

Original Article

Adolescent women as a key target population for community nutrition education programs in Indonesia

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Background and Objectives: Adolescence is a critical life-stage that sets the foundation for health in adulthood. Adolescent women are a unique population and should be targeted as such for nutrition promotion activities. Using Indonesia as a case study, this qualitative study aimed to identify existing nutrition promotion programs aimed at adolescent girls, how best to target this population and effective recommendations to inform nutrition education program design for this important group. **Methods and Study Design:** Semi-structured interviews and questionnaires were conducted with ten key informants working in public health in Indonesia. Interview transcripts were analysed and coded to identify key themes. **Results:** No existing nutrition education programs targeting adolescent women in Indonesia were identified. Several strategies apply to nutrition programs for adolescent girls: 1) nutrition promotion messages that are relevant to the lifestyles and interests of adolescent women; 2) technology-based interventions show promise, however, they need to be appropriately targeted to sub-groups; 3) school remains an important setting; and 4) early marriage is an important issue affecting nutritional status and engagement of adolescent girls. The informants recommended that: 1) more research is needed about the underlying motivations for behaviour change among adolescent women and ways to effectively implement the identified engagement strategies; 2) adolescent girls should be included in program design to improve its suitability and uptake; and 3) government budget and policy support is crucial to success. **Conclusions:** Adolescent women are an important population group and more research is required to identify the optimal forms of engagement to improve nutrition programs for them.

Key Words: adolescent health, nutrition, Indonesia, qualitative, women

INTRODUCTION

Community nutrition education programs in developing countries aim to address a number of nutrition-related health issues including stunting, wasting and overweight/obesity. Such programs targeting mothers and children under five years have been found to have positive effects on the nutritional knowledge of mothers, their nutritional practices and behaviours and the nutritional status of infants and children.¹⁻⁷ There are several clear gaps in the literature and in nutrition education practice including strategies that address adolescence as a specific, and crucial, stage in the lifecycle.^{8,9}

To date, nutrition programs in developing countries have predominantly focused on maternal and child health, targeting women as a homogenous population.^{8,10} However, there has been growing recognition of the importance of adolescents as a separate population and as influential change agents for both direct nutrition programs and nutrition-sensitive interventions.^{8,9,11-15} Adolescent girls represent a unique population, distinct from adult women, with specific health needs in a life-stage of rapid growth and change.^{8,11,13,16}

Adolescents, defined by the World Health Organisation (WHO) as individuals 10-19 years of age, are an increase-

ing population in developing countries as maternal and child health improves, however, the health of adolescents has not improved at the same rate as the rest of the population.^{9,11,14} Optimal adolescent growth has the potential to counter childhood stunting and adolescence sets the stage for adult nutrition behaviours.^{9,11,13} In developing countries, where early marriage is common, adolescent girls face an increased risk of malnutrition and complications during pregnancy; pregnancy-related deaths are the second highest cause of death for 15-19 year old women.^{8,9,13,16} Additionally, the intergenerational consequences of malnutrition, whereby malnourished mothers are more likely to have malnourished children, further perpetuating the malnutrition cycle, are accentuated among adolescent mothers.^{13,16,17}

There is little published research on the food beliefs, behaviours and motivations of teenage women in lower-middle income countries (LMIC). Studies of adolescent

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health behaviours in general show that adolescents' choices are influenced by a range of structural and inter-personal factors including culture, poverty, access to education, the media, the school environment and their peer group.^{14,15}

Many LMICs, as they become more developed, experience a phenomenon known as the nutrition transition; changes in lifestyle and dietary patterns tending towards decreased physical exercise, increased consumption of energy-dense foods leading to increases in obesity and related diseases.¹⁸ There is a lack of information regarding the effect of the nutrition transition on the nutritional status and food choices and behaviours of teenage girls.

Indonesia, a LMIC, was selected as a case study for this research because of its high malnutrition indices, its proximity and diplomatic ties to Australia, and the current favourable political environment for the implementation of nutrition interventions.¹⁹ There is a substantial gender health gap in Indonesia and it is ranked 97 out of 142 countries in a global equality gap ranking.²⁰⁻²² The legal age of marriage in Indonesia is 16 and the adolescent fertility rate of 48 births/1000 women is significantly higher than the regional average of 16.^{19,23} Various donors, non-government organisations (NGOs) and other organisations are implementing community nutrition education programs in Indonesia, however, these predominantly target mothers and children under five years which highlights the gap in adolescent nutrition.²⁴⁻³⁰ Further research is needed to identify how to best target adolescent women in Indonesia for nutrition education and to reinforce advocacy efforts to ensure this population is targeted.

This study is practical in nature and its purpose is to inform nutrition program design and provide direction for further research. The study had the following aims:

1. To identify the key nutritional issues facing adolescent women in Indonesia.
2. To identify any current nutrition education programs that target Indonesian adolescent women.
3. To identify key strategies which are likely to be effective in engaging adolescent women in nutrition education programs in Indonesia (and to a lesser extent other developing countries).
4. To provide recommendations for the design and implementation of nutrition education programs targeting adolescent women in Indonesia (and to a lesser extent other developing countries).

MATERIALS AND METHODS

Study design

A literature review on community nutrition education programs found that little is known about the nutrition promotion needs of adolescent women in LMICs generally, and Indonesia specifically (unpublished review, Savage A, 2015). A qualitative approach guided by grounded theory and case study theory was employed for this research.³¹⁻³⁴ This was a formative study and as such did not have a testable hypothesis. The study was conducted as the research component of a Master of Human Nutrition at Deakin University, Australia.

Key informant semi-structured interviews and written surveys were selected as the most appropriate form of data collection due to their common use in social re-

search³⁵ and the limited time and financial constraints of the student researcher (AS). A questionnaire consisting of five questions, developed by the authors, was administered. Four questions related directly to each of the aims and a final open-ended question allowed participants to provide any further comments.

Selection and recruitment of participants

Purposive, maximum variation sampling was utilised to obtain a range of key informants.³¹ Participants were identified and recruited through the personal and work contacts of the authors. Ten individuals, nine located in Indonesia and one in Sweden (of Indonesian nationality), participated in the research (see Table 1). Nine out of ten participants were female. Four participants worked in NGOs, three in universities/research institutes, one in a multilateral organisation and two were independent consultants. The participants worked in a variety of locations in Indonesia including Jakarta, East and West Java, West Timor and East Nusa Tenggara in a range of roles including nutrition program management, nutrition research, medical practitioner and tertiary nutrition teaching. English was a second language for all the participants.

Ethics

Ethics approval was obtained from the Deakin University Human Ethics Advisory Group (HEAG) on 23 March 2015 with reference HEAG-H 14_2015.

All participants were provided with a Plain Language Statement via email and signed electronic consent forms were obtained from all participants. Details that could identify participants are not provided here in order to protect their anonymity.

Data collection and analysis

Eight recorded interviews were conducted by AS via

Table 1. Participants

	Number of participants
Gender	
Men	1
Women	9
Age	
25-34	2
35-44	4
45-54	2
55-64	1
65+	1
Organisation	
NGO	4
Research Institute/University	3
Private clinic	1 [†]
Multilateral Organisation	1
Other	2
Work locations [‡]	
Nationally	3
East Nusa Tenggara	3
Jakarta	2
East Java	1
West Java	1
West Timor	1

[†]One participant noted two roles.

[‡]Some participants worked in more than one location.

Skype and two email responses to the questionnaires were accepted. There is no consensus on the ideal sample size for qualitative studies or the level at which data saturation occurs; recommendations for minimum sample sizes range from 5 to 30.³⁶ Given the specificity of Indonesian adolescent women as a group, the relative homogeneity of the informants, the small number of interview questions and the specificity of the topic, the researchers expected that a sample size of 6-12 would be sufficient to draw out key themes and provide a useful analysis.³⁶ This is consistent with the literature on sample extensiveness in qualitative research.^{36,37} This assumption appears to have held true as little new information or ideas emerged from the final two interviews.

An individual external to the study team transcribed the interviews and all transcripts were checked and corrected by AS. The transcripts and interview notes were first reviewed for key themes. Transcripts were imported into NVivo qualitative data analysis software (QSR International Pty Ltd. Version 10.2.0, 2014), which was used to analyse and code the transcripts by AS. The coding structure was reviewed by the other authors and a third pass was conducted by AS to re-arrange the data into clearer themes and sub-themes. An independent reviewer coded a sub-sample (3) of the transcripts confirming the validity of the coding and reducing bias.

RESULTS

The overarching themes that emerged from the informant interviews were: issues with the nutritional status of adolescent women, key determinants of their nutritional status, strategies to engage this population in nutrition education programs and other informant recommendations for targeting adolescent girls. These themes were validated by an independent coding of a sample of transcripts that resulted in similar theme analyses.

Nutrition issues

Nutritional status

Seven of the ten participants specifically identified iron deficiency anemia as one of the fundamental nutrition issues of adolescent women; three participants noted general micronutrient deficiencies. Seven informants also cited obesity and/or under-nutrition as key concerns. One participant who had worked on the development of a national strategy for adolescent health commented:

The three main issues that we highlighted in this national strategy were anemia, low weight and overweight.

HIV was also mentioned by one informant, and two participants specified stunting as a concern. One participant discussed Vitamin D deficiency, seen as an emerging nutrition issue caused primarily by lack of exposure to the sun due to an increase in Islamic religious practices that involve wearing a hijab so the majority of the body is covered, except the face and hands.

Determinants of nutritional status

Several determinants of adolescent women's nutritional status were highlighted as key issues. Seven informants identified lack of knowledge and awareness as fundamental problems and two informants expressed concern with

the information sources that adolescent women utilise.

A major issue is that there is very little awareness and very little knowledge and loads of myths that they are exposed to and that they strongly believe in. For instance, vitamins have historically been promoted in Indonesia as something to increase appetite. So if you try to convince adolescents that they should be taking vitamins or minerals or multi-micronutrients they think immediately it will make them fat.

Several themes related to gender emerged including body image, early marriage and women's changing roles. Five participants identified 'body image' issues as a concern. One participant stated:

They have idols, they have role models, they want be thin and beautiful and they don't know how to do that in a healthy way.

Three participants identified the common practice of early marriage, and accompanied adolescent pregnancy, as a key concern for female adolescent nutrition status. One informant stated:

They can move from their houses at any time and be expected to carry a baby, to be pregnant and start motherhood at that age. While we know that during that age period they are still continuing to grow.

Indonesia's nutrition transition was also identified as a key factor. A shift in women's roles, increased consumption of fast and processed foods and a lack of practical dietary skills were highlighted. One participant described some aspects of the cultural transition:

Our culture shifted from being very specific in terms of female roles in the society. The female is supposed to be the cooking expert in the family and it shifted being more focused towards education per se, and towards career. That is a very good step but as a result of that there is lack of skill in terms of cooking and food preparation in the family.

Structural issues within government and a lack of commitment were also emphasised. Two informants noted the focus on the first 1000 days, under-fives and maternal health. Four participants identified issues with decentralisation, such as the differing priorities of local governments, and difficulties with coordination between government departments such as the Ministry of Health (MoH) and the Ministry of Education (MoE) as barriers to addressing adolescent women's health. Four participants also emphasised a lack of access to nutritious healthy food, particularly for rural and poor populations, and the lack of government control of the food market.

Everyone is focusing on the first one thousand days, or first two years or pregnancy and every time there is any time to move to focusing on adolescents the budget is never there.

So national government develops national policy, and the implementation, including modification, is at the district levels. The problem is there is unclear mechanism of how the national government can facilitate and assist the local government in actually delivering the program including nutritional education. In Indonesia it is really difficult because Education is under one ministry and Health is under another so getting them to work together has proven to be very, very challenging thus far.

Current nutrition education programs

All participants agreed that the nutrition needs of young women should be a priority but they were unaware of any current nutrition education programs aimed specifically at this target group. Some informants thought that some small NGO projects may exist and that sometimes there is some nutrition education included in reproductive health programs in schools and community health centers (puskesmas). Three participants noted that female adolescent nutrition is included in some national policies, including one specific recommendation in the national dietary guidelines. However, implementation of these policies appears to be rare, if not non-existent.

I don't think there is any kind of systematic activity towards that particular end [adolescent women's nutrition]. Maybe some sporadic [activities] here and there just trying to get the budget to be spent but not anything that's well thought out, real strategy, at least not at the national level.

Engagement strategies

School

Integrating nutrition into school activities was the most commonly cited strategy for engaging adolescent women (eight informants). Suggestions included incorporating nutrition, particularly practical skills, as a subject in the national curriculum, integrating it into existing subjects or extra-curricular activities. The high school enrolment rates in Indonesia were noted and one informant stated that they would be a "captured market". Identified barriers included challenges with MoH and MoE collaboration, difficulties in curriculum change and low teacher capacity. Furthermore, concern was expressed about how to reach the out-of-school population, often the poorest of the poor.

Put nutrition education in the system of education so it's built-in a subject.

To get anything into the national curriculum is really difficult.

We have to build the capacity of the teachers, the ones who facilitate the sessions in the school.

Youth Organisations

Seven participants suggested nutrition promotion through existing youth/community organisations, particularly church or mosque groups.

If they already have something where they come together, groups or organisations, that could be something to piggy-back on instead of having to set up something completely different.

One thing that is being tried but not successful on a large scale is going through religious leaders either in churches or in mosques and see how they can be engaged to spread messages.

Make nutrition trendy

A prominent theme was the necessity to make nutrition 'trendy' and engage the interest of young women. Informants suggested focusing on the relation between nutrition and teenage girls' interests such as beauty and fashion. Five informants also suggested the use of role models.

You need to make nutrition something really cool but it

hasn't happened and, to be fair, making nutrition really cool is quite difficult. It is not impossible.

They are looking for role models and successful older female figures.

What we actually need is some people, maybe health experts or nutrition experts who can sell.

There was some disagreement on whether the use of celebrities as role models is recommended.

Presenting powerful, passionate nutrition speakers and educators instead of artists. Audience tends to focus on the celebrities' appearance rather than the content of events.

...use of a champion or celebrity that can address issues related to nutrition and growth.

Technology and Media

The informants consistently mentioned the use of mobile technology, television and social media as key engagement strategies for female adolescents and that their use is high among Indonesian youth. Television viewing rates were noted to be high even in rural areas. Some informants commented on internet unreliability in Indonesia, lower access of rural and poor populations to some technologies and the substantial costs of television advertising.

...Indonesian teenagers are very well versed in technology.

We are among the top five users of Facebook....However, doing social media is one of the most unpredictable campaigns but at the same time it can be quite effective and low budget.

Most have phones but not all have smart phones. Again it's depending on where you are and which socio-economic group you are talking about.

Television is still major driver of communication, of trends basically, in Indonesia. I think the problem is in terms of budget.

Informants' Recommendations

Sub-groups

Eight informants stressed that Indonesian female adolescents cannot be targeted as a homogenous population. Suggested stratifications included rural versus urban, socio-economic status, marital status, school attendance and location.

Indonesia is very heterogeneous so there is no one approach that fits all. If you go to Jakarta and you do your work there and you want to replicate it in, even in West Java, you will find that it doesn't really fit. Let alone if you go to another island.

In some areas there's just no food in the market. In other areas there is, but it is very expensive. You have to link it with the local situation.

Behaviour Change

Two informants recommended that programs be designed with a focus on behaviour change rather than simply nutrition education. It was recommended that this include a focus on practical skills, such as food preparation, reading food labels, and how to eat a balanced, healthy diet. Five informants also highlighted the development of

specific messaging for the target group as a key consideration.

It's really overwhelming all the information that you can give people about nutritional content and what it does to your body and then you miss your goal of a behaviour change.

Nutrition is important, you have to eat healthy food, nutritious food, balanced diet but if you don't actually give them the tools, show them this how you do it, then you won't get change in behaviour.

The messages need to be designed so they can be accepted by adolescents. They are in a very special period of time, which needs a different approach than children or adults.

Government support

The need for greater government policy and budget support was mentioned by four participants.

The first thing is to develop the policy.

First of all, political will from the authorities to give attention to nutrition problems in adolescence, rather than only focus on under five or pregnant women.

It's about advocating the government to be more interested to invest in adolescent nutrition.

Research

Six informants identified the need for further research about adolescent women's nutrition and the best ways to target and engage this population. One informant outlined this recommendation as follows:

The most immediate recommendation that I can make is to have someone do the research and try to catalogue all this information that is available for adolescent females. What level of understanding do they have? What kind of image is in their heads? What is the issue? Is it body image, is it lack of understanding, is it family situation? One of the things that would be my question is where do they put the locus of control in terms of their food intake?

Combine with other programs

Given the competing priorities and resources of government and adolescent girls themselves, four participants recommended combining nutrition with other programs such as reproductive health, life skills training, HIV and women's empowerment.

Depending on the formative research, which should be really opened-minded, there could be other issues where you can combine it with nutrition so it isn't a stand-alone thing.

Other points

Engaging adolescent women in program design and the engagement of young men were also mentioned by two and one informant respectively.

They [adolescents] are actually very creative. So we have to involve them in developing the messages.

I think we have to also focus not just on females but also males. How can males also support the females?

DISCUSSION

This is the first study to explore practical strategies and

recommendations for addressing the nutritional needs of adolescent girls in Indonesia. There is limited published research on adolescent women's nutrition, and particularly for LMICs, however, several recent papers on adolescent health identified obesity, micronutrient deficiencies and pregnancy nutrition as important considerations for this age-group.^{9,38} Our informants also noted these as key concerns, along with under-nutrition and HIV. It is clear that nutritional status issues are context specific and informants associated different concerns with specific sub-groups.³⁸

A key finding is the importance of strategic messaging and 'branding' of nutrition to engage adolescent girls and motivate behaviour change. Informants noted that Indonesian teenagers, particularly in urban areas, are trend-driven and it was recommended nutrition be positioned as 'trendy' and 'cool' to capture the interest of this target group. Positive role models were suggested as a potential strategy for motivating this population, however, further investigation is required to identify whom these would be.

Behaviour change communication tools, such as social marketing, have been used to promote positive behaviours in adolescents and alter social norms related to binge drinking, tobacco, drug use, HIV/AIDs and physical activity in high-income countries (HICs).³⁹⁻⁴² It has been found that adolescent health behaviour choices are influenced by the social desirability of particular behaviours which can be altered through effective social marketing.³⁹ A recent systematic review concluded that application of the tools and strategies of traditional marketing and branding by public health practitioners can promote positive health behaviours and increase interest and engagement of the target population.⁴⁰ It is well recognised that health promotion campaigns, like commercial marketing campaigns, need to be strategically tailored to their audience to influence their knowledge, attitudes and beliefs.^{39,41,42} Several campaigns, such as VERB and 5-4-3-2-1 Go!, in the USA have successfully used these tools to create a 'brand' for healthy eating and/or physical activity targeted to adolescents.^{43,44} These campaigns, and the majority of published studies, have been conducted in HICs and further research is required to utilise the learnings from these programs and effectively address the behaviours of adolescent girls in LMIC contexts.^{9,40,41}

Our study found mixed views regarding the use of technology, including television, mobile technology and social media, to target adolescents. Overall informants noted that there are high usage rates of such technologies among adolescent girls in Indonesia, however, several barriers for utilisation in nutrition promotion exist. Television viewing was noted as being widely popular in Indonesia across all social strata including at the village level, however, such campaigns were noted as being prohibitively costly to produce and screen. Television media has been found to have large reach in LMICs across class levels and age-groups.^{42,45} A meta-analysis of locally-adapted Sesame Street productions in 15 LMICs, including Indonesia, found significantly improved cognitive outcomes and social attitudes, including health practices such as nutrition and hygiene.^{45,46} It was concluded that the program was economical, scalable and wide-reaching suggesting the use of television media to target adoles-

Table 2. Results[†]

Themes	Number of informants	Number of References	Quotations
Existing programs	10	38	Nutrition education for adolescent females mentioned but it is more at the policy and national plan. To the best of my knowledge, there is no systematic nutrition education programs designed for adolescent females, despite the problems.
Nutrition issues			
Nutritional status			
Iron deficiency anaemia	7	9	According to our, you know, work for the national strategy, three issues highlighted is anaemia, and then low weight and
Obesity	7	11	overweight. That's the three main issues that we highlighted in this national strategy.
Micronutrient deficiencies (other than iron deficiency anaemia)	3	6	There is widespread micronutrient deficiencies.... The one where there is most information is, of course, anaemia. But where there is anaemia there is bound to be other deficiencies.
Under-nutrition	5	6	
Stunting	2	2	There is an emerging issue related to vitamin D level in young girls. It is time to focus on preparing pre-pregnancy condition to reduce stunting, because focusing only on the problem after birth give less impact. Children in Indonesia on average are already born with height deficit, because the nutrition status of the mother during and before pregnancy was bad. So, there is a need to invest in adolescent.
HIV	1	2	Even on an adult who are well nourished the virus can reduce their stamina, their take up of most of their energy intake just to fight the virus itself. We can imagine how it will affect a person who is still in their growing stage. So one of the raising concerns in Indonesia, if I may just add this, give you a background Amy, for HIV prevalence in Indonesia, one of the increasing number based on occupation are actually the housewives. They are the second highest group with the highest HIV prevalence.
Determinants of Nutrition Status			
Lack of knowledge and awareness	7	14	A major issue is that there is very little awareness and very little knowledge and loads of myths that they are exposed to and that they strongly believe in.
Body Perception	5	13	So often they just starve themselves to be thin with all kinds of deficiencies as a result of that.
Early marriage	3	7	
Nutrition transition - general	7	13	Another problem in adolescent females related to nutrition is young marital age, especially in rural areas.
Fast/processed food	7	13 when our culture shifted from being very specific in terms of female roles in the society. You know, like the female is supposed to be the cooking expert in the family and that kind of stuff. It shifted towards a more balanced, not even balanced, more
Lack of skills	1	4	focused towards education per se, towards career. Although that is a very good step but the result of that there is lack of skill in terms of cooking and food preparation in the family.
Structural government issues	4	12	
Lack of government commitment	6	14	
Access	4	4	Our food is really lovely, our local food is very lovely right. Its just too bad that our generation today, I can say well, they do not respect it so much. It's so sad that they opt to have pizza for breakfast. ... there is also amongst the rural population an increase in the consumption of processed foods... I think one of the biggest issue we have here is actually the breakdown of basic nutritional skills. It is not even knowledge, it is the skill..... So if you ask young women nowadays they don't really know how to cook or what is in their food. ...in Indonesia doing that kind of stuff is really difficult because Education is under one ministry and Health is under another so getting them to work together has proven to be very, very challenging thus far. Also more on the political side of things, because adolescence is such an awkward age group, at least in Indonesia, it is not seen as a priority. Everyone is focussing on the first one thousand days and stuff, or first two years or pregnancy and that kind of stuff. So every time there is any time to move focussing on adolescents the budget is never there. It is really low in the priority list I think.

[†]The complete results table is available from the senior author.

Table 2. Results[†] (cont.)

Themes	Number of informants	Number of References	Quotations
Engagement Strategies			
School intra and extra curricular	8	19	Put nutrition education the system of education so it's built-in a subject within our education system.
Youth organisations	7	17	School is good place to spread the messages, but it need to be done in an interactive ways.
Make nutrition trendy	4	15	The teacher actually, the one who facilitate the session in the school, we have to build the capacity.
Technology and media - general	7	20	But if they already have something where they come together, groups or organisations, that could be something to piggy-back ride on instead of having to set up something completely different.
Social media	6	9	I think you can use the groups, like the religious groups established already in Indonesia. Its religious here. They have religion here with specific groups for young people. Like mostly Christian and others. So you can address these groups first.
Television	4	8	Basically trying to make nutrition cool and trying to take into account that that particular age group is very trend-driven.
Role models	4	6	However, doing social media, I think, is one of the most unpredictable campaign, you know, form of communication, but at the same time it can be quite effective and low budget Television is still major driver of communication, of trends basically, in Indonesia. I think the problem in terms of budget. ... the use of a champion or probably celebrity that can address issues related to nutrition and growth, especially on adolescent age that is among that can be used.
Recommendations			
Differentiate subpopulations	8	22	Indonesia it is very heterogeneous so there is no one approach that fits all. If you go to Jakarta and you do your work there and you want to replicate it in, even in West Java you will find that it doesn't really fit. Let alone if you go to another island that is something that you really have to keep in mind.
BCC focus and specific messaging	5	15	In some areas there's just no food in the market. In other areas there is but it is very expensive. You have to link it with the local situation.
Focus on practical skills	5	8	People having the skills to actually read food labels, how to prepare stuff, how to cook stuff. It's not even like the chef kind of situation, its just basic cooking, food preparation at home.
Government, policy and budget support	4	20	There is a huge need to increase the adolescent self-efficacy, so that they can make a responsible decision for themselves.
Research	6	19	It's about advocating the government to be more interested to invest in this adolescent nutritions.
Combine with other programs	4	5	I think before anything else, and this is probably my bias, is we have to do some sort of research in understanding their behaviour.
Engage in design	2	3	Understanding what they eat, why they eat this and the factors influencing this will enable us to developed appropriate messages for them. For this, it needs a comprehensive formative research.
Engage males	1	1	They [adolescents] are actually very creative. So we have to involve them in developing the messages. I think we have to also focus not just female but also male. How male can also support the female.

[†]The complete results table is available from the senior author.

cents in Indonesia warrants further investigation.^{45,46}

Mobile technology and social media interventions were seen as promising for engaging young women but that further research is needed to effectively design such programs for specific subgroups. It was noted that those in poorer classes and rural areas may not have smart phones, internet connectivity can be variable and social media campaigns can be difficult to implement. There do not appear to be any studies or interventions utilising these technologies to promote positive nutrition behaviours for adolescent girls in Indonesia, or LMICs generally.

The use of mobile phones in LMICs has been steadily increasing in recent years, including in Indonesia.⁴⁷ Utilisation of new technologies for health promotion and behaviour change in developing country settings has been largely limited to text messaging and has primarily occurred in the areas of HIV/AIDs prevention, maternal and child health, malaria prevention and reproductive health.⁴⁶ Some positive results have been found in the use of mobile technologies in improved knowledge, attitudes and cognition, however, behaviour changes are less evidenced.^{46,48} Our findings concur with the current literature, which shows that while the use of these technologies in nutrition promotion has potential, it is still new, particularly in LMICs, and a stronger evidence base, encompassing issues such as sustainability and access, is needed.^{46,48,49}

Informants in this study emphasised that school continues to be an important setting for engaging adolescent girls. It was often recommended that nutrition be included in the formal curriculum, however, it was emphasised that practical dietary skills should also be incorporated. This is supported by the nutrition literacy movement which recognises the importance of “the everyday practicalities of meeting nutrition recommendations”.^{50,57} Government policy and budget support is required to revise the school curriculum and this was noted as being a significant barrier in Indonesia. As such, informants advocated informal nutrition promotion in the school setting, such as tapping into youth organisations or training teachers. Other studies also continue to highlight the school setting for targeting adolescents, however, the majority of evidence about school-based nutrition interventions focus on pre- and primary school and further research is needed for the adolescent age-group.^{8,15}

Structural gender inequality has been shown to be an important factor affecting the nutritional status of women and children and this study highlighted the issue of early marriage in Indonesia as an important consideration for adolescent girls.^{51,52} It is estimated that 17% of adolescent girls in Indonesia are married by age 18.¹⁹ Early marriage can affect the nutritional status directly through complications associated with adolescent pregnancy and the greater risk of childhood low birth weight, malnutrition and stunting and indirectly through lower educational attainment, reduced future earning potential and perpetuation of the poverty cycle.^{53,54} There are no studies investigating the health effects of early marriage in Indonesia. A recent study in India found early marriage to be significantly associated with underweight and early pregnancy to anemia prevalence.⁵⁵ This study indicates the potential importance of further research in this area.

Some of the literature highlights the protective role of a supportive family life in determining adolescent health, however, this was not emphasised in this study.^{15,56} In contrast, it was mentioned that adolescents are less likely listen to their parents and the use of external role models was recommended. The diminishing influence of parents on adolescents as age increases is recognised and this may also be more prominent in LMICs where early marriage is more common, however, further investigation is needed.⁵⁶

Limitations

This study has several limitations. It is a small study of 10, non-randomised participants with similar demographic characteristics working in similar fields in Indonesia. Nine out of ten participants were female which could result in respondent bias, however, this is also a strength as the personal experiences of these Indonesian women contribute to a more nuanced understanding of the target population. It would be useful to test the prevalence of the key themes and findings in larger samples and with other groups of informants including parents, teachers, medical professionals and adolescent girls themselves. However, purposive sampling is more common than probability sampling in qualitative research and the expert knowledge of all 10 informants is a strength of this study. Interview bias may exist given that one researcher conducted the interviews and coded the transcripts, however, independent coding of a sample of transcripts reduces this risk. The findings of this study are broad and potentially generalisable to other LMICs, however, further research is needed to adapt specific messages to different contexts.

Recommendations

A clear recommendation is the need for further research. Research is needed on how to best target adolescent women and how to best utilise and implement the key findings from this study to promote behaviour change. The research needs to be context-specific, however, some research outcomes, such as engagement strategies and motivations for behaviour change, are likely to be adaptable to different contexts.

It is recommended that the target population is not only included in formative research but also engaged in program design. It is clear from this study that ‘adolescent women’, whilst having some common attributes, are not a heterogeneous population, even within a single country, and a one-size-fits-all program is unlikely to be efficacious in engaging adolescent girls. Factors such as wealth, education level, marital status, culture and locality can all influence the design and likely success of a nutrition promotion program.

It is also clear that government policy and budget support is critical to target the female adolescent population in an extensive and sustainable manner. In the Indonesian context, closer integration is required among departments whose portfolios affect adolescent health such as Education, Health and Women’s Affairs. Furthermore, strong policy guidance at the national level would encourage district governments to prioritise adolescent nutrition. Finally, although the importance of adolescent health is beginning to gain momentum on the international public

health agenda, more needs to be done to advocate for adolescent women to be perceived as a separate, and critical target population for nutrition promotion.

Conclusion

This formative research lays the groundwork and provides direction for further research efforts to improve the targeting of nutrition programs for adolescent women in Indonesia, and other LMICs. It is clear that adolescent women are a critical target group for nutrition promotion and that there are several promising strategies that can be employed to engage this population and help to set the foundation for a healthy adult life.

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AUTHOR DISCLOSURES

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