October – December, 2023
Original Article
DOI: http://dx.doi.org/10.30867/action.v8i4.1401

AcTion: Aceh Nutrition Journal
Pages: 666 - 674 | p-issn 2527-3310; e-issn 2548-5741

Developing a nutrition education model based on local wisdom for adolescents to prevent Stunting in the early stage: a preliminary study

Pengembangan model edukasi gizi berbasis kearifan lokal bagi remaja dalam mencegah kejadian Stunting sejak dini: studi pendahuluan

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Article History:
Received: August 24, 2023; Revised: October 29, 2023; Accepted: November 17, 2023; Published: December 8, 2023.

Publisher:
Politeknik Kesehatan Aceh
Kementerian Kesehatan RI

Abstract

Anemia among adolescents in Indonesia has increased since 2007 until now, as well as worldwide. Anemia had affected their growth and development, along with cognitive abilities, making them susceptible to infectious diseases. Cognitive ability is closely related to the knowledge, attitudes, and behavior of adolescents as internal factors. This study was an introductory study in the development of nutrition education based on local wisdom for adolescents with anemia as early prevention. A qualitative study was conducted in October 2020 in Cirebon District, West Java. The participants consisted of 10 people (eight stakeholders and two experts). Data were collected through focus group discussions and in-depth interviews with instruments as a guide in collecting information data. Data were recorded with the subject's consent, transcribed word for word, and analyzed based on the listed theme by the researcher. Results from the survey stated that using digital development 4,0 learning models will be applied through blended learning and integrated into students' extracurricular activities, using a variety of learning methods and media according to adolescents' development. Thus, this study involved various government sectors to apply the nutrition education model in schools through government policies. Furthermore, it may become a preventive measure for adolescents with anemia.
Keywords: Adolescent, anemia, health education, stunting

Abstrak

Anemia pada remaja di Indonesia mengalami peningkatan sejak tahun 2007 hingga saat ini. Anemia mempengaruhi pertumbuhan dan perkembangan, serta kemampuan kognitif membuat mereka rentan terhadap penyakit menular. Kemampuan kognitif erat kaitannya dengan pengetahuan, sikap, dan perilaku remaja sebagai faktor internal. Penelitian ini merupakan penelitian pendahuluan dalam mengembangkan pendidikan gizi berbasis kearifan lokal pada remaja penderita anemia sebagai pencegahan dini. Penelitian kualitatif dilakukan pada bulan Oktober 2020 di Kabupaten Cirebon, Jawa Barat. Pesertanya berjumlah 10 orang (8 orang pemangku kepentingan dan dua orang ahli). Data dikumpulkan melalui diskusi kelompok terfokus dan wawancara mendalam dengan instrumen wawancara sebagai pedoman dalam mengumpulkan data informasi. Data dicatat atas persetujuan subjek, ditranskrip kata demi kata secara manual, dan dianalisis berdasarkan tema yang dicantumkan oleh peneliti hingga data jenuh. Hasil survei menyatakan untuk menggunakan model pembelajaran digital 4,0 yang akan diaplikasikan secara blended learning dan terintegrasi dalam kegiatan ekstrakulikuler siswa, dengan menggunakan berbagai macam metode dan media pembelajaran sesuai dengan perkembangan remaja. Dengan demikian, penelitian ini melibatkan berbagai sektor pemerintah untuk menerapkan model pendidikan gizi di sekolah melalui kebijakan pemerintah. Selain itu, hal ini juga dapat menjadi upaya pencegahan bagi remaja penderita anemia.
Kata Kunci: Anemia, pendidikan gizi kesehatan, remaja, stunting

Introduction

Stunting in toddlers has a long-lasting negative impact if not handled properly. A child is stunted if their length or height is not appropriate for age. The factors causing stunting in Indonesia are still high, as reported by the Indonesian Health Ministry (2018), mainly the socioeconomic status of the family, nutritional intake during pregnancy, level of morbidity during infancy, and lack of nutritional intake during growth and development are not adequately met (Kemenkes RI, 2018a).

Stunting and anemia have an interesting correlation, and have become serious problems in Indonesia. Anemia among women is suspected to be one of the causes of stunting, principally in Indonesia. Every year, the prevalence of stunting continues to decline, but is not significant. The latest data show that the stunting rate is approximately 30,8% in Indonesia (Kemenkes RI, 2018b). By 2020, 22% of under-five children in the world had experienced stunting, and 29,9% of women suffered from anemia (Ruswati et al., 2021). Vitaloka et al. (2019) found that a history of anemia in mothers is closely associated with the incidence of stunting, with a risk value of 3,2 times that of children suffering from stunting. Studies in Tanzania have shown that females are at higher risk and have a higher percentage of stunting than boys (Khamis et al., 2019; Titaley et al., 2019).

Preconception in women occurs when adolescents experience nutritional deficiencies and are suspected of suffering from anemia to chronic cases that affect pregnancy. Anemia is a condition in which the hemoglobin level is low (<12 dL), causing a decrease in oxygen levels in the blood and an inability to deliver the nutrients needed to the prospective baby in the womb (Ruchayati, 2012). Iftikhar (2018) also found that mothers with anemia cause children to be underweight. Anemia and stunting are similar chains that are linked and repeated. The study by the (Luna & Prado, 2021) in Peru revealed that anemic pregnant women are associated with a 6,476 times greater risk of their babies having low birth weight. The risk increases 3,68 times if the mother is anemic and has low birth weight. Another known factor is stunting; young maternal age and low maternal education are causes of anemia, and stunting continues to recur.

The Indonesian government realizes that stunting has an impact on the nation's future progress. Short-term stunting can cause growth failure, and the long-term effect shows a decrease in intellectual capacity in the future (Mairo & Jenjawaty, 2022). Stunting is also known to affect a country's economic growth. In Indonesia, estimates of potential economic losses owing to low productivity caused by stunting have reached 3,057 – 13,578 billion (Renyoet et al., 2016).

Sensitive and specific programs to reduce stunting and anemia rates continue to be implemented. One is an integrated anemia reduction intervention between the education and health sectors in the program of Fe tablet distribution to adolescents and pregnant women (Mairo & Jenjawaty, 2022). It is also a program that complements iron tablet supplementation that is already running. School-based nutrition education programs have a positive impact on attitudes, food choices, and behavior (Kulik et al., 2019). According to a study by Ortíz Pérez et al. (2020) adolescents aged 10-19 years are at risk of iron deficiency, since the need for Fe increases with age. Poor iron intake, helminth infections, and social problems, such as norms of early marriage and teenage pregnancy, increase the risk of anemia. Menarche generally occurs at the age of 12 years. Adolescents must take Fe-folic acid pills to prevent chronic Fe insufficiency.

School-based supplementation has the potential to increase hemoglobin levels. However, breaks in supplementation, either due to conflicting tablet dispersion or the imperatives of the school calendar, constrain the long-term adequacy of school-based supplementation programs (Berry et al., 2020). Another study by Permatasari et al. (2018) stated that the prevalence of anemia in adolescent girls decreased after the administration of Fe tablets (60 mg elemental Fe and 0,25 mg folic acid) for 16 weeks. However, adherence indicators were important in this study. The consumption factor of Fe tablets is closely related to their knowledge, which encourages them to feel the need to consume them. Knowledge of nutrition and health is also associated with an individual's educational level. This is supported by the study Permatasari et al. (2018), who found that the results of their study measuring the compliance of pregnant women in

consuming Fe tablets are influenced by knowledge, attitudes, values , and beliefs as internal and external factors. Based on research in various countries, nutrition education interventions are an effective strategy for improving eating habits, nutrition knowledge, and body composition (Sánchez-Díaz et al., 2020).

The purpose of this research was to obtain information, suggestions, and responses from stakeholders and academics to develop a nutritional education model for female adolescents as a preventive parameter. Education and policies within school settings are valuable approaches to improving health. Schools offer the most effective and efficient environment for reaching a large proportion of a community, including young people, families, school staff, and community members (Pulimeno et al., 2020). Female adolescents are the main target because they are considered a door to preventing anemia and giving birth to stunting. Their knowledge, state of mind, and knowledge regarding the same were advanced, and instructive mediation was an effective strategy to do so. More endeavors are required to extend adolescents' mindfulness to boost their current and future health statuses (Abu-Baker et al., 2021; Sriwahyuni et al., 2022). Thus, this nutrition educational model was chosen not only to improve students' digital literacy but also to accommodate local wisdom practices in accordance with the regions in Indonesia. It is expected to result in significant behavioral changes and is a vital step in preventing and reducing high stunting rates in Indonesia.

This is the first study to determine the efficacy of a nutrition education program held in schools that can be a supportive program for Fe tablet supplementation to reduce anemia in adolescents and significantly reduce stunting rates in Indonesia.

Methods

Subjects and Methods

A qualitative study was conducted in October 2020 in Cirebon District, West Java, Indonesia, a stunting locus in Indonesia. A qualitative study is a type of study that produces findings that cannot be achieved using statistical procedures. The data obtained were the result of direct observations by researchers of the characteristics of the original or natural conditions. Qualitative research is more concerned with the process than the result (Moha & sudrajat, 2019).

Focus group discussions (FGD) involving subjects from the government and academia were conducted. A facilitator from the researcher-guided FGD recorded all answers in audio form, other facilitators made notes, and the data were recorded clearly. The discussion was conducted in Indonesian and followed the procedures that had been prepared and determined by the research team.

Before the discussion session started, the research team introduced themselves, explained the purpose of the study, and conducted the FGD. The facilitator explained to all participants that the time to answer questions was 5 – 10 minutes for each question. All participants were informed that the discussion session would record the data for analysis. After the activity explanation process, the discussion session began with semi-structured open-ended questions. The questions compiled by the researchers are presented in Table 1. Ethical approval from the ethics commission with number LB.01.03/6/4005/2020 from the Health Polytechnic of the Mataram, Ministry of Health.

Participants

The participants were divided into two groups: government-sector workers and academic experts. The participants were a convergence team in accelerating stunting reduction in Cirebon District, and academics were experts in community nutrition, food, and education. The selected participants were representatives of the Education Office, Health Office, Livestock Service, Agriculture Service, National Family Planning Coordinating Agency (In Indonesian: Badan Kependudukan dan Keluarga Berencana Nasional, abbreviated as BKKBN), and expert staff from the Regional House of Representatives (In Indonesian: Dewan Perwakilan Rakyat Daerah, abbreviated as DPRD) of Cirebon District.

Instruments, Measures, and Procedures

The instrument was an open questionnaire compiled by the researchers covering several aspects of the information to be collected. The most basic information was (1) the prevalence of anemia

and stunting in Cirebon District, (2) government programs to reduce anemia and stunting, and (3) information related to the basic materials needed to develop a model of nutrition education based on local wisdom that would be applied was divided into two types of information (Table 1).

Table 1. Questions for focus group discussions for experts

Theme	Listed of Questions
Prevalence of Anemia and stunting	What is the prevalence of adolescent anemia and stunting in Indonesia based on the latest data?
Prevalence of Anemia and stunting	What is the impact on the nutritional status and health of adolescents if they suffer from anemia?
The government's ongoing program to reduce anemia and stunting	The implementation of nutrition programs should be based on studies of best practices (effective and efficient) and local specifics. What are the effective nutrition improvement efforts?
Nutrition education program for anemia and stunting adolescents	Countermeasures and prevention through nutrition education for adolescents: is it the right step?
Nutrition education program for elementary school children	What are the best steps so that the delivery of messages through the nutrition education model will be right on target?
Nutrition education materials for anemic and stunting adolescents	What content or materials should be included in the development of nutritional education models for adolescents, especially in handling anemia and stunting?
Educational subject	If the nutrition education model is expected as a preventive program step, what should be prepared and considered?

This information has become the basis for developing a nutritional education model for adolescents to prevent anemia and stunting from an early age by raising the theme of local wisdom according to their respective regions, to be adapted in all regions of Indonesia.

The instrument was used as a guide for FGD and in-depth interviews. FGD was conducted for 180 min, with all participants answering questions and providing responses. In-depth interviews were conducted with only two participants, the education office and the health office, to obtain more detailed and in-depth programs from participants who were considered to have an essential role in the development and application of this adolescent nutrition education model; thus, the information obtained was more accurate in meeting the information needs of the researchers. Measurement of data in the form of descriptive with researchers compiling instruments and using tools in the form of notebooks, tape recorders as a tool used in collecting data.

The data collection method was carried out in two ways: FGD and in-depth interviews with participants who were considered able to represent the needs of the researchers. The FGD was carried out with a time of 120 min to obtain the information needed by researchers and measure the level of saturation with no renewable answers.

Data Analysis

The data were analyzed using questions that were asked during FGD with the participants' permission; FGD was audiotaped and transcribed while referring to field notes recorded by the scribe. Subsequently, the audiotapes were listened to again to determine their responses to each question.

Following the completion of the analysis, the results were categorized into themes based on participant responses as follows 1) Prevalence of anemia and stunting, 2) The government's ongoing program to reduce anemia and stunting, 3) Nutrition education program for anemia and stunting adolescents, 4) Nutrition education materials for anemic and stunting adolescents, 5) Nutrition education program for elementary school children, 6) Educational subject.

Result and Discussion

The Cirebon District is one of the regencies grouped in the stunting locus of West Java Province, Indonesia. This study attempts to provide background information on the need to develop a nutritional education model for adolescents to handle cases of anemia and stunting indirectly. Health and Nutrition education have been described as instructional measures for inducing proper behavioral modifications for closing development within the dietary frame of people.

Table 2. Cross programme among institutions in Cirebon District

Institution's	Convergence Team Work Program to Reduce Stunting and Anemia
Cirebon District Health Office	dissemination of "Rematri" (adolescent girls) immunization for UKS teachers, socialization for district level students, socialization of Rematri and TTD for school committees, provision of Rematri fe tablets. Checking the hb of Rematri teens, orientation for giving Rematri immunodeficiency cards, promotions for giving Rematri immunodeficiencies at the district level, training of youth health cadres, youth care health services, counseling at Posyandu on nutrition for toddlers and pregnant women and classes for mother's toddlers and pregnant women classes
Cirebon Regency Education Office	the stunting rate reduction program is directed to PAUD, broadly speaking, the new stunting and anemia reduction program is collaborating in the program for giving TTD to young girls at the junior high school and high school levels
Food Security Service	program for sustainable food house areas with the aim of making it easier for the community to meet the daily food needs of families
The Fisheries Service	"gemar makan ikan" likes to eat fish
Bkkbn	direct management of stunting toddlers with supplementary feeding.

Table 3. Educational model design based on behavior change theory

No	Listed of Questions
Step 1	Needs assessment and problem identification
Step 2	Needs assessment and problem identification
	Formulate the form of intervention and the goal of behavior change
	Choose a behavior change theory
	Develop intervention strategies
	Designing intervention implementation
Step 3	Developing an evaluation of the intervention plan

Prevalences of Anemia and Stunting in Cirebon District, West Java, Indonesia

The in-depth interview results through a closed questionnaire administered to the Cirebon District Health Office showed that the prevalence of anemia in adolescent girls in Cirebon District was not specific. This was due to the budget factor for Hb level examinations and the number of adolescents in the district.

However, an estimate of the prevalence of anemia and stunting in Cirebon District in 2019 revealed that " *the results of health screening in 2019 for junior and senior high school adolescents in Cirebon District, obtained data of 14,714 people who have examined as many as 158 young males (1,07%) suffered from anemia, while 14,861 young females were examined, and 542 (3,09%) suffered from anemia. Hemoglobin examinations were performed on high school adolescents. Approximately 11,985 were at risk of anemia in young males and 186 people (1,55%) were at risk of anemia, while 12,149 young women who were examined and about 376 adolescent females (3,09%) suffered from anemia. Meanwhile, the results of the Hb examination for adolescent females in 2019 at the stunting locus Community Health centers showed that 4610 students were examined, and around 731 students were at risk of anemia (15,86%)*. "(Interviewee#4). Stunting was

determined through an in-depth interview questionnaire administered by the Cirebon District Health Office. "…. *In grade 10 high school adolescents, 24,134 were examined. It was found that stunting adolescents were around 41 students (0,16%)."* (Interviewer#4).

Adolescence is a menarche onset period that lasts with increase and improvement, followed by reproductive age. Adolescent girls in Indonesia aged 15-19 years whose conditions are at risk of chronic energy deficiency (CED) amounted to 46,6% in 2013. When pregnant, 24,2% of women of fertile age 15-49 years have a risk of chronic lack of energy, and 37,1% have anemia. Normal birth weight infants (> 2500 g) of anemic mothers (Hb <120 g/L) have a 1,81 (1,34-2,43) risk of having low Hb levels (<100 g/L) compared to infants. Anemic pregnant women have a 6,476 times greater risk of having a low birth weight (Luna & Prado, 2021).

Indonesian Government's Cross-Sector Stunting Reduction Program

Stakeholders and experts fully support the potential for developing a youth nutrition education model to assist government programs in reducing stunting and anemia in the long term through stakeholder collaboration in education and health by involving actor decision-makers at the government level in formally implementing this program in schools targeting young women. The Indonesian government's program to reduce stunting and anemia has only been sensitive, such as providing iron supplementation to adolescents in schools. Thus, researchers believe that developing a nutritional education model based on local wisdom can help change adolescent behavior and indirectly reduce stunting and anemia in Indonesia.

In addition to internal factors (nutrition compliance, reproductive health, etc.), external factors are thought to help the government prevent the incidence from increasing. Cross-sectoral government programmers are external factors that are thought to help prevent stunting. The types of programs selected from the results of in-depth interviews and work programs conducted by various sectors of the Cirebon District government, which were members of the stunting convergence team, are presented in Table 2.

Development of a Nutrition Education Model and Fe Supplementation based on local wisdom for young women to prevent anemia and stunting from an early age.

The results of the study show that the suggestion of stakeholders and experts is to develop educational media, which is supported by Yien et al. (2011), who found that one of the educational media was a game-based learning approach that is equally helpful to both male and female students in terms of nutrition knowledge, learning attitudes, and food and drink habits (Yien et al., 2011). Media development was performed according to the needs of time. Era 4.0 is the digital era of the use of technology in everyday life, in terms of education and health. Yulia et al. (2018) showed that the development of adolescent nutrition education media could be integrated with forms of local wisdom.

Insensitive interventions in the non-health sector include environmental health, community empowerment, and assistance in overcoming poverty. One of the most sensitive programs is to provide knowledge to the target group. Knowledge is one of the factors that can change a person's behavior. One knowledge that plays a role in a person's behavior is in choosing good food and maintaining a healthy body (Rosdiana et al., 2018). Efforts to increase young women's knowledge include nutrition education. Nutritional education can be developed on the basis of the characteristics and needs of the target group and time. In the era of disruption 4.0, nutrition education can be delivered through an online system via a website, and the 4.0 medical transformation will rely on the industry and work environment Cyber-Physical Framework (Muktiarni et al., 2019).

Upadhyay et al. (2011) reported that exposure to short lectures and other visual aids such as folders, flashcards, posters, and displays of raw foods showed a significant rise in post-exposure knowledge scores. Another study stated that implementing the nutrition education model can increase knowledge about and promote positive attitudes and behavior change toward child feeding practices, specifically iron intake, through nutrition education strategies (Kamalaja et al., 2018).

The nutrition education model was developed based on data from in-depth interviews with several stakeholders. Regarding policy, the related department is the most

feasible in the policy-making process regarding the implementation of nutrition education in Cirebon District. The adolescent nutrition education model called the "*PSAING*" nutrition education model stands for "*Prevent Stunting and Anemia in Young Age*" by paying attention to the syntax of the following activities based on behavior change theory (Table 3).

The formulation of the nutrition education model was carried out using a needs assessment analysis conducted by researchers by collecting data from informants to be used as a reference in forming a nutrition education model for adolescents, as shown in Table 3.

In preparing the nutrition education model, the first was what materials must be included to accommodate young women expected behavioral change goals. The basic competencies of the interviewees' statements are as follows:

".... Youth are expected to be able to choose healthy and nutritious food, know the nutritional problems of adolescents, and know how the food is processed properly." (Interviewee # 4).

"... Youth must know about the types of local food in their environment" (Interviewee # 6).

This statement has become a reference for researchers to develop basic competencies related to anemia and stunting in adolescents. After compiling the basic competencies, the next step was to select the material included in the nutrition education model. The experts stated that the basis for the preparation of nutrition education materials could be chosen based on the following statement.

Many of our children's subjects are basic nutrition, such as what protein's function, what mineral's function, and so on. It becomes less interesting because it is only theoretical for children, so trying to learn about nutrition in the cycle of life, from life from the womb to the elderly, so it becomes an interesting topic". (Interviewee #1).

In my opinion, adolescents must be provided with materials for their daily nutritional needs so that they know what they eat and what is needed. Today's children are the previous generation and the main "Micin" generation (MSG). My child has problems with eating disorders and wants to look thin." (Interviewee # 12).

".... Students' abilities are expected for knowledge of local foods rich in iron" (Interviewee # 2).

Therefore, the researchers summarized the material needs according to Table 3. Another component in developing the nutrition education model is allocating time, with a period of 3 to 6 months and 45 minutes of face time × 2 hours of lessons 2 times/week. (Interviewee # 5). The next component is the media'. *".... Nutrition education media with digital development 4.0, for example, educational media based on 3D / 4D (Educational Video), and online educational media*. (Interviewees # 5) (and # 6)

Based on the sources' suggestions, the education staff can be summarized as follows: *Educators as agents, if they rely on nutrition implementers who work alone, they will be overwhelmed. Thus, researchers should prepare and conduct training for teachers, science teachers, Counseling Guidance teachers, sports teachers, and the person in charge of the School Activity Unit".* (Interviewee # 1).

".... The evaluation type can be provided in online quizzes and online-based games, which supports digital 4.0 development." (Interviewees 4 and 5).

This Table describes the nutritional education model "PSAING," which is arranged according to the conceptual needs of adolescent stunting and anemia in adolescent girls in the Cirebon District, which is a locus of stunting based on focus group discussions and in-depth interviews. The compilation of basic competencies, educational materials, and types of evaluation is considered with current socioeconomic and technological advances (digital era 4.0) so that, with the teenage nutrition education model "PSAING," this can become an integrated program for adolescents in schools as an effort to reduce and prevent stunting and anemia in the future.

Conclusion

The nutrition education model for adolescents is structured as a cross-sectoral step in the education and health sector. The adolescent nutrition education model called the "*PSAING*" nutrition education model stands for "*Prevent Stunting and Anemia in Young Age*". The nutrition educational model was applied

through blended learning and integrated into students' extracurricular activities using a variety of learning methods and media according to adolescents' development. The hope is that the nutrition education model for adolescents can be integrated into the education sector as compulsory education, so that knowledge and education will occur sustainably and can change the behavior patterns of adolescents in the future.

Acknowledgments

The authors would like to acknowledge the support and funds from the LPPM UPI through Award Number 901/ UN40.D/PT/2020.

References

Abu-Baker, N. N., Eyadat, A. M., & Khamaiseh, A. M. (2021). The impact of nutrition education on knowledge, attitude, and practice regarding iron deficiency anemia among female adolescent students in Jordan. *Heliyon*, *7*(2). https://doi.org/10.1016/j.heliyon.2021.e06348

Berry, J., Mehta, S., Mukherjee, P., Ruebeck, H., & Shastry, G. K. (2020). Implementation and effects of India's national school-based iron supplementation program. *Journal of Development Economics*, *144*, 102428. https://doi.org/10.1016/j.jdeveco.2019.102428

Iftikhar, A. (2018). Maternal anemia and its impact on nutritional status of children under the age of two years. *Biomedical Journal of Scientific & Technical Research*, *5*(3), 4519–4522. https://doi.org/10.26717/bjstr.2018.05.001197

Kamalaja, T., Prashanthi, M., & Rajeswari, K. (2018). Effectiveness of health and nutritional education intervention to combat anemia problem among adolescent girls. *International Journal of Current Microbiology and Applied Sciences*, *7*(09), 3152–3162. https://doi.org/10.20546/ijcmas.2018.709.393

Kemenkes RI. (2018a). Buletin Stunting. In *Kementerian Kesehatan RI* (Vol. 301, Issue 5, pp. 1163–1178).

Kemenkes RI. (2018b). Hasil Utama Riset Kesehatan Dasar (RISKESDAS) Tahun 2018. In *Kementerian Kesehatan Republik Indonesia*. Kementerian Kesehatan Republik Indonesia. https://repository.badankebijakan.kemkes.go.id/id/eprint/3514/

Khamis, A. G., Mwanri, A. W., Ntwenya, J. E., & Kreppel, K. (2019). The influence of dietary diversity on the nutritional status of children between 6 and 23 months of age in Tanzania. *BMC Pediatrics*, *19*(1), 1–9. https://doi.org/10.1186/s12887-019-1897-5

Kulik, N. L., Moore, E. W., Centeio, E. E., Garn, A. C., Martin, J. J., Shen, B., Somers, C. L., & McCaughtry, N. (2019). Knowledge, attitudes, self-efficacy, and healthy eating behavior among children: Results from the building healthy communities trial. *Health Education and Behavior*, *46*(4), 602–611. https://doi.org/10.1177/1090198119826298

Luna, J. V., & Prado, J. V. (2021). Relationship between pregnant women with anaemia of maternal age at risk and low birth weight in a social security hospital in Peru. *Revista de La Facultad de Medicina Humana*, *21*(1), 101–107. https://doi.org/10.25176/rfmh.v21i1.3155

Mairo, Q. K. N., & Jenjawaty, S. (2022). Exploration of stunting events as an effort to prevent stunting in Bangkalan Regency. *Open Access Macedonian Journal of Medical Sciences*, *10*(E), 1774–1778. https://doi.org/10.3889/oamjms.2022.8025

Moha, I., & sudrajat, D. (2019). *Resume Ragam Penelitian Kualitatif*. https://doi.org/10.31227/osf.io/wtncz

Muktiarni, M., Widiaty, I., Abdullah, A. G., Ana, A., & Yulia, C. (2019). Digitalisation trend in education during industry 4.0. *Journal of Physics: Conference Series*, *1402*(7), 1–6. https://doi.org/10.1088/1742-6596/1402/7/077070

Ortíz Pérez, M., Vázquez López, M. A., Ibáñez Alcalde, M., Galera Martínez, R., Martín González, M., Lendínez Molinos, F., & Bonillo Perales, A. (2020). Relationship between Obesity and Iron Deficiency in

Healthy Adolescents. *Childhood Obesity*, *16*(6), 440–447. https://doi.org/10.1089/chi.2019.0276

Permatasari, T., Briawan, D., & Madanijah, S. (2018). Efektivitas program suplementasi zat besi pada remaja putri di Kota Bogor. *Media Kesehatan Masyarakat Indonesia*, *14*(1), 1. https://doi.org/10.30597/mkmi.v14i1.3705

Pulimeno, M., Piscitelli, P., Colazzo, S., Colao, A., & Miani, A. (2020). School as ideal setting to promote health and wellbeing among young people. *Health Promotion Perspectives*, *10*(4), 316–324. https://doi.org/10.34172/hpp.2020.50

Renyoet, B. S., Martianto, D., Sukandar, D., Masyarakat, D. G., & Manusia, F. E. (2016). Economic losses potential due to stunting in toddlers in Indonesia year 2013. *Jurnal Gizi Pangan*, *11*(3), 247–254. http://journal.ipb.ac.id/index.php/jgizipangan

Rosdiana, D. S., Khomsan, A., & Dwiriani, C. M. (2018). Pengetahuan asam urat, asupan purin dan status gizi terhadap kejadian hiperurisemia pada masyarakat perdesaan. *Media Pendidikan, Gizi, Dan Kuliner*, *7*(2), 1–11. https://doi.org/10.17509/boga.v7i2.14291

Ruchayati, F. (2012). Hubungan kadar hemoglobin dan lingkar lengan atas ibu hamil trimester III dengan panjang bayi lahir di Puskesmas Halmahera Kota Semarang. *Jurnal Kesehatan Masyarakat*, *1*(2), 578–585. http://ejournals1.undip.ac.id/index.php/jkm

Ruswati, R., Leksono, A. W., Prameswary, D. K., Pembajeng, G. S., Inayah, I., Felix, J., Dini, M. S. A., Rahmadina, N., Hadayna, S., Aprilia, T. R., Hermawati, E., & Ashanty, A. (2021). Risiko penyebab kejadian stunting pada anak. *Jurnal Pengabdian Kesehatan Masyarakat (Pengmaskesmas)*, *1*(2), 34–38. https://journal.fkm.ui.ac.id/pengmas/article/view/5747

Sánchez-Díaz, S., Yanci, J., Castillo, D., Scanlan, A. T., & Raya-González, J. (2020). Effects of nutrition education interventions in team sport players. A systematic review. *Nutrients*, *12*(12), 3664. https://doi.org/10.3390/nu12123664

Sriwahyuni, S., Safrizal, S., Darmawan, D., Nabela, D., Ilham, R., & Muliadi, T. (2022). The capability of village devices in stunting prevention in Nagan Raya District. *AcTion: Aceh Nutrition Journal*, *7*(1), 89–95. https://doi.org/10.30867/action.v7i1.759

Titaley, C. R., Ariawan, I., Hapsari, D., Muasyaroh, A., & Dibley, M. J. (2019). Determinants of the stunting of children under two years old in Indonesia: A multilevel analysis of the 2013 Indonesia basic health survey. *Nutrients*, *11*(5), 1106. https://doi.org/10.3390/nu11051106

Upadhyay, S., Kumar, A. R., Raghuvanshi, R. S., & Singh, B. B. (2011). Impact of nutrition education on knowledge and haemoglobin status of hill women in Uttarakhand State of India. *Malaysian Journal of Nutrition*, *17*(3), 347–357. https://pubmed.ncbi.nlm.nih.gov/22655456/

Vitaloka, F. S. W., Setya, D. N., & Widyastuti, Y. (2020). Hubungan status anemia ibu hamil dengan kejadian stunting balita usia 24-59 bulan di Wilayah Kerja Puskesmas Gedangsari II Gunung Kidul [Poltekkes Kemenkes Yogyakarta]. In *Poltekkes Kemenkes Yogyakarta*. http://eprints.poltekkesjogja.ac.id/2200/

Yien, J. M., Hung, C. M., Hwang, G. J., & Lin, Y. C. (2011). A game-based learning approach to improving students' learning achievements in a nutrition course. *Turkish Online Journal of Educational Technology*, *10*(2), 1–10. https://eric.ed.gov/?id=EJ932220

Yulia, C., Hasbullah, H., Nikmawati, E. E., Mubaroq, S. R., Abdullah, C. U., & Widiaty, I. (2018). Augmented reality of traditional food for nutrition education. In *MATEC Web of Conferences, 197*, 16001. https://doi.org/10.1051/matecconf/201819716001