Parental Perceptions of Secondhand Smoke Exposure as a Risk Factor for Stunting in Indonesia

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ABSTRACT

Background: *Secondhand smoke exposure is increasingly recognized as a risk factor contributing to stunting; however, it remains underemphasized in stunting prevention policies in Indonesia. The KaBar BesTi (Smoke-Free and Stunting-Free Family) program was developed to address this gap. Aim: This study aimed to explore parental perceptions of secondhand smoke exposure as a risk factor for stunting among children under five using the Health Belief Model framework.*
Method: *A qualitative case study approach was conducted in Sumberan Hamlet, Candibinangun Village, within the catchment area of the Pakem Community Health Center, Sleman, Indonesia. Five parents of children under five and one nutrition officer were selected through purposive sampling. Data were collected through in-depth interviews and household observations and were analyzed thematically using the Health Belief Model constructs; including perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and cues to action.*
Result:*Participants perceived that the KaBar BesTi Program strengthened parental awareness of the risk associated with secondhand smoke exposure, particularly regarding perceived susceptibility and perceived severity in relation to stunting. Nevertheless, a gap between perception and practice persisted, as smoking behaviors remained common within family and social environments. Despite these barriers, parents reported adopting protective practices, including restricting smoking around children and participating more actively in health programs. The KaBar BesTi Program appears to contribute to strengthening parental perceptions of the risks associated with secondhand smoke exposure.*

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INTRODUCTION

Stunting is a chronic nutritional problem that adversely affects children's long-term growth and development. The World Health Organization (WHO) defines stunting as a condition in which a child's height is more than two standard deviations below the median of the WHO Child Growth Standards. Stunting results from chronic undernutrition, recurrent infections, and inadequate developmental stimulation during early childhood. It remains a major public health concern worldwide, including in Indonesia.(1) Prevention (Efforts to prevent stunting)should begin during the first 1,000 days of life—from conception to the child's second birthday—known as the "golden age", as this period is characterized by rapid growth and development. Yet, adequate nutrition must continue beyond the age of two because children under five remain vulnerable to infectious diseases and nutritional disorders.(2)

According to the 2022 Indonesian Nutrition Status Study (SSGI), the national prevalence of stunting was 21.6%, remaining above the WHO public health threshold of 20% despite a gradual decline compared with previous years.(3) The highest provincial prevalences were recorded in East Nusa Tenggara (35.3%), West Sulawesi (35.0%), and Papua (34.6%), whereas the prevalence in the Special Region of Yogyakarta (DIY) was 16.4%. Within the province of DIY, the prevalence was the highest in Gunung Kidul Regency (23.5%), followed by Kulon Progo Regency (15.8%), Sleman Regency (15.0%), Bantul Regency (4.9%), and Yogyakarta City (13.8%) (3). Sleman Regency is served by 13 community health centers. According to the 2019 Nutrition Status Monitoring (Pemantauan Status Gizi/

PSG), the three centers with the highest stunting prevalence were Minggir Community Health Center (15.8%), Pakem Community Health Center (15.3%), and Ngemplak I Community Health Center (12.5%).(4) These findings identify the Pakem Community Health Center catchment area as an appropriate relevant setting for investigating factors associated with stunting.

Stunting is influenced not only by nutrition but also by environmental factors and family health behaviors, including exposure to secondhand smoke. The Indonesian Ministry of Health has reported that children under five living with parents who smoke are at greater risk of stunting than those living with non-smoking household. Similarly, a 2018 study conducted by the Center for Social Security Studies at the University of Indonesia found that children under five living with smoking parents weighed, an overage, 1.5 kg less and had a 5.5% higher risk of stunting than those living with non-smoking parents.(5) This association may work through both biological and socioeconomic pathways. Biologically, repeated exposure to secondhand smoke increase children's susceptibility to respiratory infections, which may impair growth and nutritional status.(6) Previous studies have also identified interactions between cigarette smoke exposure and nutritional factors in the development of stunting.(7) From a socioeconomic perspective, household expenditure on cigarettes may reduce the financial resources available for nutritious foods and children's healthcare, thereby limiting household consumption of spending on nutrient-rich foods such as meat, dairy products, vegetables, and fruits.(8) Secondhand smoke (SHS) comprises smoke emitted from burning tobacco products and smoke exhaled by smokers that is inhaled by nearby individuals. The Centers for Disease Control and Prevention emphasizes that there is no safe level of SHS exposure, even minimal exposure can adversely affect health.(9)

Indonesia has one of the highest smoking prevalences globally; with 27.6% of the population which is approximately 65 million people are identified as active smokers who consume an estimated 225 billion cigarettes annually.(10) Consequently, the risk of household SHS exposure remains substantial. According to the 2018 Basic Health Research, 59.91% of individuals aged ≥10 years in the Special Region of Yogyakarta reported smoking inside buildings or enclosed spaces with the proportion increasing to 62.21% in Sleman Regency.(11) Children are particularly vulnerable because their respiratory systems are still developing and they breathe more rapidly than adults.(12) A 2019 study conducted by the Sleman District Health Office in collaboration with the Yogyakarta Health Polytechnic found that 65.6% of children with stunting lived in families with members who smoked.(4) More recent local data further underscore this concern as of October 2023, Pakem Community Health Center recorded 175 stunted children across five villages in Pakem Subdistrict, including 35 in Candibinangun Village and two in Sumberan Hamlet. Among the cases identified in Candibinangun Village, 18 stunted children lived in households with family members who smoked, indicating that households SHS exposure remains an important local public health concern.

Recent interventions in other countries suggest that household-based strategies can reduce children's exposure to SHS. In the United States, a 2022 intervention involving real-time indoor air quality feedback in 298 households increased the likelihood that particulate matter concentration in children's bedrooms remained below the WHO guideline and that households established and maintained smoke-free homes.(13) Similarly, a 2024 randomized controlled trial in Thailand demonstrated that tailored educational brochures and telephone counseling at two and eight weeks increased maternal efforts to reduce children's SHS exposure and encourage household smokers to avoid smoking near children at the 16-week follow-up.(14) Collectively, these findings suggest that family engagement, behavioral support, and personalized feedback can promote smoke-free home practices.

In response to the high prevalence of smoking and stunting in the study area, the Keluarga Bebas Asap Rokok dan Bebas Stunting (KaBar BesTi; Smoke-Free and Stunting-Free Family) program was developed as a community-based health promotion and prevention initiative. The program aims to reduce tobacco use among parents of children under five while supporting stunting prevention through family-centered behavior change. It encourages families to redirect household expenditure from cigarettes toward child nutrition, save money previously spent on cigarettes, avoid smoking inside the home or near children, dispose of cigarette butts responsibly.(15) Understanding parents' perceptions of the relationship between SHS exposure and stunting is therefore essential for evaluating the program's potential to promote protective health behaviors.

Previous studies have investigated different aspects of this issue. A 2021 study conducted in Malaysia examined parental perceptions and preventive measures related to children's secondhand smoke exposure but did not evaluate these perceptions within an integrated stunting prevention program.(16) In line with the previous research, a 2023 Indonesian study quantitatively examined the association between family smoking behavior and stunting among 221 households with children aged 0–59 months but

did not explore parents' experiences or responses of a community-based intervention integrating tobacco control and stunting prevention (to clarify what focus is discussed in the research).(17) Consequently, evidence remains limited regarding how integrated community-based interventions addressing both secondhand smoke exposure and stunting prevention (influence) parental perceptions and protective behaviors. The novelty of this studies lies on its qualitative as this study addresses the gap of researches by qualitatively exploring parents' perceptions and protective behaviors within the KaBar BesTi program using the Health Belief Model as the guiding theoretical framework. The study provides evidence on how community-based interventions may influence parental awareness and family health behaviors by integrating household secondhand smoke control with stunting prevention.

The Health Belief Model (HBM) provides a theoretical framework for understanding how individuals' beliefs and perceptions regarding a health threat influence their decisions to adopt preventive actions. The model comprises five key constructs: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and cues to action.(18)(19) In this study, the HBM was applied to explore the perceptions of parents participating in the KaBar BesTi Program rather than to assess parental readiness for program implementation or scale-up. Specifically, the model was used to examine parents' perceived susceptibility to and perceived severity of SHS-related stunting, perceived benefits and barriers associated with adopting protective behaviors, and the cues that encouraged them to reduce children's exposure to secondhand smoke. Accordingly, this study aimed to explore parents' perceptions of secondhand smoke exposure as a risk factor for stunting and their reported protective behaviors within the KaBar BesTi Program using the Health Belief Model framework.

METHOD

This study employed a qualitative a case study design to obtain an in-depth and contextual understanding of parental perceptions of seconhand smoke (SHS) exposure as a risk factor for stunting within KaBar BesTi program.(20) The study was conducted in Sumberan Hamlet, Candibinangun Village, within the catchment area of Pakem Community Health Center, Sleman Regency, in July 2024. Five parents of children under five participated as key informants, including one parent of a child with stunting and four parents of children without stunting. One nutrition officer from the Pakem Community Health Center served as a triangulation informant. The study was designed to explore community-level parental perceptions rather than to compare perceptions between parents of children with and without stunting. Participants were selected using purposive sampling based on predefined inclusion and exclusion criteria. Potential participants were identified through records maintained by the Pakem Community Health Center and recommendations form community health cadres in Sumberan Hamlet. Eligible participants were adults aged ≥17 years, parents of children under five with or without stunting, smokers or non-smokers, participants in the KaBar BesTi Program, and willing to participate in the interviews. Individuals who declined participation or were unable to complete the interview were excluded.

Data were collected through in-depth interviews and household observations supported by audio recordings, field notes, and photographs. Written informed consent was obtained from all participants before data collection. The principal investigator conducted the interviews using semi-structured interview guides developed according to the five constructs of the Health Belief Model. A separate interview guide was developed for the nutrition officer. Each interview lasted approximately 90 minutes ("interview" as the subject of the sentence emphasizes the activity that is described here, becoming relevant to the previous discussion about it). The audio recordings were transcribed and analyzed using OpenCode software involving data reduction, coding and categorization, data presentation, and drawing conclusion. Analysis focused on identifying recurring community-level perceptions across all parent participants rather than comparing households with and without children with stunting. The data analysis continued until no new relevant information to the study focus emerged from the interview data.

Data trustworthiness was enhanced through both methodological and source triangulation. Methodological triangulation involved comparing interview data with household observation findings related to smoking practices and potential secondhand smoke exposure. Source triangulation involved comparing information obtained from parent informants with that provided by the nutrition officer regarding household smoking conditions, stunting prevention activities, and efforts to reduce children's exposure to secondhand smoke. Ethical approval was obtained from the Research Ethics Committee of Universitas Ahmad Dahlan under Ethical Clearance No. 012406136.

RESULT AND DISCUSSION

This study involved six informants, comprising of five parent informants and one triangulation key informant.

Among the five parent informants, one had a stunted child and four had non-stunted children. The triangulation informant was a nutrition officer from the Pakem Community Health Center. The characteristics of the informants are presented in Table 1.

Table 1 shows that one parent informant had a stunted child, whereas four parent informants had non-stunted children. The nutrition officer served as the triangulation informant. Given the composition of the informants, the findings were interpreted as reflecting community-level parental perceptions rather than as a direct comparison between parents of stunted and non-stunted children.

Parents' perceived severity of the impact of secondhand smoke exposure on stunting in children

The qualitative analysis of the interview data involved transcription, data reduction, coding, and the grouping of related codes into categories using OpenCode. The analysis generated five themes corresponding to the constructs of the Health Belief Model: perceived severity, perceived susceptibility, perceived benefits, perceived barriers, and cues to action. Collectively, these themes illustrate how parents understood the risks associated with secondhand smoke exposure, perceived the benefits and barriers of preventive measures, and related these perceptions to their reported protective actions. The first theme, perceived severity, reflected parents' understanding of stunting, its characteristics and consequences, the relationship between secondhand smoke exposure and stunting, and the perceived seriousness of secondhand smoke exposure for children. The analytical progression from representative informant quotations to open codes, categories or sub-themes, and the corresponding HBM construct is presented in Table 2.

Table 2 shows that parents perceived stunting as a serious condition characterized by inadequate height, weight, growth, and development relative to a child's age. They also recognized potential consequences for children's health, physical development, brain development, and cognitive functioning. In addition, parents perceived secondhand smoke exposure as a serious health threat because of its potential to cause respiratory illness and interfere with children's growth. Some informants explicitly associated cigarette smoke exposure with pneumonia or lung diseases, illness, and subsequent growth impairment. In the Health Belief Model (HBM), perceived severity refers to an individual's belief about the seriousness of a health condition and its potential consequences. Together with perceived susceptibility, perceived severity contributes to an individual's perceived threat and may influence the adoption of preventive health behaviors.(21) In this study, parents perceived stunting as severe condition because of its potential effects on children's physical growth, health, brain development, and cognitive functioning. Their perceptions therefore extended beyond the observable physical characteristics of stunting to encompass its possible longer-term health and developmental consequences.

Parents also regarded secondhand smoke exposure as a serious health risk because cigarette smoke contains harmful substances that may adversely affect children's health and development. The participants' statements linked exposure to cigarette smoke with respiratory illness, general illness , and impaired growth. These perceptions are broadly consistent with scientific evidence indicating that exposure to secondhand smoke can adversely affect disrupt children's respiratory health and increase the risk of respiratory infections and asthma, which may have implication for subsequent growth and development.(22)

Table 1. Characteristics of research informants

Informant Initials	Age (Years)	Sex	Occupation	Description
IU 1	30	Female	Housewife	Key informant: parent of a stunted child
IU 2	26	Female	Housewife	Key informant: parent of a non-stunted child
IU 3	38	Female	Housewife	Key informant: parent of a non-stunted child
IU 4	38	Female	Housewife	Key informant: parent of a non-stunted child
IU 5	37	Male	Daily wage laborer	Key informant: parent of a non-stunted child and non-smoker
IU 6	47	Female	Nutrition Officer, Pakem Community Health Center	Triangulation informant

Table 2. Mapping of open codes, categories/sub-themes of the perceived severity theme

Open codes (representative informant quotations)	Categories/Sub-themes
"Stunting means inadequate growth and development in children. Their weight and height are insufficient; they are thin, short, often ill, and may have lower intelligence. I consider it dangerous because it can affect children's growth and development, particularly their intelligence." (IU,4)	1. Understanding and meaning of stunting 2. Characteristics of stunting 3. Reasons stunting is perceived as serious and dangerous
"I had actually only recently heard about the relationship between cigarette smoke exposure and stunting, but I think it still affects children's growth. When a child is exposed to cigarette smoke, the child may become ill, so their growth will be inhibited. I consider the severity of the exposure to be high because cigarette smoke contains harmful substances, including nicotine." (IU,3)	1. Perceived relationship between secondhand smoke exposure and stunting 2. Perceived severity of secondhand smoke exposure in relation to stunting

Note: *Two representative quotations from Informants (IU,4) and (IU,3) are presented. Data from all five parent informants were included in the thematic analysis*

Table 3. Mapping of open codes, categories/sub-themes of perceived susceptibility theme

Open Codes (Representative Informant Quotations)	Categories/Sub-themes
"Children from families where someone smokes and children who have difficulty eating are vulnerable, particularly those under two years of age. Stunting may be caused by inadequate nutrition, poor food hygiene, and inappropriate parenting. I know that cigarette smoke can increase the risk because it contains nicotine, which is not good for babies to inhale into their lungs. Therefore, children exposed to cigarette smoke are highly vulnerable." (IU,2)	1. Groups perceived as vulnerable to stunting 2. Perceived causes of stunting 3. Perceived relationship between secondhand smoke exposure and stunting
"Children from birth to approximately two years of age are vulnerable. The causes may include cigarette smoke, inadequate nutrition, and frequent illness. Cigarette smoke contains harmful chemicals. Children exposed to it are vulnerable because they may become ill frequently, experience impaired cognitive development, and have inadequate growth." (IU,4)	1. Perceived relationship between secondhand smoke exposure and stunting 2. Perceived susceptibility of children under five to secondhand smoke exposure

Note: *The table presents two representative quotations from Informants (IU,2) and (IU,4). However, data from all five parent informants were included in the coding, categorization, and thematic analysis*.

Some participants indicated that their understanding of the relationship between secondhand smoke exposure and stunting was informed by information received through the KaBar BesTi Program. This finding suggests that the program may have contributed to parents' awareness of the potential health and developmental consequences of secondhand smoke exposure among children under five. The educational information provided through the program may have broadened parents' understanding of secondhand smoke exposure beyond its effects on respiratory health to include its potential implications for nutritional status, growth, and development. Previous evidence suggests that secondhand smoke exposure may increase the risk of respiratory tract infections and may indirectly affect appetite, nutrient intake or utilization, and child growth, thereby potentially contributing to growth impairment and stunting.(23) However, because this study did not include baseline measurement or a pre–post evaluation, changes in parental perceptions could not be directly assessed, and any observed perceptions could not be causally attributed to the KaBar BesTi Program.

Parents' perceived susceptibility to the effects of secondhand smoke exposure on stunting in children

The second theme, perceived susceptibility, reflected parents' beliefs regarding the groups considered most vulnerable to stunting, the factors perceived to contribute to stunting, the perceived relationship between secondhand smoke exposure and stunting, and children's susceptibility to the harmful effects of cigarette smoke. The analytical mapping of representative informant quotations, categories or sub-themes, and the corresponding Health Belief Model construct is presented in Table 3.

Table 3 shows that parents perceived children under five, particularly those younger than two years, as being vulnerable to stunting. This perceived vulnerability was associated with nutritional inadequacy, inappropriate parenting practices, poor food hygiene, frequent illness, and exposure to cigarette smoke. Parents also identified children

living in households with smokers as particularly vulnerable. Secondhand smoke exposure was perceived to increase children's vulnerability because cigarette smoke contains harmful substances, including nicotine, that may adversely affect children's respiratory health and may be associated with illness, impaired cognitive development, and physical growth impairment.

Within the Health Belief Model (HBM), perceived susceptibility refers to an individual's belief about the likelihood of experiencing a particular disease or health problem. A stronger perception of susceptibility may increase perceived threat and may encourage individuals to adopt preventive health actions (24). The findings of this study indicate that parents perceived children under five as particularly susceptible to the adverse effect of secondhand smoke exposure and to growth impairment. This perception was associated with the harmful substances contained in cigarette smoke, children's ongoing growth and development, and their perceived physical vulnerability during early childhood.

The findings further indicate that informants recognized children's susceptibility to the harmful effects of secondhand smoke exposure. This understanding may have been shaped by multiple sources of health information, including the KaBar BesTi Program previously implemented by the team from the Faculty of Public Health, Ahmad Dahlan University (FKM UAD). Through the program, the community members received education on the importance of creating a smoke-free family environment to support children's health, growth, and development and to contribute to stunting prevention. Families, particularly those with infants and toddlers, were encouraged to avoid smoking inside the home to reduce children's exposure to secondhand smoke.(15) The information provided through these activities may have reinforced parents' recognition that children under five are susceptible to harmful substances in cigarette smoke and to associated health and developmental problems, including impaired growth. Because the present study did not include baseline measurement or a pre–post assessment, changes in parental perceptions could not be directly evaluated and the observed perception could not be causally attributed to the KaBar BesTi Program.

Parents' perceived benefits of reducing smoke exposure and preventing stunting in children

The third theme, perceived benefits, reflected parents' beliefs about the benefits of preventing stunting, reducing children's exposure to secondhand smoke, and reducing smoking behavior in the presence of children. The analytical mapping of representative informant quotations, categories or sub-themes, and the corresponding Health Belief Model construct is presented in Table 4.

Table 4 shows that parents perceived stunting prevention as beneficial for children's health, physical growth, cognitive development, and age-appropriate growth and development. Parents also perceived reducing secondhand smoke exposure as beneficial because it could improve the quality of the air childrenbrea the, reduce their exposure to harmful substances in cigarette smoke, and potentially reduce the occurrence of illness also support better growth. Accordingly, reducing smoking in the presence of children was considered an important protective measure for minimizing children's exposure to secondhand smoke and its potential consequences. Within the Health Belief Model (HBM), perceived benefits refer to an individual's belief that a recommended action will be effective in reducing the risk or severity of a health problem.

Table 4. Mapping of open codes, categories/sub-themes of perceived benefits theme

Open Codes (Representative Informant Quotations)	Categories/Sub-themes
"Preventing stunting allows children to live more healthily and to grow and develop according to their age. Reducing cigarette-smoke exposure also improves the air because it no longer contains substances from cigarette smoke. Reducing smoking near children is very important so that children can avoid various diseases." (IU,2) "Preventing stunting has many benefits because the child can grow healthily and their intelligence will not be impaired. Reducing cigarette-smoke exposure is also beneficial because the child will not become ill easily. When the child is healthy, their growth will be better. Reducing smoking near children is very important so that children are not exposed to harmful substances in cigarette smoke." (IU,3)	1. Benefits of preventing stunting 2. Benefits of reducing children's exposure to secondhand smoke 3. Importance of reducing smoking behavior in the presence of children

Note: *Table 4 presents two representative quotations from Informants (IU,2) and (IU,3). However, data from all five parent informants were included in the coding, categorization, and thematic analysis*.

Stronger perceptions of the benefits of a preventive action may increase the likelihood of adopting the recommended preventive behavior.(24) In this study, parents perceived preventing stunting and reducing secondhand smoke exposure as beneficial for children's health, physical growth, development, and cognitive functioning. This perceptions indicate that parents recognized the potential value of preventive actions which was extended from immediate reduction of smoke exposure to broader outcomes related to child health and development.

Parents specifically associated reduced secondhand smoke exposure with a lower likelihood of illness better growth. They also perceived a smoke-free environment as beneficial because it could improve the quality of the air inhaled by children and reduce their exposure to harmful substances in cigarette smoke. Such perceived benefits may support the adoption of protective practices by parents and other household members, including refraining smoking in the presence of children and maintaining a smoke-free home environment. The findings also indicate that parents viewed stunting prevention as broader health-promoting effort, involving adequate nutrition, maintaining children's health, and supporting their physical and cognitive development. This finding is consistent with previous evidence that appropriate practices during the first 1,000 days of life, including adequate nutrition, clean and healthy living practices, and appropriate childcare, play an important role in supporting children growth and development and reducing the risk of stunting.(25)

Parents' perceived barriers to reducing secondhand smoke exposure and preventing stunting in children

The fourth theme, perceived barriers, reflected the difficulties parents encountered in preventing stunting, protecting children from secondhand smoke exposure, reducing exposure within the family and social environment, and implementing strategies to address these challenges. The analytical mapping of representative informant quotations, categories or sub-themes, and the corresponding Health Belief Model construct is presented in Table 5.

Table 5 shows that parents experienced barriers arising from household practices and the broader social environment. Family members who smoked, difficulties in asking smokers to move away from children or adopt hygiene practices after smoking, and the presence of smokers among neighbors and at community gatherings made it difficult to consistently protect children from secondhand smoke exposure. One informant also described a short interval between pregnancies as a factor that had affected the continuation of exclusive breastfeeding. Although parents reported strategies such as asking family members to smoke away from children, encouraging handwashing and changing clothes after smoking, and keeping children away from smokers, these measures did not completely eliminate the barriers they encountered. These experiences are illustrated by the accounts of Informants RK and DD presented in Table 5.

Table 5. Mapping of open codes, categories/sub-themes of perceived barriers theme

Open Codes (Representative Informant Quotations)	Categories/Sub-themes
"It is very difficult to ask them to smoke farther away. It is also difficult to ask them to wash their hands after smoking. My husband and my oldest child smoke, and the neighbors also smoke. […] The father now moves away when smoking and has gradually become more aware; he washes his hands and changes his clothes." (IU,3)	1. Barriers to protecting children from secondhand smoke exposure 2. Family and social environmental barriers to reducing secondhand smoke exposure 3. Strategies used to address perceived barriers
"My first child was not exclusively breastfed because the birth interval between my first and second child was short, so breastfeeding had to be discontinued. At community gatherings, many people still smoke, and it is difficult to eliminate this habit, although it can be changed gradually. The barriers come from the environment and neighbors. […] To address them, we try to maintain adequate birth spacing so that the child can be exclusively breastfed, and I keep my child away from people who smoke." (IU,5)	1. Barriers to stunting prevention 2. Social environmental barriers to reducing secondhand smoke exposure 3. Strategies used to address perceived barriers

Note: *Table 5 presents two representative quotations from Informants (IU,3) and (IU,5). Data from all five parent informants were included in the coding, categorization, and thematic analysis. The symbol […] indicates the omission of an interviewer's question between consecutive responses from the same informant.*

Within the Health Belief Model, perceived barriers refer to an individual's assessment of the obstacles, difficulties, or perceived cost associated with adopting a recommended health behavior. Such barriers may reduce the likelihood of taking preventive action even when individuals recognize the seriousness of a health problem and the potential benefits of prevention.(24) In this study, the perceived barriers extended beyond individual knowledge or motivation but were strongly influenced by smoking practices within the family and broader community. The presence of smokers in households, neighborhoods, and community gatherings limited parents' ability to control children's exposure to secondhand smoke and made consistent implementation of smoke-free practices more challenging. In the context of stunting prevention, Clean and Healthy Living Behavior (Perilaku Hidup Bersih dan Sehat, PHBS) includes practices intended to promote smoke-free household environment.(26) However, its implementation may be challenging when active smokers are present in the household or when smoking is socially normalized in the surrounding community. Nicotine dependence may further reinforce these barriers because it can make smoking cessation or reduction difficult.(27) Therefore, efforts to reduce secondhand smoke exposure and support stunting prevention should not rely solely on mothers or primary caregivers. Interventions should engage fathers, other household members who smoke, and relevant community members in strengthening smoke-free practices at both household and community levels.

Actions Taken by Parents to Reduce Exposure to Secondhand Smoke and Prevent Stunting in Children

The fifth theme, cues to action, reflected the internal and external triggers that encouraged parents to adopt preventive measures against secondhand smoke exposure and stunting. Within the Health Belief Model (HBM), cues to action may arise from personal experiences, advice from others, health information, or exposure to health campaigns and programs.(24) The preventive actions reported by the participants are summarized in Figure 1.

Figure 1 shows that the reported stunting-prevention measures were grouped into three categories, individual and household actions, activities organized by the Pakem Community Health Center, and activities organized by the Candibinangun Village Administration. Individual and household actions included consuming nutritious foods, maintaining food hygiene, taking vitamins, providing exclusive breastfeeding, avoiding smoking indoors, keeping children away from smokers, and avoiding places where smoking was common. Participants also reported attending Posyandu, receiving nutrition education, and participating in supplementary feeding activities (Pemberian Makanan Tambahan/SUPPLEMENTARY FEEDING). Two representative quotations regarding their participation in these activities are presented below:

"Nutrition for children is provided every three months. The three-month check-ups are conducted at the Posyandu, while the supplementary food is collected from the village office." (IU,2)

"The Posyandu is held once a month, while the supplementary feeding program is conducted approximately every three months. The program is intended for children whose nutritional status is close to or below the red line." (IU,3)

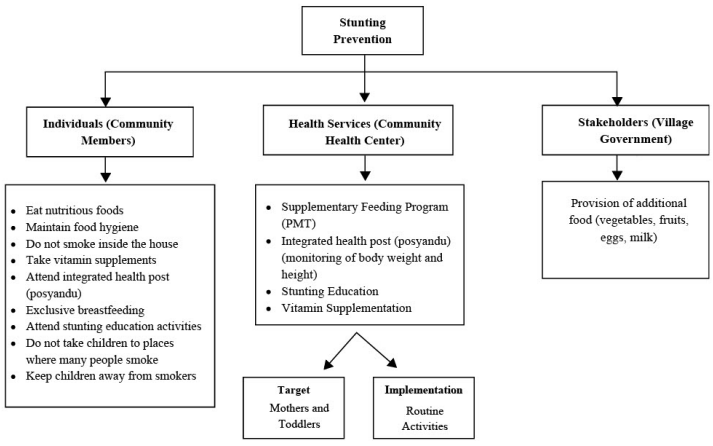

Figure 1. Measures taken to prevent stunting

These findings indicate that parents' preventive practices were influenced not only by their individual awareness but also by external cues provided through Posyandu services, nutrition programs, and village-based activities. These services provided opportunities for health education, routine monitoring of children's growth nutritional status, and access to nutritional support, which may have encouraged parents to engage in stunting-prevention practices. In addition to general stunting-prevention activities, participants also reported involvement in programs specifically aimed at reducing children's exposure to secondhand smoke. These activities were implemented through collaboration between the Pakem Community Health Center and the university and are presented in Figure 2.

In addition to individual actions, cues to action were also provided through programs implemented by the Pakem Community Health Center, including supplementary feeding, nutrition education, the distribution of iron tablets to adolescents, and home visits. The SUPPLEMENTARY FEEDING program aimed to provide adequate nutritional intake to support children's optimal growth and development. The program also incorporated locally available foods, illustrating that nutritionally appropriate supplementary foods can be prepared using affordable and accessible ingredients.(28) Furthermore, TTD interventions targeting adolescents, women of reproductive age, and pregnant women indicate that stunting prevention can begin during adolescence as part of longer-term promotive and preventive efforts.(26) The implementation of these activities was further confirmed by the triangulation informant:

"…We have dedicated staff for the program, both for distribution and food preparation, and the menu complies with the Ministry of Health's guidelines—we've adjusted the nutritional content, calorie count, and protein levels accordingly." (IU, 6)

"56 days for malnourished children—we just started this program this July for childrenn and pregnant women…specifically pregnant women at risk of Chronic Energy Deficiency (CED); CED risk is identified by an upper arm circumference of less than 23.5 cm…for pregnant women at CED risk, the program lasts 120 days, so we provide support for 4 months"(IU,6)

According to the triangulation informant, locally sourced supplementary foods were delivered directly to the homes of undernourished children and pregnant women at risk of Chronic Energy Deficiency (CED). The supplementary foods were provided as snacks and were not intended to replace regular meals. The stunting-prevention activities implemented by the Pakem Community Health Center are summarized in Figure 3.

Efforts to reduce children's exposure to secondhand smoke were also implemented through collaboration between the Pakem Community Health Center and Universitas Ahmad Dahlan (UAD) under the KaBar BesTi (Smoke-Free and Stunting-Free Family) Program. The program used health-promotion materials, including leaflets and posters, to educate the community about reducing secondhand smoke exposure and preventing stunting. Its development and initial implementation were reported in a previous action-research study.(29) Building on this work, the present study used qualitative interview data collected in July 2024 to explore parents' perceptions and reported protective practices through the Health Belief Model (HBM) framework.

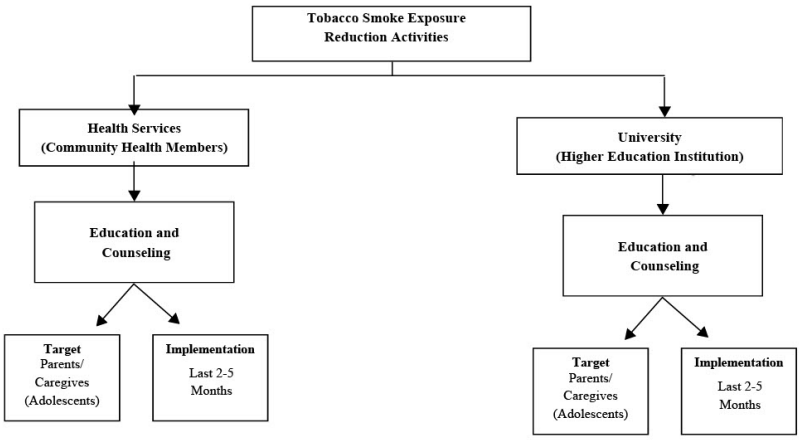

Figure 2. Activities to reduce secondhand smoke exposure

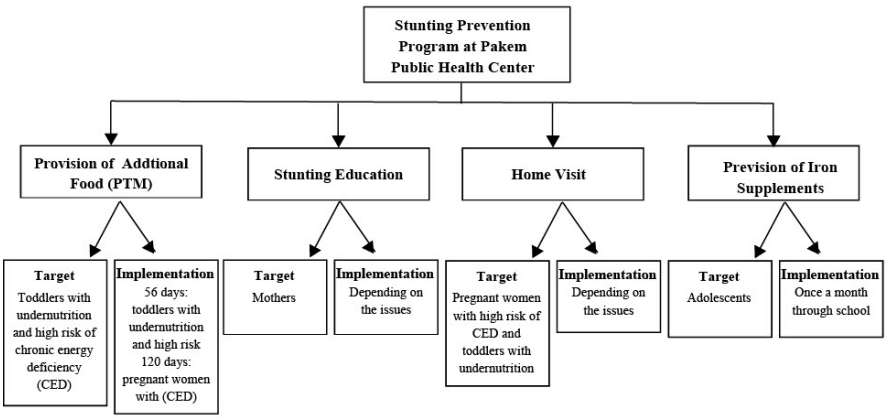

Figure 3. Stunting prevention at the Pakem community health center

A comparable community-based initiative implemented in Indonesia and Malaysia involved health professionals, community leaders, people who smoke, and their families in promoting smoke-free homes. The initiative combined health-professional training, public information campaigns, household air-quality feedback, and information about available local support services. However, its effectiveness and scalability still require further evaluation.(30) This evidence highlights the potential value of combining health education with community participation and practical support at the household-level. In Sumberan Hamlet, however, the establishment of a Smoke-Free Zone (SFZ) had not been accompanied by adequate enforcement, resulting in limited implementation at the household level. This perception was supported by the triangulation informant's statement:

"…*We met with a UAD professor, and there we discussed the link between smoking and stunting, because it turns out that stunting rates are quite high there, and perhaps the smoking habit inside the home is still a bit of a challenge."* (*IU,6)*

Household observations also identified indicators consistent with smoking activity, including ashtrays, cigarette ash, cigarette packs, lighters, and the smell of cigarette smoke inside and around the informants' homes. These indicators were predominantly observed in households with active smokers, which accounted for four of the five key informants. Cigarette butts were also observed around one household whose residents did not identify themselves as active smokers. The findings therefore indicate that participation in health programs and awareness of potential risk of secondhand smoke had not consistently resulted in fully smoke-free household environments.

The gap between awareness and practice suggests that preventive behavior was shaped not only by individual perceptions but also by family smoking practices and the broader social environment. Families play an important role in shaping children's nutrition, healthcare practices, and protection from environmental risks, including secondhand smoke exposure. Local social norms and community practices may function as either barriers or facilitators to stunting prevention, depending on how far smoking in the presence of children is perceived acceptable.(31) Therefore, sustained interventions should combine parental education with the involvement of fathers, other household members who smoke, health cadres, and community leaders. Overall, parents' preventive practices appeared to reflect the interaction between individual awareness, health-program interventions, family practices, and the broader social environment as cues to action within the Health Belief Model.

These findings have several implications for health policy and practice. Tobacco-control components could be integrated into family-based stunting-prevention services, including Posyandu activities, home visits, nutrition counseling, and community health-promotion programs. Interventions should engage fathers, other household members who smoke, health cadres, and community leaders rather than focusing primarily only on mothers. The findings may be transferable to communities with similar patterns of household smoking, social norms, and primary health care structures. However, the adaptation of the interventions to other settings should be considered cautiously and should take into account local cultural

practices, health services availability, and community readiness.

This study has several limitations. First, it involved only six informants from a single hamlet, which limits the transferability of the findings to other settings. Most key informants were women, and only one was the parent of a stunted child, whereas four were parents of non-stunted children. Consequently, fathers' perspectives and the experiences of parents caring for stunted children were not equally represented. The findings should therefore be interpreted as reflecting community-level parental perceptions rather than as a comparison between parents of stunted and non-stunted children. Second, the qualitative post-program design did not include baseline data or a pre-post assessment; therefore, changes in parental perceptions and reported behaviors could not be directly assessed or causally attributed to the KaBar BesTi Program. Third, participants' reports of protective practices may have been influenced by social desirability bias, although household observations were used to triangulate the interview data. Finally, the study focused specifically on secondhand smoke exposure as one potential determinant of stunting and did not assess other determinants or measure children's exposure to cigarette smoke. Future studies should involve multiple communities and more diverse informants, particularly fathers and parents of stunted children, use longitudinal or pre–post designs, and incorporate objective measures of secondhand smoke exposure.

CONCLUSION

Parents' perceptions, interpreted through the Health Belief Model (HBM), indicate that parents in Sumberan Hamlet understand the vulnerability and severity of the risks associated with by secondhand smoke exposure, and perceived benefits in adopting preventive measures, and are aware of the various barriers they face in their efforts to protect children from the risk of potential health and developmental consequences. Parents perceived secondhand smoke exposure as a potential risk factor for stunting and recognized its possible implications for children's health, growth, and development. At the same time, parents reported barriers arising from household and social environments still in which smoking remained common, indicating that smoke-free norms and practices at the household level have not yet been fully established. Despite these barriers, parents continue to undertake various preventive efforts including parenting practices, utilization of health services, and participation in health-promotion activities such as the KaBar BesTi program. These findings suggest that community-based interventions such as KaBar BesTi play a role in shaping strengthening parents' awareness and perceptions of risk associated with the effects of secondhand smoke exposure. However, awareness alone may be insufficient to overcome persistent smoking practices within families and the broader community. Integrating tobacco control measures into family-based stunting-prevention policies is crucial for enhancing the impacts of the program.

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Conflict of Interest

The authors declare no conflict of interest.

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