings provide valuable insights for health professionals and public health program organizers in designing more effective educational interventions, particularly in regions with similar demographic characteristics. Furthermore, enhancing maternal knowledge and attitudes regarding sanitation hygiene can yield significant benefits, including improved health outcomes for children under five, a reduction in the incidence of infectious diseases, and an overall enhancement in family well-being and quality of life.

This study integrates collaborative learning methodologies with visually engaging educational media to optimize the effectiveness of health message dissemination. Additionally, the study evaluates the practical application of this approach in a specific local setting, namely the Wapunto Health Center area, which possesses distinct socio-economic and educational characteristics. This localized evaluation provides a novel contribution to the public health literature, particularly in the realm of maternal and child health improvement through innovative and culturally relevant educational strategies.

CONCLUSION

The conclusion of this study is that the intervention using traffic card media with the jigsaw method showed significant improvement in knowledge, attitude, and sanitation hygiene practice. Before the intervention, the knowledge and attitude of mothers were in the moderate and poor categories, but after the intervention, the majority showed good knowledge and attitude. The practice of sanitary hygiene before the intervention was in the moderate category, and after the intervention, the majority showed the good category. The use of traffic card media and the jigsaw method has a significant difference in improving knowledge, attitudes, and sanitation hygiene practices. It is effective for mothers of toddlers as an effort to prevent stunting.

It is recommended that future research be conducted with a wider scope and involve additional variables, such as socio-economic influences, the role of fathers in parenting, and child health, to evaluate other factors that may affect the success of this intervention. Steps are needed to expand access to innovative educational media such as traffic cards, especially in remote areas, through collaboration with local governments and non-governmental organizations.

LIMITATION

This study focused on the implementation of traffic card media with a jigsaw method approach to improving the knowledge, attitudes, and sanitation hygiene practices of mothers of toddlers for stunting prevention. The scope of this study was limited to mothers of children under five who live in certain areas that have a high prevalence of stunting, according to the latest health data. The aspects evaluated included mothers' knowledge of parenting, understanding of environmental sanitation, and hygienic attitudes and practices related to child health. This study did not include direct intervention with children under five or long-term evaluation of intervention outcomes.

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DECLARATION OF CONFLICTING INTERESTS

The authors declare no conflict of interest relating to this study. All stages of the study were conducted independently and aimed at the development of science and improving the quality of public health. There are no affiliations with commercial parties or organizations that could influence the results of the study. The authors also ensure that all results and data reported are based on objective facts and analysis.

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