



Influence of Selenium Supplementation on Oxidative Stress and Inflammatory Response in High-Intensity Exercise

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Abstract

Exhaustive exercise could increase oxygen consumption 10 to 20 times folds which can then increase oxidative stress which is characterized by an increase in Reactive Oxygen Species (ROS). Increased oxidative stress (ROS) during exercise could cause cell damage. Selenium is a trace element that is believed to have antioxidant and anti-inflammatory activity. Objectives: This study aimed to determine the effectiveness of a 28-day supplementation period on plasma MDA and HMGB1 levels after high-intensity exercise activities. Methods: This study was experimental, with a pretest-posttest control group design approach. A total of 28 Sports Science Department students at Universitas Negeri Surabaya who met the inclusion and exclusion criteria participated in the study. Through simple random sampling, participation was divided into 2 groups, namely the selenium group (SG) and the placebo (PL) group. Selenium supplements for SG were 200 mcg/day, and PL was 100mg corn starch capsules, both groups consumed in 28 days. Participants performed bench-stepping by Newham with 10 sets x 10 repetitions, with 1-minute intervals. Plasma MDA and HMGB1 measurements were carried out immediately after, 24 hours after, and 48 hours after bench-stepping. Data on changes in plasma levels of MDA and HMGB1 were tested using repeated measures ANOVA with a significance level of $P < 0.05$. Result: there was a significant difference in the plasma MDA and HMGB1 between each group with the significance value of MDA that was $p = 0.000$ and the significance value of HMGB1 that was $p = 0.000$. Conclusion: Selenium supplementation for 28 days reduces the increase in oxidative stress (MDA) and increase in HMGB1 after high-intensity exercise activities.

Introduction

The second goal of the Sustainable Development Goals (SDGs) is to eliminate all forms of hunger by 2030 and achieve food security, aiming to reduce stunting by 40% by 2025 (United Nations, 2023). Stunting remains a significant nutritional health issue globally, particularly in developing countries. In 2020, the prevalence of stunting in Indonesia was alarmingly high at 149.2 million cases, surpassing other nutritional issues such as wasting (45.4 million) and overweight (38.9

million) (WHO, 2021). By 2022, the prevalence of stunting in Indonesia had decreased to 21.6%, yet it still exceeded the WHO standard of less than 20% (Miranda *et al.*, 2023). Stunting is characterized by a failure to thrive due to chronic malnutrition during the first 1,000 days of life (de Onis & Branca, 2016). Children are considered stunted if their height-for-age Z-score (HAZ) is less than -2 standard deviations (SD), and severely stunted if the Z-score is less than -3 SD (Suratri *et al.*, 2023). The impact of stunting on human resources

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is profound, affecting not only individual physical and cognitive development but also the country's economic potential (Soliman *et al.*, 2021). Short-term effects include impaired physical growth and cognitive development, potentially leading to reduced intelligence, lower educational outcomes, and increased poverty (Annisa & Sulistyaningsih, 2022). Long-term consequences include a higher risk of chronic diseases such as heart disease, diabetes, obesity, and stroke (Soliman *et al.*, 2021).

The multifaceted causes of stunting include economic disparities, inadequate education, infectious diseases, insufficient nutrition during the first 1,000 days of life, and poor health services and sanitation (Nafisah & Astuti, 2023; Utami & Laila, 2022). Additionally, maternal nutritional status during pregnancy and suboptimal maternal care contribute significantly to the problem (Hanifah & Astuti, 2023). Addressing stunting requires raising awareness among families, particularly women, about the importance of proper nutrition from a young age and during adolescence (Titaley *et al.*, 2013). The first 1,000 days of life are critical for a child's growth and development, often referred to as the "window of opportunity" by the World Bank (Titaley *et al.*, 2014). The Indonesian government has implemented a nutrition program to protect pregnant women from deficiencies in iron, folic acid, and protein, and to ensure adequate nutrition for children under two years old (Agustina *et al.*, 2023). The government also has Presidential Regulation Number 72 of 2021 on the Acceleration of Stunting Reduction mandates and the National Population and Family Planning Board as a lead to implement this program, involving various sectors and creating provincial and local Stunting Reduction Acceleration Teams (TPPS) (Sari, 2023). Gunungkidul is a municipality within Yogyakarta province with a stunting prevalence of 16.4% in 2022, which is considered the highest prevalence among other municipalities in Yogyakarta province (Dinkes-Gunungkidul, 2023). To address this, the Indonesian Family Planning Board has initiated the establishment of *Kampung Keluarga Berkualitas* (Quality Family Village), aimed at improving human resource quality

through integrated and convergent strategies. Given the persistently high prevalence of stunting in Gunungkidul and the establishment of Quality Family Villages, this study aimed to understand the implementation of stunting prevention programs and the optimization of the first 1,000 days of life in Gunungkidul.

Methods

This study employed a mixed methods approach with an embedded design (Shorten & Smith, 2017). The first phase of this research applied qualitative methods, with data collection and analysis adhering to standard qualitative research practices. Concurrently, quantitative data were also collected and analyzed, to augment and develop findings derived from the qualitative methods. The results were subsequently interpreted in an integrated manner. The qualitative component of the research adopted a single embedded case study approach, selected due to the singular nature of the case, which encompassed multiple units of analysis necessitating in-depth understanding. In the quantitative component, a one-group pre-test post-test approach was utilized. This method aimed to assess research activities by administering an initial test (pre-test) before delivering an intervention. Following the intervention, a final test (post-test) was conducted. The quantitative research aimed to determine the effect of video media on participants' knowledge regarding the optimization of the first 1,000 days of life in the context of stunting. By integrating these qualitative and quantitative approaches, the study provides a comprehensive analysis of the stunting reduction program and the critical period of the first 1,000 days of life.

This study was conducted in 4 villages within Gunungkidul Municipality, the population was 260 including 34 future parents, 73 women in pregnancy, 20 in the postnatal period, and 133 mothers of children under five. The qualitative phase used purposive sampling based on inclusion criteria set before, and data collection was conducted through semi-structured interviews. The qualitative sample size was 15, involving several groups of stakeholders, including 2 Family Planning Field Officers (PLKB), 2 midwives, 2 Secretaries

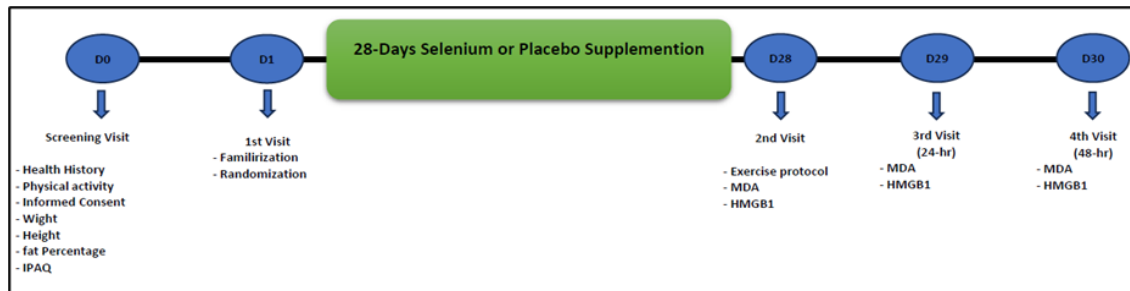


Figure 1. Study Design

of the Family Welfare Movement (PKK), 2 PKK members, 2 cadres, 2 future parents, and 3 women during their maternal period. Additionally, the number of quantitative sample sizes was 155, including prospective parents, pregnant women, and mothers of children under five years old. The sample size of the quantitative component was calculated by using the sample size for a population of 260 with a 95% confidence level, a 5% margin of error, and a population proportion of 0.5 (Creswell & Creswell, 2018).

The qualitative research instruments utilized semi-structured guidelines, employing individual interview techniques. Interview guideline was piloted before interviews were conducted to ensure that it worked properly and aligned with the research objectives. Additionally, an observation list form was also used for qualitative secondary data. As for the quantitative research, questionnaires were employed to assess respondents' knowledge regarding the impact of video media on mothers' understanding of the optimization of the first 1,000 days of life in stunting prevention. The questionnaire was adapted from previous research, which had previously undergone validity and reliability testing. The validity of the questionnaire was confirmed at 100%, and its reliability, measured using Cronbach's Alpha, was 0.809, surpassing the threshold of 0.50. Consequently, it can be concluded that the questions in the questionnaire are reliable.

All the participants in the qualitative and quantitative components were provided with participants' information sheets, informed consent forms, and information on the right to withdraw from this study. Only those who signed the informed consent form were eligible to participate in this study. In this study, qualitative data were collected through one-to-

one semi-structured interviews, audio recorded, and supplemented by secondary data obtained from documentation studies. Interviews were conducted in a private room within the office of stakeholders, which was set previously to maintain privacy. These secondary data sources were utilized to support and enrich the existing research data. The recruitment of informants was facilitated by two midwives who work at Community Health Centres, acting as guides. For the quantitative component, primary data were collected through online questionnaires completed by the respondents. The online questionnaires used Google Forms and were distributed to the respondents by using the WhatsApp application with a guideline involving steps for fulfilling the form.

Qualitative research in this study employed analytical techniques, utilizing thematic analysis (Braun & Clarke, 2006). The steps in the data analysis process included data familiarisation, coding qualitative data, building themes, reviewing themes, defining and naming emerging themes, and reporting the analysis results, facilitated by the NVivo 12 software tool. For quantitative research, data analysis was conducted using the paired sample t-test. Before determining the appropriate test, tests for data normality and homogeneity were performed to assess whether the data were normally distributed. This process was supported by computer software using the SPSS 26 application.

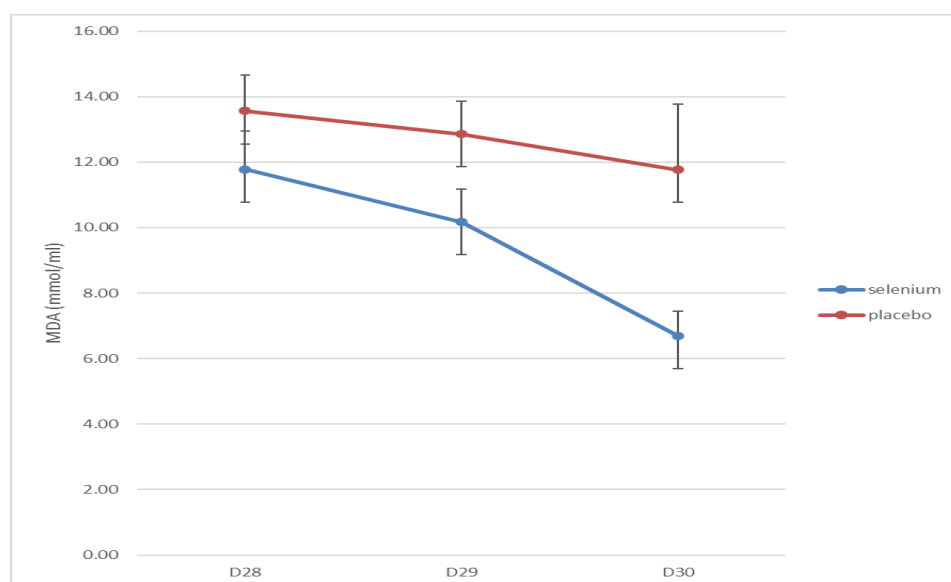
This study adhered to rigorous qualitative research standards to ensure the validity and trustworthiness of the data (Johnson *et al.*, 2020), employing multiple strategies to maintain high data quality throughout the research process. Data validity in qualitative research is assessed through trustworthiness, which includes various aspects such as transferability,

TABLE 1. Participants Characteristic

Variables	SG (M ± SD)	PL (M ± SD)	<i>P-value</i> ^a
Age (years)	19,43 ± 1,09	19,29 ± 1,14	0,92
Height (cm)	169,64 ± 6,43	168,00 ± 4,62	0,26
Wight (kg)	60,36 ± 7,67	59,50 ± 6,07	0,39
BMI	20,88 ± 1,33	21,04 ± 1,34	0,91
Fat (%)	13,01 ± 1,24	12,63 ± 0,98	0,39

confirmability, dependability, and credibility. Transferability in this research was ensured by considering the characteristics of the research setting, the methods employed, the interview process, data analysis, and the documentation of findings. Discussions with the research team also contributed to strengthening the assessment of the research process. Confirmability was achieved by adhering to the research design, ensuring accurate language translation in interview transcripts, taking comprehensive notes during data collection, including direct quotes from informants to substantiate findings, and holding discussions with supervisors. Dependability was enhanced by incorporating direct quotes from informants and involving other researchers in reading the transcriptions,

thus improving data quality. Repeated checks and transcript reviews by other researchers further ensured dependability, with NVivo 12 being used for data storage and organization. Data coding facilitated the analysis process. Credibility was established through the use of recording devices during interviews to ensure accurate recordings, verbatim transcription of interview data, and repeated checks to verify the accuracy of information provided by informants. Discussions with other research team members were conducted to assess data validity. Reflexivity was maintained by the researchers using reflexive notes to complement the data analyzed, as suggested by Morse (2015). This reflexive practice helped ensure comprehensive and accurate data analysis. The

**FIGURE 2.** Comparison of Changes in MDA Variables at D28, D29, and D30 Post Single Bout High-Intensity Exercises in SG and PL.

research was conducted after obtaining approval from the Health Research Ethics Committee of Universitas Aisyiyah Yogyakarta on May 22, 2023, with reference number No.1644/ KEP-UNISA/V/2023.

Results and Discussion

This research was conducted in Gunungkidul Regency. Gunungkidul Regency is one of the regencies in the Special Region of Yogyakarta. The area of Gunungkidul Regency is 1,485.36 km² or about 46.63% of the site of the Special Region of Yogyakarta. Gunungkidul Regency consists of 18 Kapanewon and 144 Villages. The data and mapping of this research theme describe the stunting reduction programs and optimization of 1,000 the first days of life in Gunungkidul. The data in this qualitative research were analyzed through thematic analysis based on meaningful information from participants. Within the analysis process, the researcher used NVivo 12 software. There were 3 themes emerged from the interviews, namely *pre-existing knowledge* related to stunting, strategies in reducing stunting, and expectations pertaining to stunting reduction programs and optimization of 1,000 the first days of life.

Theme 1: Pre-existing Knowledge Related to Stunting

The theme of *pre-existing knowledge* illustrates the knowledge that participants previously knew about stunting, nutrition, health monitoring, and knowledge related to existing stunting programs in Quality Family Villages. There are 3 sub-theme findings associated with pre-existing knowledge such as limited knowledge related to stunting, nutrition, health monitoring, and stunting reduction programs.

Limitations of Knowledge Related to Stunting

The sub-theme of limited knowledge related to stunting describes that there is limited knowledge of participants related to stunting. This is illustrated through quotation submitted by informants [A1BM] and [A2BF], as follows:

“What is that, small child? I don’t know, maybe the topic was discussed in ICS?” [A1BM]

“I don’t know, I’ve never heard of stunting either” [A2BF]

Based on the results of the quotation above, it can be interpreted that some participants have limited knowledge of stunting. This is due to the limited information, lack of education, and their unpreparedness to become parents.

In addition, participants also mentioned that they knew about the stunting topic of the ICS in their residence. This was illustrated

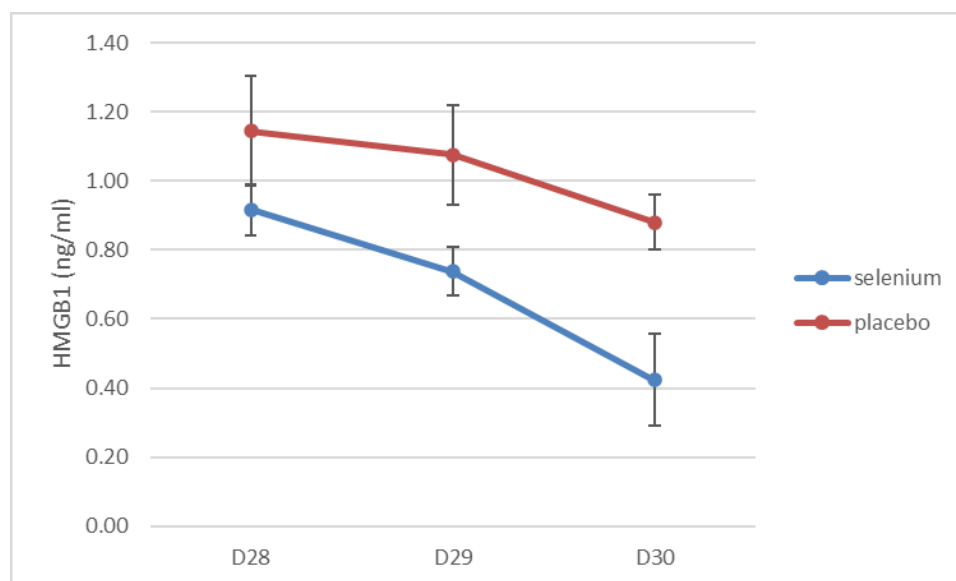


FIGURE 3. Comparison of changes in HMGB1 variables at D28, D29, and D30 post single bout high-intensity exercise in SG and PL.

Table 2. Effect size value with a 95% confidence level

Time Variable	D28	D29	D30
MDA	1,56 (11,78/13,56)	2,68 (10,17/12,86)	3,36 (6,69/11,77)
HMGB1	1,78 (0,92/1,14)	3,07 (0,74/1,08)	4,26 (0,42/0,88)

through the quotes of informants [B1BD] and [A1K]:

“...giving information usually in Integrated Health Service or ICS about stunting, which refers to impaired growth due to malnutrition” [B1BD]

“There is an ICS in the health service; stunting counseling is also given there, starting from the beginning of pregnancy at 0–9 months; children aged 1-2 years... The program is from pregnancy to the 2-year-old children.” [A1K]

Furthermore, in addition to quoting information sources related to stunting that they get from ICS, the participants [A1BB] further added that local cadres usually convey the provision of information related to stunting. This is demonstrated by the following quotation: *“In the Family Planning Village, usually the cadres conduct counseling here, to mothers of toddlers, teenagers also pregnant women”* [A1BB]

Nutrition and Health Monitoring

The sub-theme of nutrition and health monitoring describes participants' knowledge related to stunting prevention through nutrition management and health monitoring. This was conveyed by participants [A1BB] and [B1PK] as follows:

“Yes, how to say it... Maybe about the portion of breakfast, lunch, and dinner, then don't get too close if someone in the family smokes. Don't forget to eat vegetables every day” [A1BB]

“Stunting refers to children with low-height-for-the-age. Children who don't consume nutritious food... To prevent stunting, children should eat nutritious food. The information is also given to the teenagers so they know later how to be healthy during pregnancy. They are also given Blood Supplement Tablets, which are good for their health” [B1PK]

In addition, participants also mentioned they obtained information on nutrition management and health monitoring from the ICS. This is demonstrated by the following

quotation:

“The counseling is mostly related to eating. They tell about how children eat and how to maintain cleanliness and hygiene. The ICS measures children's weight, height, and head circumference. When we come to the Community Health Center, they will give us vitamins and anthelmintic medications for treating worms. This medicine is given to 1-year-old children; they will be given again next year. All like this...” [B2BB]

Furthermore, Participants also had a health monitoring check every month. This is as stated in the following quote:

“Every ICS for toddlers has information for mothers of toddlers, pregnant women, and mothers of cadres. So once every 1 month, it is checked by the health of all (BKB) Build a family of toddlers” [B1BB]

Based on the data, it can be concluded that the participants had knowledge related to the prevention of stunting through nutritional management and health monitoring; this knowledge was obtained from the informant and knowledge derived from information obtained through the counseling section.

Existing Programme Prevention

The sub-theme of the existing program prevention describes a stunting reduction program in the local area known by participants. This is illustrated through a quotation submitted by informants [B1PK], as follows:

“If the program is good, giving supplementary feeding program (PMT) for pregnant women is like milk and for toddlers when given processed food. We also got a stunting prevention program from PT Unilever about the cooking demonstration we had carried out at the hamlet hall” [B1PK]

In addition, interviews were obtained from postpartum mothers' informants [B2BF] and pregnant women [A1BB] who said they received the information after participating in the stunting reduction program. This is conveyed

through the following quotation:

"Usually, I take part in counseling at ICS. They explain exclusive breastfeeding, too; I was also given PMT during pregnancy" [B2BF]

"The program is like giving vitamins, ICS, the weight and height measurement of the child, giving additional food such as eggs, counseling to mothers of toddlers about parenting patterns for children including stunting" [A1BB]

Based on the data above, it can be concluded that the participants had knowledge related to the stunting reduction program in the local area. The existing stunting reduction programs include providing healthy foods for pregnant women and toddlers, vitamins for children, and ICS activities.

Theme 2: Stunting Reduction Strategies

The theme of the stunting reduction strategy describes stunting reduction programs that already existed in the Quality Family Village area as a strategy to control stunting and optimize 1,000 in the first days of life. There are 3 sub-theme findings related to the theme of stunting reduction strategy: stunting reduction program, role in stunting reduction, and best practice in stunting reduction.

Stunting Reduction Programme

The stunting reduction program sub-theme describes the overview of stunting reduction program activities and optimization of 1,000 the first days of life in Quality Family Villages. This program was formed in collaboration with cross-sectoral parties as a form of preventive and promotive efforts in stunting prevention. The following are the results of the quotation submitted by Family Planning Field Officers related to the beginning of the formation of the team in the stunting reduction program:

"The stunting prevention program that we have done first is that we formed the mother TPK Team, the family companion TPK Team, that we form there are 16 Teams. Each team consists of three people: midwives, PKK cadres, and Family Planning cadres, whom we first trained on November 29, 2021. Thank God they all passed and got an Electronic Application for Marriage and Pregnancy (Elsimil) training certificate. All the participants are the TPK

Team." [B1P]

Participants explain the tasks of the team in the stunting reduction program:

"First, the TPP (Tim Pendamping Keluarga or Family Companion Team) and second, the TPPS (Tim Percepatan Penurunan Stunting or Stunting Reduction Acceleration Team) jump in the program. If the TPPS usually helps give PMTs, each sub-district budget for the APBD for Stunting Prevention... TPPS is different from the TPK Team, but the ending is the same; that is the stunting problem. TPK should send a report to TPPS because the Secretary is the chief directory, while all urban village heads are the chief executors, all the Secretary are the chief executors of TPPS." [B1P]

In addition, there is information related to the form of stunting prevention program implementation, namely counseling, Posyandu activities, and supplementary feeding (PMT). The following is a quotation from a midwife [B1B] who explained the existing stunting reduction program. This is demonstrated by the quotation:

"There is TPK, pregnant women's classes, toddler classes, and home visits for the program. For the nutritional aspect, there is nutritional surveillance if, for example, there is a risk of stunting and there is a reason for the participants, the nutrition officer, the regional coordinator, and the doctor to do a home visit. TPK is the Indonesian Family Planning Board's program for the class of pregnant women and mothers of toddlers from the ICS. The class of pregnant women should be categorized based on age for counseling, but we cannot categorize each hamlet based on age. It usually does not meet its quota, only 15-20 people. The obstacle is that the mothers of toddlers don't come. If the situation in ICS is the same, we combine it; if there is counseling related to breastfeeding and supplementary food after breastfeeding, they will be invited together."

Additionally, the mothers of toddlers [A2BB] and mothers under [A1BD] said that related to the stunting reduction program in the form of ICS and counseling that they had participated in, this was conveyed through quotation:

"Usually, the program is uncertain, from the Community Health Center. For example, on

the 15th, there is ICS. There is counseling and, usually about stunting,” [A2BB]

“If to optimize the first 2 years of the child’s life, we have also been given information in ICS, so that in the ICS we are not just measuring the weight, measuring hands, but also being given information as well” [A1BD]

This is following the results of research submitted by cadres s [A1K], that in the implementation of stunting prevention programs, there are also activities such as counseling in ICS to the provision of supplementary foods:

“If the midwife of the health center service comes to the posling (mobile ICS) or if there is an invitation to the Posbindu (integrated guidance post) activities, that provides counseling from the health center service. But every month, only Cadre who provides information and measures babies’ weight and gives the PMT” [A1K]

In addition to ICS activities, which become routine programs every month, counseling and mentoring activities are provided as a form of promotive efforts. Counseling and assistance are carried out not only by midwives but also by other health workers. As mentioned by the participants [A2BM]:

“Cadre was not present at the event yesterday. Only staff from the health service center and the village head were coming. Since the event was a little long yesterday, from 09.00 to 12.00, many of which were from the health service center. There were dentists, some were from the nutrition department, some were from the midwifery department, but there were different materials” [A2BM]

Then, it was conveyed by PLKB [B1P] that besides promotional efforts such as ICS activities, mentoring activities were also carried out by the team such as cadres, with targets ranging from prospectus parents, pregnant women, postpartum mothers, and mothers of children under five. The following are the quotations conveyed:

“...If the future parents are anemic, it also has the potential to give birth to stunting children. That is why Cadre assists the prospectus parents. Usually, before the marriage, prospectus parents must be injected with Tetanus Toxoid Vaccine...” [B1P]

Furthermore, the participant added that

not only assistance, but the stunting acceleration program team also monitored each activity to the target. This was explained in the following quotation:

“...the important thing is that even if you have been accompanied later, yet it turns out that the condition is less than the standard, we will have an intervention. If the TPK also focuses on growth and development. Usually, the TPK has midwives, cadres, PKK, and KB cadres. We also provide information about child development cards, so we send a child development card to each Village. The card will be filled together with ICS. Through the child development card, the Cadre can monitor children’s growth. For example, children at a certain age should be able to be like this. There is a reference; if a child in certain months cannot be like this, then we will refer to it.” [B1P]

The efforts made to implement the stunting reduction program and the optimization of 1,000 in the first days of life cannot be separated from the support factors obtained when running the program, including readiness support in program implementation, cross-sector and cross-program cooperation, and community support. The following quotation from interviews with midwife participants [A1B], Secretary [B1C], and PKK [B1PK]:

“There is training for midwives and cadres. The community, which is aware of the role of the officers and the parties across the village sector, are all lending their support. If the village does not give support, we also do not support this. The government programs are supported by the conscious community and also the village government of cadres. In the past, this village was not like that, but now it can be found in other villages” [A1B]

“Our cadres are encouraged because every month there is an incentive also for 50k/month cadres from the village” [B1C]

In addition to the support factor, there are also inhibiting factors that affect the stunting reduction program. The inhibiting factors found in this study include budget problems, the implementation of inefficiently designed programs, lack of public awareness, and socio-cultural, economic, and geographical conditions. The results of the quotation

submitted by the informant are as follows:

"We used a small amount of the Cadre's money each month to pay for the upcoming event. A mother who comes to measure the children's weight gives Rp1,000.00 as additional cash. Later, it can be counted as if there are 20 people so that it can be Rp20,000.00 and 30,000 from the previous donation. So, later, Rp50,000.00 can be used to make porridge or sponge cake. We are trying our best to provide nutritional food despite limited funds. Meanwhile, the village fund is used to provide milk for the toddler .." [A1K]

"Many of the budgets at KIA were cut and transferred to PHN. For the class of pregnant women and toddlers, the budget was cut. For the class of mothers of toddlers, one village can hold the class 5 times, and they can target Indonesia Early Childhood Care and Education (PAUD) as well. As pregnant women, one village can hold the class 2 times, but because it is cut, it is only held 1 time" [B1B]

There were also findings that the team's formation was only formed in the last 1 year, so it is not maximal. This is as stated in the quote: [B1C]

"The stunting acceleration team has only existed for a year, but it has not yet reached its potential because we are occasionally asked to meetings in the new sub-district." [B1C]

In addition to the relatively new team, there is a lack of public awareness from the community to participate in existing activities. This is conveyed in the quotation:

"Health advice is still rare in the hamlet due to the young man's lack of activity, but when it is offered, most people reject it out of reluctance." [B2CT]

Furthermore, it was also conveyed that geographical conditions were also an obstacle in the implementation of the stunting reduction program, as reported by the following participants:

"If the hurdles are included in what we sense, the field, yes, if it's not too heavy, but in Kayugerit, it's a bit extreme" [B1P]

"Stunting is a personal matter, especially for someone with a young child. But the water is the issue in my region. Water is occasionally difficult to find. Geographical factors thus become important." [A1P]

From the data, it can be summarized that

the different programs pursued to decrease the incidence of stunting and optimize 1,000 the first days of life in the Quality Family Village region undoubtedly also have supporting and inhibiting aspects in their implementation. These elements interact with one another both inside and externally. In terms of, for example, program funding readiness and implementation readiness. Externally, for example, across sectors and communities. These are related to each other to reduce stunting and optimize 1,000 in the first days of life.

Integrated Roles in Reducing Stunting

The sub-theme of the role in reducing stunting describes that there is a division for implementing the stunting reduction program and optimization of 1,000 the first days of life. The role in stunting prevention is carried out by cross-sectors or representatives of the implementation of the Indonesian Family Planning Board, including PLKB, Secretary, PKK, Midwives, and Cadres. The following is a quotation from [A1C] related to an example of the actions of cadres involved in the stunting reduction program:

"Cadres are also active now. If anyone is absent, they will visit and measure their weight. There is a group, so the results of the ICS are directly conveyed from the cadres" [A1C]

In addition, participants mentioned that cadres are also assigned to assist the community, starting from the prospectus parent target. This was conveyed by the participant [B1P]

"They then jumped into the field to do the first assistance done to future parents. Future parents need to be accompanied because they will be married soon. The Cadre lives in the village and knows if a future parent is near them. There are still three months remaining, so they accompany future parents by hoping that they can prevent stunted offspring" [B1P]

Not only are cadres deemed active during the current stunting reduction program, but the community has also undergone better improvements, as seen by their involvement in stunting prevention program activities. This is as conveyed by participants [A1K] and [A1C]:

It's good that her mother is involved, and occasionally, they join at arisan (regular social gatherings) to promote knowledge sharing and get young mothers excited about attending ICS

and having their kids get to know each other. [A1K]

"Yes, it's a relief that the community's awareness has also changed. Today, it seems that the average community has also been active" [A1C]

Additionally, it was well known that all parties participated in and worked together to implement the current stunting program to cooperate in reducing stunting. Cadres did not just carry this effort. This is proven through the quotation of participants [B1C] and [A1K]

"Collaboration of cadres, Hamlet residence, and the team of cadres...If our Muskal (Village Deliberation) invites cadres, then hamlets, Posyandu administrators, Kapanewon also (village), then Head of the Village, Pak Kamituo (Village Official) as the one in charge..." [B1C]

"All cadres are involved; there are elderly and toddler cadres here. We help each other so every time there is any counseling, all cadres are involved, whether it's elderly or toddlers, always side by side like that, they participate together..." [A1K]

"Yes, there are. From the Cadre, from PLKB, Community Health Services are also there, usually after the KB village event. That's usually, for example, the date of counseling" [A1BB]

This statement was also confirmed by midwives that there was a team formation to reduce stunting and optimize 1,000 in the first days of life. The following are the quotations conveyed:

"So there is a team (midwives, PKKs, cadres) that is formed to prevent stunting...Then for the treatment, starting from future parents, then pregnant women, then postpartum mother and the baby, then children under two years. Well, if there is a case which shows the possibility of stunting, it will be addressed together" [A1B]

Based on the data above, it can be concluded that many parties have a task or role in the implementation of the stunting reduction program and optimization of 1,000 in the first days of life. The parties involved in the program have the same goal: to reduce the incidence of stunting in the area of Quality Family Villages.

Best Practice in Stunting Reduction

The best practice sub-theme in reducing

stunting describes interesting implementation practices in stunting reduction programs in Quality Family Villages. Best practice in this study is illustrated through the support of government programs through budgets, human resources empowerment, cooperation from various responsible parties, implementing parties and the community, cadre activity, and community enthusiasm. This is illustrated through several quotes as follows:

"Thank God, after there was a stunting locus, we got a program from the board center, supervised by the Indonesian Parliament, for the MJK (Completely Healthy Latrine Stimulant) of almost half a billion aimed at 55 families. Well, there is a positive impact here. The fund given by the board center is used for that, which might cost several million rupiahs, and there are some additions, too. That's a positive side of the program that has entered the village." [B1C]

Still, a secretary [B1P] participant in the government assistance program added that the government also assisted in the form of funds during the TPK orientation. This was conveyed in the [B1P] participant's quotation:

"If the fund is given smoothly, the province gives the fund to PKB directly. Like the previous TPK orientation, all have been managed by the province; we then monitored from the beginning until the end." [B1P]

In addition, the next best practice is in the form of collaboration between the TPPS and TPPK teams to reduce stunting in Quality Family Villages. PLKB [B1P] conveyed this:

"There is cooperation between the TPPS and TPK teams. If the TPPS is more involved in the village or policies, it is like a kind of section that moves the working community (no health workers) all across sectors. If there are health workers, they are the executors. So the TPK (Midwives, KB Cadres, PKK cadres) are the executor" [B1P]

There is establishing cooperation between teams, and the cadres that were previously empowered, motivated, and equipped before going into the field. This is proven by the following quotation from [A1C] and [B1C]:

"I visit the hamlets as the PKK leader, along with the administrators (PKK), so I am provided a way to inspire people. For example, when there are older people present, we encourage the elderly

on how to maintain their health. Likewise, when toddlers are present, we encourage the toddlers on how to maintain their health.” [A1C]

“We give information, especially related to nutrition” [B1C]

Not only empowerment but also the TPK (cadres, midwives, and PKK) was facilitated in the field implementation process, as stated by the following [B1P]:

“Yes, we provide each participant in TPK, which we have done before, Rp100,000.00 per month. Every month, they get Rp100,000.00 for credit. For example, if there is assistance to catin, pregnant women, and mothers of children under two years, they will get Rp10,000.00 for each visit. That Rp100,000.00 will be divided into three (Cadre, midwives, and PKK) so that each assistant has funds again. Today, the credit phone given in assistance is not Rp100,000.00. But we give cash, and the distribution is fifty thousand. We buy credit/month. In addition to assistance, they must also do a resume every time there is an activity, and later it must be uploaded and sent to the sub-district” [B1P]

Furthermore, there were also several quotes stating that the current activeness of the Cadre is the strength in implementing the existing stunting program. This is as conveyed by the following [A1C]:

“Cadres are also active if now if someone is not present, cadres will pay a visit, measure, measure weights. Since there is a group, the results of the ICS are directly conveyed from the cadres. We are grateful for the exceptional spirit of the cadres. They may have socialization at the community health center or village. In addition to serving as cadres, they also work” [A1C]

The PLKB also confirmed that the cadres assigned and involved in this stunting reduction program have a high social spirit. This is as stated in the informant's quote [B1P]:

“The social spirit of the cadres is indeed strong because they have been active in the village.” [B1P]

Additional statements submitted by the [A1K]:

“If I can say maybe the activeness of cadres and, from the Community Health Center too” [A1K]

Not only cadres, public enthusiasm to participate in the stunting program was

also found in the interview data, such as the following quotation from [A2BB]:

“So far, the mothers are enthusiastic. Maybe it can be adjusted to the community here. Maybe it can be conditioned. For example, it's a bit late. They presented the information excellently, and the audience was enthused....” [A2BB]

Based on the data above, it can be concluded that various best practices have been carried out to reduce stunting in Quality Family Villages. The government's support proves this: the collaboration between the team in charge of implementing TPK and the team in order of TPPS, as well as the passion and spirit of cadres and the community.

Theme 3: Hope

The theme of hope illustrates the expectations and needs that informants express for stunting prevention programs and optimization of 1,000 the first days of life in Quality Family Villages. There are 2 sub-theme findings related to the theme of hope: expectation and needs

Expectation

The sub-theme of hope expresses their aspirations for the future to the evaluation initiatives to avoid stunting and the optimization of 1,000 in the first days of life. As for the quotation submitted by participants [B2BB] and [B1CT], who said that counseling activities related to stunting should be carried out more often. The following are the quotations conveyed:

“Yes, it should be held at least once every three months. Maybe it will benefit both those who have toddlers and those who only have toddlers. As long as I have children, just once, so that other mothers are aware of it as well as those who are unaware of it and those who are unaware of adding” [B2BB]

“I hope there will be more counseling about nutrition” [B1CT]

Another statement was conveyed by the participant [B1BD], who wanted supplementary feeding given to children at risk of stunting and to children with adequate nutrition. This is expressed through the following quotation:

“...We hope socialization continues and PMT like eggs, milk is sent to the house So it's not just for the stunted children” [B1BD]

Based on the results of the quotation above, it can be concluded that there are several expectations expressed by participants related to the stunting reduction program in the future, such as the expectation of educational media that can be accessed online, the provision of more counseling up to the provision of additional food given to children with adequate nutrition.

Needs

The needs sub-theme describes that several requirements support stunting prevention programs and optimization of 1,000 in the first days of life. The participant's statement related to the need for a direct approach provided by health workers to residents through home visits. This is what the participant [B1BB] mentioned:

"In my opinion, the health worker must come directly into the house so that the officer can also know the daily life of the person, like the economy, and their home environment" [B1BB]

In addition, findings were also obtained from [B1P] who conveyed that the need for online educational media is appropriate for adolescents so that they are also exposed to health education, especially in controlling stunting from an early age.

"It is challenging to gather the teenagers because they usually go to school and also need permission. So it is not easy if we invite them during working hours. Then, the alternative strategy is we provide education either through leaflets or videos" [B1P]

The same thing was conveyed by the future parent [B2CT], which was described in the quotation:

"In my opinion, for young people, it's easier to go online. If the adults also want to go to the health service center, it's also a bit far from access, and most can't use a motorbike. It's also difficult if their children work and no one is at home, it's also difficult. Well, if older people, it will be better if cadres come to the houses. But for teenagers, it seems that via WhatsApp it can also be easier" [B2CT]

Besides, there is a statement from participant [A2BB] related to the need for facilities and infrastructure that can support current ICS activities, such as the following quotation:

"..maybe the height ruler in the ICS is poor and limited, so it sometimes takes a longer time to measure height" [A2BB]

"Scales, the tied scales, we have already proposed change since it has been torn. There are also digital scales that the Community Health Service usually carries. At least the child likes it, you know, it's funny, for measuring height too because here you use the board," [A1K]

Based on the data, it can be concluded that the needs expressed by the informant are related to the stunting reduction program in the future, such as the direct approach by health workers in the form of home visits, the existence of online educational media that can be accessed anytime and anywhere, and the availability of adequate facilities and infrastructure in routine ICS activities that have been routinely carried out in Quality Family Villages. This study was conducted on 155 respondents, consisting of future parents, pregnant women, and mothers of under-five. This quantitative data collection was carried out through online questionnaires using Google Forms and the provision of video education media. The analyses conducted in this quantitative study were univariate analysis and bivariate analysis. The univariate analysis used in this study illustrates the frequency distribution of maternal knowledge about the Optimisation of 1,000 in the first days of life in Stunting Prevention.

Based on Table 1, the univariate analysis indicates a significant difference in respondents' knowledge levels before and after the intervention. Initially, the respondents exhibited varying levels of knowledge, categorized as poor, sufficient, and good. Post-intervention, there was a noticeable improvement in knowledge levels among the respondents, with a marked increase in the number of mothers displaying sufficient knowledge. This improvement demonstrates the positive impact of the intervention on enhancing the respondents' understanding.

Based on Table 2, the normality test for pre-test and post-test knowledge data yielded a significance value greater than 0.05, indicating that the data are normally distributed. Consequently, a paired t-test was employed to

determine the mean difference in values before and after the intervention. Additionally, the homogeneity test indicated a significance value greater than 0.05 for knowledge, confirming that the data in this study are homogeneous. This homogeneity signifies that the sample data possess consistent variance. The results of the bivariate test used a different test related to the effect of video media on mothers' knowledge about the optimization of 1,000 the first days of life in stunting prevention.

Table 3 indicates significant differences in knowledge levels between the pre-test and post-test assessments related to the video media intervention. This is evidenced by a significance value of 0.008, suggesting a notable increase in knowledge about stunting due to the video media intervention, with a p-value less than 0.05. In the stunting reduction program, maternal and family knowledge concerning stunting, dietary provision, and parenting behavior significantly impact the reduction of stunting within the family. Mothers and families equipped with comprehensive knowledge, appropriate behaviors, and adequate nutritional understanding are more likely to provide optimal nutritional intake, thereby preventing stunting and enhancing growth and development during the first 1,000 days of life (Ma *et al.*, 2023; Reni *et al.*, 2023). Stunting reduction program strategies could involve activities for improving maternal knowledge regarding nutritional management, enabling mothers to prepare healthy food and adopt better feeding practices for infants and toddlers (Rahmadiyah *et al.*, 2022).

Previous research in Indonesia including 1,332 respondents revealed that 51.1% of respondents had limited knowledge about stunting, including its definition, causes, prevention, and impacts (Torlesse *et al.*, 2016). This was attributed to inadequate counseling on stunting provided by ICS. ICS is a vital source of knowledge for the community, aligning with previous research indicating that 80% of respondents relied on ICS for stunting-related information (Haines *et al.*, 2018). Furthermore, information disseminated by health workers is generally considered more reliable than information obtained from the Internet.

However, the Internet remains a valuable source of information due to the community's time constraints and the increasing demand for accessible knowledge. ICS plays a crucial role in stunting reduction by offering services such as monitoring children's growth and development, measuring height and weight, administering immunizations and vitamins, as well as providing counseling during its activities.

The government of Indonesia has implemented various strategies to reduce stunting, including forming dedicated teams such as TPPS, TPS, and TPK. Additionally, through cross-sectoral cooperation involving sub-districts, the Indonesian Family Planning Board, Health Offices, and Community Health Centres, the government has initiated multiple activities. These activities include coordination meetings, stunting discussions, education and counseling, and training of cadres and other stakeholders. Additionally, there is also an Elsimil program for preparing brides-to-be for engaging in marriage, pregnancy planning, supplementary feeding programs, distribution of vitamins and iron tablets for at-risk communities, and monitoring growth and development through ICS. Home visits by cadres and health workers are also part of these initiatives. These strategies align with WHO recommendations, which emphasize the crucial role of government commitment in reducing childhood stunting (WHO, 2021).

The government's commitment to stunting prevention began with Indonesia's participation in the 2011 Global Scaling Up Nutrition (SUN) movement, marked by the Minister of Health's submission of a participation letter to the UN Secretary-General. Launched in 2010, this movement is based on the principle that all citizens have the right to adequate and nutritious food. Effective stunting reduction requires cross-sectoral cooperation, involving individuals, organizations, related institutions, and community levels to implement optimal interventions with multiple sectors and stakeholders (Lameky, 2024). Effective program implementation also requires attention to health insurance accessibility for all societal levels (Agustina *et al.*, 2023). Despite the implementation of various stunting prevention programs, effectiveness and scale remain

challenges. A previous study revealed that most pregnant women and mothers of children under the age of two lack sufficient access to essential services, critical for child development during the first 1,000 days of life, and only 28.7% of children under two have access to four basic services simultaneously: birth certificates, drinking water, sanitation, and exclusive breastfeeding (UNICEF-Indonesia, 2020).

Research examining the impact of video media on the optimization of the first 1,000 days of life for stunting prevention indicates a significant increase in the average knowledge score, from 13.33% to 14.50%. This study demonstrates that video media effectively enhances mothers' knowledge about stunting prevention. This finding aligns with annual research, which consistently shows a significant knowledge increase in groups exposed to educational videos compared to those given booklets (Sewak *et al.*, 2023). Previous research further elaborates that educational media, particularly videos, offer several advantages due to their visually appealing nature (Salmerón *et al.*, 2020). The engaging visual elements facilitate the effective conveyance of messages. Audiovisual content enhances respondents' concentration, making it easier for them to absorb information (Wu *et al.*, 2020). Videos not only present images but also provide an auditory dimension, which helps maintain the audience's interest and improves information retention (Abdulrahman *et al.*, 2020). Overall, the research underscores that video media is a powerful tool for educational interventions, particularly in the context of stunting prevention. Its ability to engage multiple senses makes it superior to other forms of educational materials, ensuring that recipients are better informed and more likely to retain the knowledge provided.

This study reflects the community's desires and consistent implementation of stunting prevention programs. However, it has been observed that current initiatives, such as counseling and education, are limited in scope and not regularly scheduled. This inconsistency may be attributed to various factors, including insufficient support due to limited facilities, infrastructure, human resources, socio-economic barriers, and geographical

challenges. These obstacles hinder the effective implementation of stunting prevention programs and the optimization of the first 1,000 days of life. Therefore, government strategies are needed to optimize stunting reduction through comprehensive family assistance, which involves the collaboration of various programs and activities across sectors at the village level. Beyond the implementation of programs and activities, family assistance involves cooperation with field cadres from different sectors, leveraging their respective expertise and skills to address gaps in stunting reduction efforts. Moreover, there is a need for systematic monitoring and evaluation, conducted through direct observations and interviews with family assistance teams. This should be conducted in an integrated and systematic manner at least twice a year or as needed. Such measures ensure the effective acceleration of stunting reduction and address the community's expectations for a more structured and sustained approach.

Conclusion

The internal influences on individuals, such as knowledge, socio-cultural factors, geographical conditions, and economic status, significantly impact community awareness related to stunting. The ongoing stunting prevention programs serve as clear evidence of the government's commitment to collaborating with various sectors, including the Government, Health Offices, Community Health Centers, the Indonesian Family Planning Board, and other community organizations. Additionally, educational media in the form of videos has proven to be significantly effective in enhancing the knowledge of research respondents about stunting. This therefore could potentially be an alternative for health education to communities.

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