

Empowering Adolescents in Stunting Prevention: A Literature Review on Educational Media and Methods

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ABSTRACT

Introduction: The Indonesian Health Survey (IHS) data in 2023 stated that the prevalence of stunting was 21.5%. One form of handling stunting with nutrition and health education, especially for adolescents who will later give birth to a healthy generation.

Method: The literature review is based on national and international scientific journals on educating adolescents on stunting management. Publications between 2019-2024 databases; PubMed, ScienceDirect, Google Scholar, and Semantic Scholar. Obtained by using keywords; education, teenager, handling, stunting. There were 105 articles identified, then 80 literatures were screened. Further selection related to abstract, full text, open access type of research obtained 50 articles. The final process is to read and select eligible articles based on the criteria obtained 30 relevant articles consisting of 10 international journals and 20 national journals with the Population is all adolescent girls.

Result: There were 30 articles that met the criteria, explaining about adolescents, stunting and education for adolescents about handling stunting and the media used in education for handling stunting. Educational media are booklets, audio, whatsapp, social media, stunting prevention cards while educational methods are training and brainstorming.

Conclusion; Educational outreach can improve adolescents' knowledge of nutritional intake (iron and protein), understanding of 1000 HPK and Fe tablet consumption as well as improve adolescents' attitudes and behaviour in stunting prevention. Education can provide significant results that must be supported by media. The delivery of education using good media such as videos, digital booklets, whatsapp and Stunting Prevent Card will make it easier for adolescents to understand the educational material presented.

Keywords: Education, Teenager, Handling of stunting

1. INTRODUCTION

Stunting is still a prevalent malnutrition problem in the world. According to the Joint Malnutrition Estimates (JME) released in 2023, insufficient progress has been made towards achieving the World Health Assembly's (WHA) global nutrition targets for 2025 and the sustainable development goals (SDGS) for 2030. Only about one-third of the world's countries are on track to reduce the number of stunted children. By 2022, 148.1 million or about 22.3% of children under the age of 5 will be stunted, with more than half of stunted children under five living in Asia and two in five living in Africa¹. Stunting remains a serious nutritional problem in Indonesia as the percentage is above the World Health Organisation (WHO) threshold of 20%.² As of 2018, WHO revealed that stunting in Indonesia ranked third throughout Southeast Asia with a percentage of 36.4%.³ Indonesia is still ranked 108 out of 132 countries with the highest prevalence of stunting in the world⁴. Indonesian Health Survey (IHS) in 2023, stunting prevalence of 21.5 percent. The prevalence of stunting in South Sulawesi Province is 27.4%, higher than the results of the Indonesian Nutrition Status Survey (SSGI) in 2022, which was 27.2%.⁵

A nutrition problem that still occurs and is a national nutrition problem is stunting. Stunting is one of the problems that hinders human development globally. Currently, around 162 million children under the age of five are stunted. It is estimated that by 2025, 127 million children under the age of five will be stunted⁶. Stunting is a cycle. Children born to anaemic and malnourished mothers will experience stunting in the future and continue endlessly, which is called the intergenerational stunting cycle. The intergenerational cycle of stunting is difficult to break if not done at the right time⁷. The 1000 HPK period is the period of 270 days (nine months) in the womb plus the first 730 days (two years) of life after birth⁸. The 1000 HPK period is often called the Window of Opportunities or the golden period, which is based on the fact that during the fetal period until the age of two years there is a very rapid growth and development process that does not occur in other age groups. Fulfilment of nutritional intake in 1000 HPK children is very important. If at that age children get optimal nutrition, the decline in children's nutritional status can be prevented from the beginning⁸. The imbalance of nutrient intake with body needs over a long period of time is manifested by stunting in children under five. According to the Height-for-Age (TB/U) index, children are categorised as stunted if the z-score is between -3 SD and <-2 SD, and as severely stunted if the z-score is <-3 SD⁹.

Stunting is not only influenced by the nutritional status of pregnant women and children during 1,000 HPK, but also influenced by maternal nutrition in the previous period, especially in the pre-conception period, namely women of childbearing age (WUS) and adolescents as important targets in stunting prevention strategies. Adolescents have an important role in preventing stunting, so they need to be counselled so that they can participate in helping the government reduce the incidence of stunting¹⁰. Adolescence is included in the stage of human life, where in the period of adolescent life is a critical point because there is a transfer of age groups from children to adult life periods¹¹. The adolescent age group is vulnerable to health problems, especially adolescent girls, which can affect the next period of life¹¹ where adolescent girls will become Under or over nourished that occurs since adolescence and there is no effort to handle it so that nutritional problems occur throughout the life cycle will affect the nutritional status of adolescent girls, especially during pregnancy¹². For adolescent girls in particular, nutrient intake needs to be fulfilled as they prepare for motherhood¹³.

Prevention and handling of stunting must be carried out in synergy and involve all parties, with the form of handling must see the target and causes of stunting. The form of stunting prevention efforts is education about stunting so that people can understand about stunting. One of the target groups is adolescent girls through intervention by educating using the counselling method in schools¹¹. Early marriage is a complex phenomenon influenced by various social, economic, cultural, and individual factors, occurring among economically disadvantaged families. Children who are born into difficult economic environments have a high risk of higher experience stunted children due to lack of access to quality food. Early marriages are often followed by the birth of children at short intervals, at higher risk of stunting, as their mothers may not have fully recovered from previous pregnancies¹⁴. Children who marry at a young age tend to have a limited understanding of the importance of proper nutrition and health care¹⁵. As a result, they may not be able to provide good enough care for their children, including nutritious food. Malnutrition during a child's growing years can lead to stunting¹⁶. Research has found that early marriage education provided to adolescents plays an important role in preventing early marriage¹⁷. Adolescents who have good knowledge of their rights as individuals are more likely to resist early marriages that could violate these rights. Stunting prevention education on one pillar of nutritious food access with brainstorming method increases knowledge in stunting prevention¹⁸.

The purpose of this literature review research is to review various models and media for educating adolescents on handling stunting.

2. METHOD

This study is a literature review approach based on national and international scientific journals on education in adolescents towards handling stunting in Sinjai Regency. Published between 2019-2024 in several databases, namely PubMed, ScienceDirect, Google Scholar, and Semantic databases with keywords using Indonesian and English, namely education, teenager, handling, stunting, the results obtained were 105 articles, then screening of the publication year, namely 2019 to 2024, obtained 80 literature. Furthermore, selection was carried out regarding abstracts, full text, open access to the type of research obtained 30 articles. The final process is reading and selecting eligibility articles based on the criteria obtained 30 relevant articles (Figure 1). Articles were evaluated based on:

Inclusion Criteria

- a. Articles discussing education of adolescents on stunting management
- b. Year of publication 2019-2024
- c. Articles using English and Indonesian
- d. Original article, abstract, full text and open access

Exclusion criteria

- a. Type of literature review research
- b. Publication in community service journals

Strategi pencarian artikel dapat dilihat pada gambar 1.

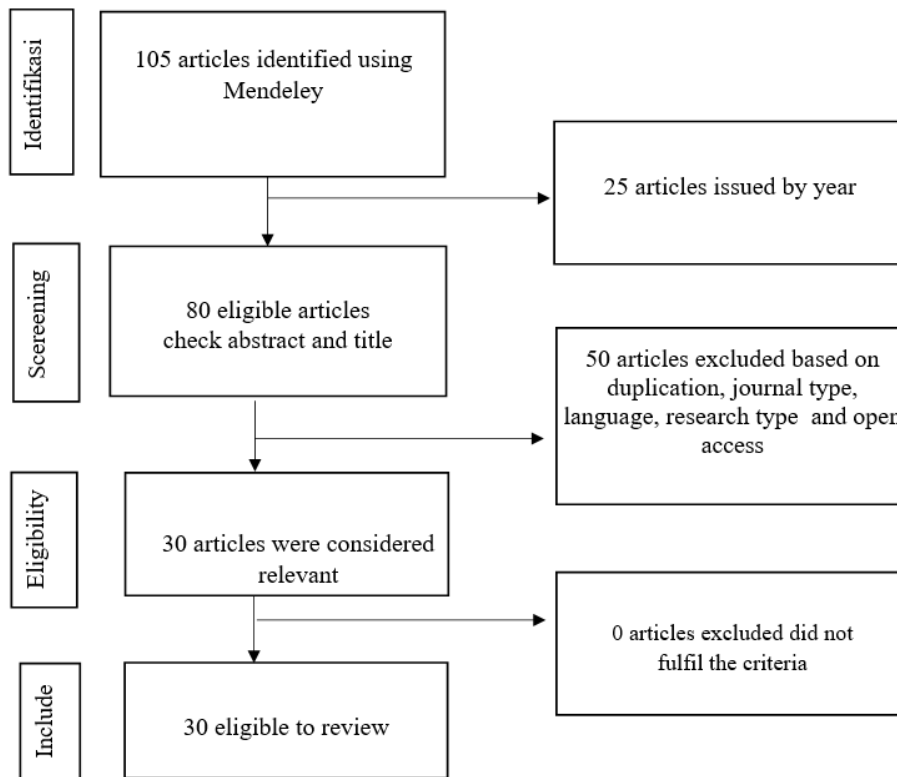


Figure 1. Flow Chart of Article Search

3. RESULT

This literature review was synthesised using a narrative approach by grouping the identified and extracted literature data according to the research objectives. The extracted literature was then read, reviewed and analysed based on the abstract and full text. A summary of the results of the review or analysis contained in the research results/findings is presented in table 1.

Table 1. Summary of Research Literature Extraction Results

No	Author/Years	Title	Type of Research	Sample	Data Analisis	Result
1	Lasmawanti, S., Siregar, M.A., dan Maria H.B/2022	The Effectiveness of Nutrition Education on the Improvement of Iron Intake, Protein and Hemoglobin Levels Towards Zero Stunting At Amanah Deli Serdang Private Junior High School in 2022	This was a quantitative study, using a quasi experimental design with one group pretest-posttest design	The sample in this study was 28 grade 2 students at MP Amanah Deli serdang,	This research was conducted by giving a pretest (initial observation) before being given an intervention, after being given an intervention, then a posttest (final observation)	Nutrition education for adolescents increases knowledge of the nutritional intake of iron and iron protein intake shows that the p value = 0.015. protein intake variables shows that the p value = 0.009,

					will be carried out again.	based on the hemoglobin level variable The p value = 0.009 for the three variables indicates that the p value is <0.05
2	Az-zahra, M.J dan Rahmat, S/ 2023	The Effect of Digital Booklet Media for the First 1000 Days Life on Adolescent Girls' Knowledge As an Effort to Prevent Stunting In Senior High School Bandung Regency	This study used a quasi-experimental research design with a one group pretest-posttest design without control	The sample was 83 schoolgirls out of 497 who were taken through stratified sampling technique.	Wilcoxon test	Difference in knowledge before and after being given digital booklet media to adolescent girls by 20, there was an increase in knowledge by 29,42%.
3	Emylisa, D.A., Nany, S., Desya M.F., dan Sigit Y/2023	Balanced Nutrition and Reproductive Health Education Through Whatsapp Media on Adolescents' Knowledge in Preventing Stunting	Pre experimental design with a one group approach pretest-posttest design	Method with the calculation of the Slovin formula totalling 77 subjects.	Paired T-test	Balanced nutrition and reproductive health education has an influence on increasing nutritional knowledge in efforts to prevent stunting.
4	Sulistiyowati, D.W.W., Halimatus Sa'diyah dan Ahdatul I/2023	The Effect of Stunting Prevent Card (SPC) Games on Adolescent Knowledge in Stunting Prevention	Types of research quasi-experimental with a plan one group pretest and posttest design.	42 respondents were selected using simple random sampling.	Wilcoxon Signed Rank Test and Shapiro Wilk.	SPC games increase adolescent knowledge about stunting so that they can become educational media from an early age and prevent stunting in the future.
5	Nurlaela, E dan Rasmanir (2023)	Balanced Nutrition Training For Adolescent Girls As Peer Educators On Improving Behavior Among Senior High School Students For Stunting	This type of research was an analytic survey with a quasi experimental design with a pre-test post-test	the peer education method treatment group of 40 students and the counseling method control group	The Mann-Whitney test was carried out with a significant level of 0.05.	The results of the statistical test showed that there was a significant difference between the level of knowledge, attitudes and

		Prevention	control group design model	of 40 students		practices of young women in the peer education treatment group and the control group with the counseling method, namely
6	Sarlina dan Admasari, Y/2022.	Knowledge and Attitudes of Young Women about the First 1000 Days of Life (HPK) in Stunting Prevention	Descriptive quantitative, which describes the description of the knowledge and attitudes of young women about the first 1000 days of life (HPK). The research was carried out at the SMAN in the Palu City area in April – June 2022	Total sample of 100 grade 11 and 12 students at Senior High School) in the Palu city area	Data were analyzed using Univariate analysis to describe the parameters of each variable studied.	The results showed that most of the respondents had sufficient knowledge about 1000 HPK, namely 66%, and had a negative attitude, namely 67%.
7	Kamba, I., Razak, A., Saifuddin, S dan Sukri P.	The Effect of Video on the Change of Attitude Toward Stunting Prevention among Children in State Senior High School 1 Topoyo, Central Mamuju	Quasi-Experiment” , pre-test post-test with control group design.	342 students	Wilcoxon test	The results showed that there was attitude change before and after intervention by watching video and video plus material explanation from instructor about first 1000 days of life (1000 Hari Pertama Kehidupan / HPK) and stunting prevention among children under five years old, which means that the video had an influence (p =

						0.000); there was no change found in the control group after intervention ($p = 0.713$). Furthermore, there was difference between the use of video and the use of video accompanied by explanation ($p= 0.000$).
8	Ulfah, B., and Fika A. (2023)	The Effect of Fe Tablet Booklet Media Education for Adolescent Girls to Prevent Stunting Efforts to Prevent Stunting	Descriptif analysis design	Sampel 56 remaja putri teknik with accidental sampling	Uji Wilcoxon	There is an effect of booklet media education on adolescents' knowledge about FE tablets.
9	Hayati, A.W., Husnan and Roziana (2023)	Training on the Utilisation of the Book 'Balanced Nutrition for Adolescents: Prevent Stunting' to Improve Food Consumption Patterns of Adolescents	Cross sectional	12 people consisting of 6 girls and 6 boys at Junior High School Kampar District, Kampar Regency Kampar	Paired T Test	Training on Utilisation of the Book 'Adolescent Balanced Nutrition: Prevent Stunting can improve adolescents' food consumption patterns
10	Sriwiyanti, Hartati, S., Dodi A.F dan Muzakar (2022)	Effectiveness of Nutritional Education on Knowledge and Adolescent Attitudes About Stunting in High School	Quasy Experimenta l One Group Pretest Posttest design	50 respondent of Senior High 05 on Lahat.	The statistical test used in this study is the Paired Samples T-Test.	There is an effect of providing nutrition education with booklet media on the knowledge and attitudes of young women.
11	Heryani, H., Lusi L dan Suhanda (2023)	Knowledge of Young Women Regarding the Components of 'My Plate' as a Strategy for Stunting Prevention	The research methodology employed is descriptive research.	214 sample on Junior High School 1 Ciamis.	univariate to obtain a frequency distribution.	The research findings reveal that the majority of young women exhibit sufficient knowledge, accounting for 91.1%, while

						the second-largest group demonstrates a lower level of knowledge at 6.1%
12	Lestari, E., Adiatma, S., Achmad, K.H., dan Arief, A.Y (2024)	Stunting and its association with education and cognitive outcomes in adulthood: A longitudinal study in Indonesia	Longitudinal Study	sample of 4,379 children aged 0–5	using longitudinal quantitative analysis as described in the file you uploaded, multivariate regression (OLS) and instrumental variable (IV) models were used to test the association between stunting and educational and cognitive outcomes.	The results of this study indicate that childhood stunting is significantly associated with lower educational outcomes and cognitive abilities in adulthood. Stunting reduces the length of education by 2 years, delays school entry age, and lowers cognitive and math test scores. The negative impacts on cognitive and educational abilities continue into adolescence and adulthood, although the effects weaken with age.
13	Natanael, S., Ni Kadek, A.P., dan Kadek, T. A (2022)	Stunting Perception Among Adolescent Girls In Gianyar Regency Bali (Stunting Perception Among Adolescents Girl In Gianyar Regency Bali Province)	Cross sectional study	High school female students in Gianyar Regency as many as 411 respondents were selected using non probability sampling technique	Descriptive analysis	The results showed that most respondents did not know if stunting is a nutritional problem in adolescents.
14	Rohmatin, E., dan Lies, I.P.S (2021)	Factors Influencing the Incidence of Unintended Pregnancy in	Jenis penelitian yang dilakukan pada	Adolescent girls who experienced unwanted pregnancy in	Univariate qualitative approach with phenomenology	The results showed that the cause of unwanted pregnancy in

		Adolescents In Rajadatu Village, Subdistrict Cineam Kabupaten Tasikmalaya	penelitian ini adalah kualitatif dengan The type of research conducted in This research is qualitative with a phenomenological approach.	Rajadatu Village, Sub-district Cineam Tasikmalaya Regency which amounted to 4 people with Purposive Sampling technique.		adolescents are risky sexual behaviour family income level, parenting, towards sexuality.
15	Munanda MI, Muharramah A, Komala R. (2021)	Relationship between Zinc Adequacy Level and Incidence of Stunting in Adolescents at SMP Negeri 2 Sukoharjo Academic Year 2020/2021	Correlation using the Cross Sectional approach	The sample taken as many as 115 people.	Bivariate analysis in this study using the Chi Square Test	Proportion respondents who were stunted were 44.3% and 55.7% who were not stunted. From the results of the bivariate analysis test between the level of zinc sufficiency with the incidence of stunting
16	Abidin U.W, Afriani. (2022)	The Relationship of Early Marriage to the Incidence of Stunting in Anreapi Subdistrict	Analytical observational with cross sectional study approach	All mothers of toddlers who gave birth to their first child in the Anreapi Health Centre working area were 36 samples. Sample withdrawal using non probability sampling technique	Chi Square Analysis	Respondents who married <19 years of age produced more stunted children (63.6%) than those who married over the age of 19 years. there is a significant relationship between mothers who married at an early age and the the incidence of stunting.
17	Wardhani PI. (2020)	Relationship between body image and diet with chronic energy deficiency (Kek) in adolescent girls	Cross sectional design	sample totalled 189 female students	Paired t-test and Wilcoxon test Signed Rank	There is a relationship between body image (appearance evaluation, appearance

		from high school in West Java.				orientation, body area satisfaction, overweight preoccupation, self-classified weight and diet (frequency of eating and type of food variety) with chronic energy deficiency
18	Sumartini, E. (2022)..	Adolescent Eating Behaviour Overview	Survey Research	106 teenagers aged 12-21 years	Analisis Uji Paired t-test dan Uji Wilcoxon Signed Rank Test	The research results showed that out of 106 respondents, the majority of adolescents (83.01%) had poor eating behaviour. Only 16.98% of respondents showed good eating behaviour. Poor eating behaviour includes not eating regularly, skipping breakfast, rarely consuming fruits, and eating snacks more often. Female adolescents were more dominant in having poor eating behaviour (84.41%) compared to males (79.31%). Based on age, late adolescents (18-21 years old) had the highest percentage of poor eating behaviour..

19	Rizkiana, E. (2022)	Knowledge and Attitude of Adolescent Girls towards Consumption of Blood Addition Tablet (TTD) as Stunting Prevention	Descriptif research	Sample of 40 adolescent girls with accidental sampling technique sampling technique	Univariat Analysis	The results showed that adolescent girls have good knowledge and good attitudes. The majority with good knowledge and attitude in consuming Fe tablets as a prevention of stunting is at the level of education level, and most of the adolescent girls have knowledge of the consumption of (TTD) consumption as a prevention of stunting in the good category.
20	Setyaningsih, P (2023).	Teenagers' Behaviour towards the consumption of nutritious food in Stunting Prevention	Descriptif Research	The sample of adolescent girls of SMA Muhammadiyah 04 Kendal was 30 with the total sample technique.	Univariat analysis	Adolescents sometimes eat regularly 3 times a day, with balanced nutritional food, rarely consume animal side dishes, vegetables and fruits and rarely consume water. Adolescents never consume TTD during menstruation.
21	Oktavia, L (2020)	Stunting in Adolescents from Industrial Labour and Fishermen Areas in Surabaya City Surabaya	Cross sectional study	145 respondent.	Chi square	There are differences in the nutritional status of adolescent height in industrial labour and fishing areas. The incidence of stunting is more prevalent in fishing areas
22	Maslikhah (2024)	The relationship between adolescents'	Cross Sectional study	teenagers totalled 42 people	Spearmen Rho	There is a significant relationship

		knowledge of adolescent nutrition and stunting prevention behaviour				between adolescents' knowledge about adolescent nutrition and stunting prevention behaviour.
23	Zuhriyatun F, Hastuti P, Rusmini R, Walin W. (2023)	Factors influencing teenage pregnancy	Field research (qualitative)	Adolescents who experienced pregnancy, parents of adolescents who experienced pregnancy and adolescents who did not experience pregnancy	<i>Dept Interview</i>	The causes of teenage pregnancy are media influence, promiscuity, environment, use of wrong information facilities, early marriage, juvenile delinquency, cultural factors: low education, unhealthy relationships, low economy, lack of knowledge about religion, trial and error, lack of knowledge about reproductive health, entering the age of marriage, helping parents who are economically disadvantaged, unwanted pregnancy and avoiding adultery.
24	Maritje S. J. Malisngorar ISWOJ.(2024)	Influence of Health Education on Stunting on Adolescents' Knowledge in Teluti Baru Village, Tehoru Sub-district	Pre-experimental design	66 teenagers	Chi-Square	The effect of education on the level of knowledge of adolescents on stunting in Teluti Baru Village, Tehoru Sub-district
25	Aulia NR. (2021)	Impact of nutrition knowledge on	Crossectiona l.	The 30 students in class IX of	<i>Chi Square analysis</i>	There was a relationship between

		energy intake, nutritional status and attitude towards nutrition of adolescents		SMP N 02 Banjarharjo Kec. Banjarharjo using random sampling method		nutrition knowledge and energy intake, nutritional status and attitudes about nutrition.
26	Ana V, Setyawati V, Yuniastuti A, Woro O, Handayani K, Farida E, et al. (2023)	Faktor Risiko Kekurangan Energi Kronik pada Remaja Putri di Kota Semarang	Remaja putri madya di SMA Laboratorium UPGRIS Kota Semarang sebanyak 42 orang	Penelitian ini merupakan studi kuantitatif dengan pendekatan cross sectional	Uji chi-square	Adolescent girls experience a lot of calorific energy deficiency, knowledge affects the status of calorific energy deficiency, and lifestyle has no effect on nutritional status.
27	Sudiarmanto, A.R., dan Sri S (2021)	The Relationship between Calcium and Zinc Intake with the Incidence of Stunting in Students of Bina Insani Superior Junior High School Surabaya	Cross sectional study.	There were 68 female students of Bina Insani Junior High School in Surabaya.	Descriptif and Correlasion Kendall's-Tau andi ANCOVA analysis	The result showed that 22.1% of the respondents were stunted and 77.9% were normal, with an average Z-score of 1.13 ± 0.94 . The consumption level of calcium intake was sufficient at 7.4% and 92.6% of intake was deficient, with an average intake of 336.7 ± 326.2 mg/day. The consumption level of zinc intake was sufficient at 5.9% and deficient at 94.1%, with an average intake of 5.7 ± 3.0 mg/day. There was no association between calcium intake ($r=0.072$; $p=0.385$), zinc intake ($r=0.124$;

						p=0.138), calcium and zinc intake (p=0.478) with the incidence of stunting.
28	Marlinawati, D.A., Rahfiludin, M.Z dan Mustofa S.B (2023)	Education Media about Stunting Prevention on Adolescents in Islamic Boarding Schools	Quasi-experimental pre-posttest design with control group.	162 participant divided into the intervention group (n=63) and the control group (n=63)	Independent sample t-tests, multiple linear regression, and gain scores.	The findings indicate a positive influence of educating adolescents through animated videos and booklets on their knowledge (p=0.000) and attitudes (p=0.000) regarding stunting prevention. Notably, the average gain score for knowledge increased by 63.99%, and for attitudes by 58.49%.
29	Neherta, M dan Yonrizal N (2021)	Primary Prevention of Neglect in Children through Health Education for Adolescent Girls in West Sumatra, Indonesia	Quasi experimental research, one-group design.	involving 370 female adolescents as respondents	Wilcoxon test.	Health education interventions on anemia prevention can improve knowledge and attitudes among female adolescents; anemia prevention got a p-value of 0.00
30	Susanto, B.N.A., Nofri Z , Selvy, A., , Deden G.N (2023)	The effectiveness of health counseling with video and leaflet media on knowledge and attitude of stunting prevention on the members of the adolescent counseling and information center (pikr)	Pre-Experiment Design using the one Group Pretest-Posttest design	The sample consisted of 20 PIK-R members with details of 10 subjects for group 1 with health education treatment with video media and 10 subjects for group 2 with	Wilcoxon test	The research results showed that counseling using video media and leaflets significantly increased teenagers' knowledge and attitudes regarding stunting prevention.

				health education treatment with leaflet media		Based on the analysis, video media is more effective than leaflets in increasing knowledge (p=0.008) and attitudes (p=0.008) of PIK-R members in Taban, Tangerang. Although leaflets also improved knowledge (p=0.025) and attitudes (p=0.025), the improvements produced by videos were greater
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4. DISCUSSION

Teenagers

Teenagers are vulnerable to various nutritional problems, such as undernutrition and overnutrition. Adolescent nutrition needs special attention because it affects the growth and development of the body as well as the impact on adulthood. Chronic energy deficiency (CHD) is a health problem caused by a lack of nutrients such as energy and protein, so that the nutrients needed by the body are not fulfilled. The nutritional problem of SEZ is prominent in the group of women of childbearing age (WUS), especially adolescent girls. The results of Jumiatus's research ¹⁹, shows that adolescent girls rarely consume animal side dishes, vegetables, fruit, water and never consume (TTD) during menstruation ²⁰ The results of Eni's research show that most adolescent girls have poor eating behaviour. teenagers sometimes eat regularly in 3 times a day, sometimes breakfast, sometimes consume staple foods and side dishes, rarely consume fruit, always consume snacks 2-3 times a day and sometimes read labels before buying packaged food. In adolescence, especially teenage girls are often very concerned about their body shape so that many limit their food consumption. In fact, many go on a diet without the advice or supervision of health and nutrition experts, so that their consumption patterns violate nutritional rules. Many self-determined taboos or restrictions are based on hearing from friends who are not competent in nutrition and health matters, resulting in various symptoms and complaints that are actually symptoms of nutritional disorders.²¹, one of them is chronic energy deficiency²².

Teenage girls and women of childbearing age at risk of Chronic Energy Deficiency who become pregnant tend to give birth to babies with low birth weight which will ultimately inhibit growth in toddler age and if not immediately addressed can result in stunted children ²³.For short-term effects of Chronic Energy Deficiency include anaemia, suboptimal organ development and less physical growth, resulting in less productive people, so there needs to be prevention of the incidence of Chronic Energy Deficiency ¹⁹. Teenage girls who have low and inadequate levels of protein intake over a long period of time can cause inhibition of linear growth and sexual maturation, decreased muscle mass, organ function and immunity, inhibition of iron transport and reduced fat-free body mass. In addition, adolescent girls will also be at risk of Chronic Energy Deficiency. This can occur because the role of protein in building the structure of body tissues becomes the final part to supply energy needs when carbohydrate and fat intake is reduced and as compensation when there is an energy deficit. Many adolescent girls often skip two meals and prefer snacks. Whereas most snacks are not only empty of calories, but also contain few nutrients, besides being able to disturb (eliminate) appetite. Teenagers, especially young women, love junk food that contains very little (or no) calcium, iron, riboflavin, folic acid, vitamin A, and vitamins ²³. Teenage girls who are anaemic are at risk of becoming anaemic women of childbearing age and subsequently anaemic pregnant women, even those with protein energy deficiency. This increases the likelihood of giving birth to a low birth weight (LBW) and stunted baby, complications during childbirth, and several other pregnancy-related risks, as well as the risk of giving birth to a generation with nutritional problems.²⁴.

Stunting

Stunting is a state of failure to thrive due to chronic nutrient deficiencies. Women with stunting tend to produce low birth weight babies, if the baby is a girl then the child is likely to continue the cycle, creating an intergenerational cycle. The cycle will tend to be difficult to break if not done at the right time. Adolescence is one of the critical windows for growth improvement or height catch up. One way to break the intergenerational cycle of stunting is to improve the nutrition of adolescent girls before conception⁷. Research shows that adolescents who are stunted are mostly less than the recommended zinc sufficiency²⁵. A higher level of zinc sufficiency in adolescents will lead to better height growth, while a lower level of zinc sufficiency will lead to inhibition of the height growth process in adolescents. Zinc is one of the micronutrients that plays an important role in human growth because it has the structure and role in several enzyme systems involved in physical growth, immunological and reproductive functions. As a result, when zinc deficiency occurs, it can affect the physical growth of children. Zinc is also associated with important hormones involved in bone growth such as samatomedin-c, osteocalcin, testosterone, thyroid hormone, and insulin. Zinc also facilitates the effect of vitamin D on bone metabolism by stimulating DNA synthesis in bone cells.²⁵

A woman who suffers from malnutrition before pregnancy or during the first week of pregnancy is likely to give birth to a baby with brain and spinal cord damage because the central nervous system is very sensitive in the first 2-5 weeks. If it is suffered by pregnant women²⁶ then mothers will give birth to babies with Low Birth Weight²⁷. This study found that women who give birth at the age of <19 years will produce more stunted children. This might happen because women who are less than 18 years old usually have poor parenting that can have an impact on the nutritional status of their children.²⁸

Education

The knowledge of nutrients will affect the attitude of adolescents in choosing or consuming food to fulfil the body's needs. Nutritional knowledge can be obtained through education or counselling about nutrition. Attitude in choosing good snacks can affect a person's health condition because he is able to accept and respond or like healthy and nutritious food. This can show that attitude is formed from the knowledge component and this will affect a person's behaviour in choosing balanced food. Good eating behaviour can affect the quality of food consumed³⁰.

The research states that adolescents who have good knowledge about adolescent nutrition will have good behaviour in preventing stunting³¹. As an example of adolescents who experience menstruation every month, they will take blood supplement tablets during menstruation, adolescents will consume foods that contain good nutrition, choosing healthy foods compared to fast food. The research proved that building a comprehensive educational intervention can improve the knowledge and attitude of respondents to reduce anaemia cases in adolescent girls who are expecting mothers.^{24, 32}

Health education on stunting for adolescents fosters adequate nutritional knowledge in adolescent girls and can initiate early maternal readiness, thus affecting pregnancy outcomes and the welfare of children who are born, because adolescent girls who are malnourished are at risk of stunting.^{33,34} It is essential to educate adolescents to foster positive perceptions and motivation to prevent stunting. Knowledge reinforcement in adolescents aims to encourage behaviour change related to health maintenance. Information dissemination serves as a strategy to increase knowledge, foster awareness and, ultimately, align behaviour with the knowledge gained.⁶

There are various ways to increase adolescent knowledge, one of which is by utilising appropriate and easy-to-understand digital-based creative media such as digital booklets that make respondents more interested and the educational content delivered can be well received by respondents. Az-Zahra's research results³⁵, showed that educational interventions using Booklet media for the first 1000 days of life increased the knowledge of adolescent girls. The increase in knowledge itself is influenced by various factors, one of which is the number of interventions carried out to the target. The education of balanced nutrition and adolescent reproductive health using whatsapp media gave positive results. This is due to the delivery of education through whastapp media can be well received by adolescents because the delivery is clear and presented in an interesting way²³. Education of Fe tablets with Booklet media showed a significant effect on adolescents' knowledge of Fe tablets. Booklets can generate interest in reading, and understand the content more clearly³⁶. Using the Stunting Prevent Card (SPC) media provides significant results in increasing adolescents' knowledge about stunting³⁷. This increase in knowledge is due to new information conveyed to students through the educational process, where the new information obtained is a substitute for knowledge that has been previously obtained or is a refinement of previous information^{38, 18}. The education on adolescent nutrition knowledge can be obtained through various media, one of which is social media. Social media is one of the media used by people to communicate with others. One application that is often used in the learning process is WhatsApp. Whatsapp is one of the learning media used in schools, considering that currently the features in whatsapp are easier and more interesting. We can send pictures, videos, audio, and materials in the form of pdf or other Microsoft office. In addition, this method is quite effective to use nowadays even without face-to-face to minimise the crowd.³⁹. Kegiatan yang sama telah terbukti memberikan efek yang baik terhadap pengetahuan peserta kuliah whatsapp (kulwap)⁴⁰.

Research by Nurlaela⁴¹, state that nutrition training for adolescents can improve adolescent behaviour in relation to stunting prevention. The training used peer education for the treatment group and counselling for the control group. The peer

education method is a system of delivering information through peer education. Peer education can overcome some difficulties, can transfer knowledge and communication is carried out more freely and openly in peer groups.⁴² The education of peer groups is conducted among peer groups guided by a facilitator who also comes from the group itself.⁴³ Supporting factors for better nutritional behaviour change in adolescents after peer education are educators who have attended training so that they have basic skills as educators and have good self-confidence, using styles and language that are appropriate for group members so that they are easily understood by group members (respondents). Peers can provide modelling exercises because they are very similar to the behaviour and style of their group members. Peers have a greater influence in conveying information⁴⁴, professionals are often unable to do so because peers are quicker to enter and adapt to society because their language style, appearance, and desires tend to be the same⁴⁵.

It is also possible to educate people by providing videos. Videos can display sound, images and movement at the same time, making this media effective in presenting various topics related to health issues that are difficult to convey through verbal information. On the other hand, leaflets have some disadvantages, such as being easily folded. If the printed leaflet is not able to attract people's attention, then there is a high probability that people will throw it away. In addition, if the font used is too small and the arrangement is not attractive, then people will be reluctant to read the brochure. Moreover, leaflets cannot accommodate the needs of people who cannot read and write.⁴⁶ Utilisation of the media used were animated videos and booklets, incorporating alternative media such as booklets combining images and text showed a positive effect on students' knowledge and attitudes in the pesantren environment.⁴⁷

The study found that education using video media had an effect on attitude change. Video playback needs to be accompanied by explanations by teachers or instructors who understand the material being broadcast, so that it is more Effective in changing students' attitudes⁴⁸.

Conclusion

The education can provide significant results must be supported by media. The delivery of education using good media such as videos, digital booklets, whatsapp and Stunting Prevent Card will make it easier for adolescents to understand the educational material presented.

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