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Knowledge of elementary school children about the health risks of sugar-sweetened beverages

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Abstract

Limitations in school-age children's knowledge about unhealthy eating and drinking patterns can increase the risk of long-term health problems, so early prevention efforts are needed. This study aims to provide an overview of elementary school children's knowledge of the dangers of packaged sweetened beverages. The study used a quantitative descriptive design with a cross-sectional approach. 133 fifth and sixth-grade students were involved in the study, selected through simple random sampling. Data were collected using questionnaires and analyzed using descriptive statistics and cross-tabulation. The results showed that most respondents had a good level of knowledge about the dangers of packaged sweetened beverages. A higher level of knowledge was found among older students, female students, students whose parents worked as private employees or entrepreneurs, students who obtained health information online, and students who bought packaged sweetened beverages at school. The findings indicate that elementary school children already have a sufficient knowledge base regarding the health risks of sweetened beverages, but environmental factors and sources of information still play an important role in shaping this understanding. Strengthening school-based health education and family support is necessary to encourage healthier beverage choices from an early age.

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1. Introduction

School-age children are a strategic investment in a nation's sustainability. It is during this phase that the foundations of health, behavior, and cognitive capacity begin to take shape more permanently. Their school experiences are inseparable from the habit of buying snacks, a phenomenon across various socioeconomic strata. According to the World Health Organization, the school-age range is 5–19, with the 6–12 age group in elementary school and the 12–19 age group in secondary school. Children in this period often struggle to choose healthy foods and beverages. They tend to prefer products sold in the school environment over foods prepared by their parents. This situation is evident, for example, when children buy packaged soft drinks during school breaks.

One of the most accessible and popular products among children is sugar-sweetened beverages, which are packaged drinks that contain caloric sweeteners as their main ingredient. This group of beverages includes a variety of products, ranging from carbonated drinks and ready-to-drink tea to packaged fruit juices and energy drinks, which are generally attractively packaged and available in a variety of flavours to appeal to young consumers (Juliyanti & Wibowo, 2021). The availability of these products, both around the home and in the school environment, indirectly encourages children to make impulsive purchases

without considering the health implications (Yanti & Idayanti, 2022).

The global average consumption of sweetened beverages is reported to be 326 ml per day across 51 countries. It is equivalent to approximately 1.3 servings, assuming 1 serving is 250 ml. This figure shows that sugar consumption from sweetened beverages exceeds the recommended daily intake by 38%–75% in children and by 62%–124% in adolescents (Ooi et al., 2022). Data from the 2022 National Socioeconomic Survey shows that 34.15% of households consume packaged sweetened beverages, with the 5–18 age group being the largest consumers in Indonesia. Packaged beverage products on the market generally contain 37–54 grams of sugar per serving and contribute approximately 310–420 kilocalories of energy intake (Sari Lidya et al., 2016). The same condition occurs in Bali Province, where the proportion of sweet beverage consumption is quite high, especially among children aged 5–9 years (53.0%) and those aged 10–14 years (50.7%). In fact, this consumption exceeds the national average for consumption of more than once per day, which stands at 47.5% (Kemenkes RI, 2018).

These consumption patterns contribute to the increasing prevalence of overweight and obesity among children and adolescents. Global data from 2016 show that more than 340 million children and adolescents aged 5–19 years are overweight or obese. The prevalence of overweight and obesity among children in Asia also shows an alarming trend, including in South Korea, Thailand, and China (Timur et al., 2020). The 2018 Indonesian Basic Health Research reported an increase in the prevalence of overweight and obesity among children aged 6–12 years from 18.8% in 2013 to 20.8% in 2018 in Indonesia. Bali is recorded as one of the provinces with a prevalence of childhood obesity exceeding the national figure, both in the 6–12 and 12–15 age groups, in line with the high proportion of the school-age population and the introductory education participation rate reaching 99.12% (Wiardani & Kusumajaya, 2023).

The American Heart Association recommends that children aged 2–18 years consume no more than 25 grams of added sugar per day (AHA, 2017). However, findings from the 2018 Indonesian Health Risk Assessment (Riskesdas) show a significant increase in non-communicable diseases, including diabetes mellitus, hypertension, stroke, and chronic kidney disease, most of which are related to unhealthy diets and excessive sugar consumption. This situation is a serious concern, given that non-communicable diseases now account for seven out of ten causes of death in Indonesia, with the main risk factors including obesity, hyperglycemia, and dyslipidemia.

Various studies show that children's consumption of sweetened beverages is influenced by several factors, including their level of knowledge. Low knowledge tends to correlate with the selection of less healthy beverages, thereby increasing the risk of long-term health problems. Therefore, providing appropriate and continuous education about healthy foods and beverages is a fundamental requirement in efforts to promote and prevent health problems in children (Yulianti & Mardiyah, 2023). These findings are in line with Aisyah's (2021) research, which reported that most elementary school-aged children have limited knowledge about the effects of soft drink consumption, a factor that can influence daily consumption behaviour.

Preliminary study results conducted on February 6, 2025, at Saraswati 2 Elementary School in Denpasar showed that 199 students in grades V and VI were enrolled, with 1 case of diabetes mellitus and 9 children who were overweight. In addition, the school has never conducted educational activities related to the dangers of sweetened beverages. In fact, the area surrounding the school is filled with street vendors selling various types of sweetened beverages. This condition indicates a need to understand the level of knowledge among elementary school children about the health risks of packaged sweetened beverages, as a basis for planning school-based educational interventions.

2. Method

2.1 Research Design and Participants

This study used a quantitative descriptive design to provide an overview of elementary school children's knowledge of the dangers of packaged sweetened beverages. Data were collected cross-sectionally at a specific point in time without any intervention. The population in this study comprised all fifth- and sixth-grade students at Saraswati 2 Elementary School in Denpasar, totalling 199 students. The research sample consisted of 133 respondents, calculated using the Slovin formula and selected via simple random sampling (Subhaktiyasa, 2024b).

2.2 Instruments and Data Collection

Data collection was conducted using a structured questionnaire designed to assess elementary

school children's knowledge of the dangers of consuming packaged sweetened beverages. The research instrument consisted of 10 questions, using a 1-point Guttman scale. The questionnaire has undergone validity testing with a calculated r value > r table (0.444) and reliability testing with a Cronbach's Alpha value of 0.924. These values met the criteria for use in this study (Subhaktiyasa, 2024a). Data collection was conducted directly in the school environment by the researcher, with the assistance of classroom teachers to ensure a conducive atmosphere for completing the questionnaire. Before completing the questionnaire, respondents were given a brief explanation of the study's purpose and how to complete it, in simple language appropriate for their age group.

2.3 Data Analysis

The collected data were analyzed using descriptive statistics to numerically describe the distribution of respondents' knowledge levels in terms of frequencies and percentages (Subhaktiyasa et al., 2025). This approach aligns with the research objective, which aims to provide an overview of the knowledge. The results of the analysis are presented in tables and descriptive narratives to understand the level of knowledge among elementary school children regarding the dangers of packaged sweetened drinks.

2.4 Ethical Considerations

This study has been approved by the STIKES Wira Medika Bali health research ethics committee, number: 496/E1.STIKESWIKA/EC/V/2025. The researchers have also obtained permission from the school, which is the educational institution where the research was conducted. The researcher has also obtained permission from the school, which is the educational institution where the research was conducted. Participation consent was obtained through informed consent provided to the students' parents or guardians, as well as verbal consent from the children before filling out the questionnaire. All respondents were informed that participation was voluntary and that they had the right to refuse or withdraw from the study. Confidentiality was maintained, with data used solely for this research.

3. Results and Discussion

3.1 Results

Data collected from 133 respondents were analyzed using descriptive statistics. The cross-tabulation of respondent characteristics and knowledge levels is presented in Table 1.

Table 1. Cross-tabulation of respondent characteristics by level of knowledge

Characteristics	Categories	Knwoledge							
		Good		Adequate		Insufficient		Total	
		f	%	f	%	f	%	f	%
Age	11 year	34	54.0	20	31.7	9	14.3	63	100
	12 year	45	76.3	13	22.0	1	1.7	59	100
	13 year	6	54.5	2	18.2	3	27.3	11	100
Gender	Man	39	63.9	14	23.0	8	13.1	61	100
	Female	46	63.9	21	29.2	5	6.9	72	100
Parents' work	Civil Servants/ Military/ Police	15	46.9	11	34.4	6	18.8	32	100
	Private Sector Employees/ Entrepreneurs	70	69.3	24	23.8	7	6.9	101	100
Source of information	Internet	53	73.6	15	20.8	4	5.6	72	100
	School	3	60.0	0	0	2	40.0	59	100
	Home	29	51.8	20	35.7	7	12.5	56	100
Environment	School	50	70.4	17	23.9	4	5.6	71	100
	Home	35	56.5	18	29.0	9	14.5	62	100

Table 1 presents the cross-tabulation of respondents' age and knowledge level. Respondents aged 2 years old constitute the largest group. The majority of this age group has a good level of knowledge, with 76.3% of respondents. The 11-year-old age group also shows a relatively high proportion of sound knowledge, although some respondents still have adequate or poor knowledge levels. Meanwhile, the 13-year-olds show

a broader range of knowledge levels than other age groups. Cross-tabulation by gender shows that both male and female respondents are predominantly in the good knowledge category. The percentage of female respondents with good knowledge is 63.9%. Meanwhile, the number of male respondents is 63.9%. Although the proportion of sound knowledge is relatively balanced, male respondents show a higher proportion of poor knowledge than female respondents.

In addition, most respondents with a high level of knowledge came from families whose parents were private-sector employees or entrepreneurs, accounting for 69.3%. Parents who were civil servants, soldiers, or police officers still showed variation across the good, fair, and poor categories, with a higher proportion in the poor category than in other occupational groups. The distribution of knowledge levels by information source indicates that respondents who obtained information from the internet dominated the good knowledge category, with 73.6%. Information sources from home and school also contributed to knowledge levels, but with a relatively larger proportion in the adequate and poor categories than internet sources. Furthermore, in school environments, respondents showed a higher proportion of good knowledge levels, at 70.4%. Conversely, respondents in a home environment demonstrated a more diverse distribution of knowledge, with a relatively larger proportion of poor knowledge than in the school environment.

3.2 Discussion

The findings of this study provide an overview of the level of knowledge among elementary school children about the dangers of packaged sweetened beverages based on demographic and environmental characteristics. The majority of respondents were in an important transitional phase in developing their understanding of health. These results align with Aisyah's (2021) findings, which showed a predominance of 11-year-old respondents in a similar study, indicating that this age group is a strategic target for early health education interventions. The World Health Organization defines the age range of 6–12 years as the elementary school period, characterized by increased cognitive abilities and greater awareness of daily health behaviours. Children begin to understand the cause-and-effect relationship between consumption habits and their impact on long-term health, making information about healthy eating and drinking patterns relatively easier to accept and internalize (Oematan et al., 2023). These findings reinforce the importance of a promotive-preventive approach in the elementary school-age group as a foundation for the development of sustainable health behaviours.

The distribution of respondents by gender is relatively balanced, though girls are slightly more prevalent. This pattern is consistent with Aisyah's (2021) research and supported by Waluyani et al. (2022), who state that girls tend to pay more attention to eating and drinking patterns and are more active in seeking health information. These findings indicate gender-based differences in how people search for and use health information. It needs to be considered in the design of educational materials that are sensitive to children's characteristics.

The characteristics of parents' jobs also show a significant relationship with children's knowledge levels. The majority of respondents came from families in which the parents worked as private employees or entrepreneurs, in line with Aisyah's (2021) findings. The role of parents is not only limited to economic aspects, but also to their capacity to provide supervision, role models, and health education in the home environment. The relative flexibility in time available to this occupational group has the potential to foster more intense communication between parents and children regarding daily consumption habits.

The information source was another important factor that stood out in this study. The internet emerged as the primary source of information associated with a higher level of knowledge. These results are consistent with the findings of Rizma et al. (2024) and Tsurayya et al. (2025). Rapid and widespread access to information through online media in the digital age exposes children to a variety of health content. These findings indicate the need for supervision and content curation by parents, teachers, and health workers to ensure that the information children receive is accurate and educational.

The school environment also plays a crucial role in shaping children's consumption behavior. The majority of respondents reported that packaged sweetened beverage purchases occurred in the school environment. This behavior aligns with the results of Aprillia's (2024) research. This situation shows that schools not only serve as formal learning spaces but also as social spaces that strongly influence children's consumption choices. The uncontrolled availability of sweetened beverages in school canteens can undermine the health education messages children have received at home or through other media.

Most respondents demonstrated a good level of knowledge about the dangers of packaged sweetened beverages. These findings are consistent with the research by Lidya Sari et al. (2021), although

they differ from Aisyah's (2021) results, which showed a predominance of low knowledge. This difference indicates that children's level of knowledge is greatly influenced by their environmental context, access to information, and the intensity of health education they receive. Fitriani in Fauziah et al. (2020) emphasizes that knowledge is influenced by various factors, including age, gender, parents' occupation, sources of information, environment, and education. Notoatmodjo (2017) explains, within the framework of cognitive development, that increasing age contributes to greater comprehension and a more positive mindset. It explains why the 12-year-old age group in this study showed a higher proportion of good knowledge than other age groups.

In addition, Jean Piaget's cognitive development theory provides a theoretical basis for understanding these findings. Children aged 11–13 years are in the concrete operational stage, where logical and rational thinking skills begin to develop more steadily. Children can connect factual information with everyday experiences, including understanding the impact of consuming sugary drinks on health. Exposure to information online, parental support, and a conducive school environment are factors that reinforce the formation of this knowledge.

Although the study's results show a relatively high level of knowledge, knowledge does not necessarily translate directly into healthy behaviour. This study has not explored the relationship between knowledge and consumption behavior in depth, which is a limitation for further research. Therefore, the involvement of families, schools, and health workers is essential to ensure that children's knowledge is actually applied in their daily lives. A sustainable, school-based, family-supported health education approach is the primary practical implication of these findings. Interactive, contextually relevant, and child-relevant education programs are expected to strengthen understanding and encourage healthier consumption behaviours. This strategy can be implemented more effectively and sustainably to prevent health risks associated with the consumption of packaged sweetened beverages.

4. Conclusion

This study provides a comprehensive overview of the level of knowledge among elementary school children about the dangers of packaged sweetened beverages at SD Saraswati 2 Denpasa. Most respondents had good knowledge, though some children still had moderate to poor understanding. The findings confirm that elementary school age is a strategic phase in the formation of health literacy. Factors such as age, gender, parents' occupation, sources of information, and the school environment contribute to children's knowledge levels. The study's results confirm that children's cognitive development and early exposure to health information play an important role in shaping their understanding of health risks. This study emphasizes the important roles of schools, families, and health workers, especially community nurses, in designing structured, context-specific, and sustainable health education to encourage healthier consumption choices. However, this study has limitations because it only describes the level of knowledge, rather than directly assessing the relationship between knowledge and consumption behaviour. The study was also conducted at only one school location. Furthermore, it is necessary to explore the relationships among knowledge, attitudes, and consumption behaviour regarding sweetened beverages. A longitudinal causal design or an educational intervention, along with expanding the scope of the research area, is needed to strengthen the basis for developing policies and health promotion programs for children at the elementary school level.

Conflict of Interest

The authors declare no conflict of interest.

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