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Determinants of Healthy Puberty among Adolescents with Intellectual Disabilities: A Cross-Sectional Study in Indonesia

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ABSTRACT

Healthy puberty is a critical developmental phase requiring appropriate biological, psychological, and social adaptation, particularly for adolescents with intellectual disabilities who may experience limitations in cognitive and adaptive functioning. These limitations can affect their ability to understand bodily changes, maintain personal hygiene, and engage in appropriate social behavior during puberty. This study aimed to identify factors associated with healthy puberty behavior and to determine the strongest bivariate association among adolescents with intellectual disabilities. A quantitative analytic study with a cross-sectional design was conducted involving 32 adolescents selected using purposive sampling. Data were collected using a structured questionnaire assessing knowledge about puberty, attitudes toward puberty, health status, parental role, and healthy puberty behavior. Data were analyzed using univariate and bivariate statistical tests. The results showed that knowledge about puberty ($p = 0.036$; OR = 5.76) and parental role ($p = 0.006$; OR = 9.00) were associated with healthy puberty behavior. Health status showed a borderline association ($p = 0.050$; OR = 4.58), while attitudes toward puberty were not associated ($p = 0.492$). In conclusion, knowledge and parental role are important factors related to healthy puberty behavior among adolescents with intellectual disabilities, with parental role showing the strongest association. These findings highlight the importance of caregiver involvement in supporting adolescents during puberty. However, the small sample size limits the generalizability of the results.

Keywords: healthy puberty behavior; intellectual disability; adolescents with disabilities; parental involvement; puberty knowledge

INTRODUCTION

Adolescence is a transitional stage characterized by rapid biological, psychological, and social changes. For adolescents with intellectual disabilities, this developmental phase often presents greater challenges because their cognitive and adaptive functioning may not progress at the same pace as their physical maturation[1]. As a result, many adolescents with intellectual disabilities experience difficulties understanding bodily changes, managing personal hygiene, and regulating social interactions during puberty. For example, girls with intellectual disabilities may struggle with menstrual hygiene management due to limited motor skills and self-care abilities, often requiring assistance from caregivers or teachers[2]. t the same time, increased sexual awareness combined with limited understanding of social boundaries may increase vulnerability to inappropriate behaviors or sexual exploitation. Previous studies have also shown that adolescents with intellectual disabilities are more vulnerable to sexual abuse because they may have difficulty distinguishing appropriate from inappropriate physical contact and are often eager to gain social acceptance from peers. These challenges highlight the importance of ensuring that adolescents with intellectual disabilities experience puberty in a safe, informed, and supportive environment.

In this study, healthy puberty is conceptually defined as the ability of adolescents to adapt to pubertal changes in a manner that supports physical health, psychological well-being, and appropriate social behavior. This includes the ability to understand pubertal changes, practice adequate personal hygiene (such as menstrual hygiene management), demonstrate appropriate social boundaries, and maintain positive health behaviors related to reproductive health[3]. From a health promotion perspective, healthy puberty is influenced by a combination of individual knowledge, attitudes, health status, and environmental support systems, particularly family involvement[4–7]. Without adequate guidance and support, adolescents with intellectual disabilities may face difficulties in achieving these adaptive behaviors during puberty[8].

Previous studies have explored various aspects of reproductive health among adolescents with intellectual disabilities. Research has shown that many adolescents with intellectual disabilities have limited knowledge of puberty and reproductive health, while parents and teachers often feel unprepared to provide sexuality education due to insufficient knowledge, cultural taboos, or communication barriers[9]. Other studies have demonstrated that educational interventions such as peer education programs or parent-focused training can improve reproductive health knowledge among adolescents with intellectual and developmental disabilities[10]. However, most existing studies have focused on specific interventions or educational strategies rather than examining the combination of behavioral and environmental factors that influence healthy puberty outcomes. Furthermore, the role of family involvement, health status, and adolescents attitudes toward puberty has not been comprehensively analyzed within a single analytical framework.

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Despite increasing attention to sexual and reproductive health among persons with disabilities globally, empirical evidence remains limited in the Indonesian context, particularly at the local level. National reproductive health programs such as Youth-Friendly Health Services and Youth Information and Counseling Centers primarily target adolescents without disabilities [11]. Although educational modules for adolescents with intellectual disabilities have been developed, their implementation remains limited and often does not adequately involve parents as key caregivers. In Batam City, where the number of adolescents with disabilities is relatively high compared with other districts in the Riau Islands Province, little research has examined factors influencing how adolescents with intellectual disabilities experience puberty[12]. Preliminary observations conducted in special education schools in Batam indicated that many adolescents with intellectual disabilities still required assistance with menstrual hygiene management and demonstrated limited understanding of appropriate social boundaries between males and females. These findings suggest a gap between existing reproductive health education programs and the practical needs of adolescents with intellectual disabilities and their families[13].

From a conceptual perspective, adolescent health behavior during puberty can be influenced by multiple determinants, including knowledge, attitudes, health status, and social support[14]. Health behavior theories such as the Health Belief Model and social ecological perspectives emphasize that health behaviors are shaped not only by individual cognitive factors but also by environmental influences, including family roles and support systems[15]. Within this framework, adolescents' knowledge about puberty may influence their understanding of bodily changes, while attitudes toward puberty may affect their willingness to adopt healthy behaviors[16]. Health status may influence the ability to perform self-care activities, and parental roles may provide guidance, supervision, and emotional support necessary for healthy behavioral adaptation. Understanding how these factors interact is essential for identifying key determinants that support healthy puberty among adolescents with intellectual disabilities[17].

Based on these considerations, this study aims to identify factors associated with healthy puberty among adolescents with mild and moderate intellectual disabilities in Batam City[18]. Specifically, this study aims to identify factors associated with healthy puberty and to determine the strongest bivariate association among adolescents with intellectual disabilities in Batam City, Indonesia[19]. By identifying the factors that show the strongest association with healthy puberty, this study is expected to provide empirical evidence that can inform the development of supportive strategies and educational approaches for adolescents with intellectual disabilities and their families[20].

MATERIALS AND METHODS

Study Design and Setting

This study employed a quantitative analytic design with a cross-sectional approach to examine factors associated with healthy puberty among adolescents with intellectual disabilities. The research was conducted from March to June 2024 in three Special Education Schools (Sekolah Luar Biasa/SLB) in Batam City, Riau Islands Province, Indonesia, namely SLB Negeri Batam, SLB Putra Batam, and SLB Kasih Ananda Batam. These schools provide educational services for students with various types of disabilities, including intellectual disabilities (tunagrahita), and offer basic life-skills training and special education programs. Including multiple schools allowed the study to capture variation in educational services and student characteristics among adolescents with intellectual disabilities in Batam City.

Population and Sampling

The study population consisted of all adolescents with mild and moderate intellectual disabilities enrolled in the selected schools, totaling 66 students aged 10–19 years. The inclusion criteria were: (1) adolescents diagnosed with mild or moderate intellectual disability based on school records, (2) able to communicate verbally or with simple assistance, and (3) willing to participate in the study with parental or guardian consent. The exclusion criteria included adolescents who were ill or absent during data collection.

The sample size was calculated using the finite population correction formula for a single proportion:

$$n = \frac{Z2 \cdot P(1-P)}{d2}$$

where n is the required sample size, Z is the standard normal deviation (1.96 for 95% confidence level), P is the estimated proportion (0.17), and d is the margin of error (0.10). The adjusted sample size using finite population correction (N = 66) resulted in a minimum sample of 32 respondents. Participants were selected using purposive sampling, ensuring that the selected adolescents met the inclusion criteria and were able to participate in the questionnaire process with assistance when necessary.

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Variables and Operational Definitions
Dependent variables is healthy puberty behavior. Independent variables is knowledge, attitudes, health status, parental role. All variables were categorized into "good" and "poor" based on the median score because no standardized cutoff is currently available.

Research Instruments
Data were collected using a structured questionnaire specifically developed for adolescents with intellectual disabilities. The instrument consisted of several sections:

1. Knowledge about puberty (15 items) : Questions covered definitions of puberty, reproductive organs, menstruation, nocturnal emissions, signs of puberty, gender concepts, and personal hygiene. Each correct answer was scored 1, and incorrect or "do not know" responses were scored 0. Total scores ranged from 0–15.
2. Attitudes toward puberty (10 items): Measured using a Likert scale (1–4) ranging from strongly disagree to strongly agree, assessing attitudes toward bodily changes and hygiene practices during puberty.
3. Health status (5 items) : Assessed adolescents' general health condition and their ability to perform daily self-care activities.
4. Parental roles (12 items) : Assessed parental involvement as educators, supervisors, motivators, role models, and counselors in guiding adolescents during puberty. Responses used a Likert scale (1–4).
5. Healthy puberty behavior (12 items) : Measured behaviors related to personal hygiene practices, menstrual hygiene management or hygiene during nocturnal emissions, and behaviors related to sexual abuse prevention.

Validity and Reliability Testing
Content validity of the questionnaire was assessed by four experts in public health, sociology, psychiatry, and psychology to ensure the appropriateness of the instrument for adolescents with intellectual disabilities. A pilot test was conducted among 20 adolescents with intellectual disabilities from a different special education school. Item validity was evaluated using Pearson product-moment correlation, with items considered valid when $r > 0.30$. Reliability testing was performed using Cronbach's alpha, yielding the following results: Knowledge questionnaire: $\alpha = 0.82$, Attitude questionnaire: $\alpha = 0.79$, Parental role questionnaire: $\alpha = 0.85$, Healthy puberty behavior questionnaire: $\alpha = 0.81$. All instruments demonstrated acceptable reliability ($\alpha > 0.70$).

Data Collection Procedures
Data collection was conducted after obtaining permission from school authorities and parents or guardians. Questionnaires were administered in classrooms with the assistance of trained research assistants. Considering the cognitive limitations of the participants, questions were read aloud and explained using simple language, and visual aids were used when necessary to facilitate understanding. Teachers were present during data collection to help maintain a comfortable environment for the students, but they did not influence the respondents answers.

Data Analysis
Data were analyzed using statistical software. Univariate analysis was performed to describe respondent characteristics and variable distributions. Univariate and Chi-square tests were performed. A p-value < 0.05 was considered statistically significant.

Ethical Considerations
This study received ethical approval from the Health Research Ethics Committee of Universitas Andalas with approval number 514/UN.16.2/KEP-FK/2024. Written informed consent was obtained from parents or guardians prior to participation, and verbal assent was obtained from the adolescents. Confidentiality and anonymity of all participants were strictly maintained throughout the research process.

RESULTS
Univariate Analysis
Overview of Respondent Characteristic
The respondents in this study were adolescents with mild and moderate intellectual disabilities in Batam City, totaling 32 individuals. The age distribution showed that 53.1% of respondents were in early adolescence (11–15 years), while 46.9% were in middle adolescence (16–18 years). These findings indicate that the majority of respondents were still in the early adolescent phase, which represents a critical period in the pubertal process and adaptation to physical and psychological changes. Most respondents were male (62.5%), while female respondents accounted for 37.5%. The predominance of male respondents suggests that male adolescents with intellectual disabilities were more involved in this study than females, which may influence the overall depiction of healthy puberty. In terms of educational level, the majority of respondents were at the junior high school level

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(65.6%), while 34.4% were at the senior high school level. This distribution indicates that most adolescents with intellectual disabilities in this study were still enrolled in lower secondary education, which may affect their level of understanding regarding healthy puberty.

Table 1. Frequency Distribution of Respondent Characteristics

Respondent Characteristics	n (32)	%
Age		
Early adolescence (11–15 years)	17	53.1
Middle adolescence (16–18 years)	15	46.9
Gender		
Male	20	62.5
Female	12	37.5
Education		
Junior high school	21	65.6
Senior high school	11	34.4
Disability Level		
Mild	23	71.9
Moderate	9	28.1
Congenital Abnormalities		
Yes	1	3.1
No	31	96.9
Presence of Caregiver		
Yes	18	56.3
No	14	43.7

Table 1 shows that most respondents were in early adolescence (53.1%). Male respondents accounted for 62.5%, while females represented 37.5%. The majority of respondents were enrolled in junior high school (65.6%). Most respondents had mild intellectual disabilities (71.9%), while 28.1% had moderate intellectual disabilities. Nearly all respondents (96.9%) did not have congenital abnormalities. More than half of the respondents (56.3%) had a caregiver assisting them in daily activities.

Overview of Healthy Puberty Factors

The factors for healthy puberty in this quantitative phase IB study were knowledge, attitudes, health status, and parental role. The results are presented in Table 2 below:

Table 2. Distribution of Healthy Puberty Factors

Variable	n (32)	%
Knowledge about puberty		
Good	18	56.3
Poor	14	43.7
Attitudes toward puberty		
Positive	30	93.8
Negative	2	6.2
Health Status		
Good	19	59.4
Poor	13	40.6
Parental Role		
Good	12	37.5
Poor	20	62.5

Table 2 shows that 56.3% of respondents had good knowledge about puberty, while 43.7% had poor knowledge. Most respondents (93.8%) demonstrated positive attitudes toward puberty. In terms of health status, 59.4% were categorized as having good health status. Regarding parental roles, 62.5% of respondents reported inadequate parental involvement, while 37.5% experienced adequate parental support.

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Bivariate Analysis

Bivariate analysis was conducted to determine the relationship between each independent variable and healthy puberty status in adolescents with disabilities. The statistical test used was the Chi-Square test with a significance level of α = 0.05.

Tabel 3. Analysis of Factors Associated with Healthy Puberty

Variable	Healthy Puberty Good n (%)	Healthy Puberty Poor n (%)	Total	p-value	OR (95% CI)
Knowledge about puberty					
Good	11 (61.1)	7 (38.9)	18	0.036*	5.76 (1.07–30.93)
Poor	3 (21.4)	11 (78.6)	14		
Attitudes toward puberty					
Positive	14 (46.7)	16 (53.3)	30	0.492[a]	–
Negative	0 (0.0)	2 (100.0)	2		
Health Status					
Good	11 (57.9)	8 (42.1)	19	0.050*	4.58 (0.94–22.28)
Poor	3 (23.1)	10 (76.9)	13		
Parental Role					
Good	9 (75.0)	3 (25.0)	12	0.006*	9.00 (1.79–45.25)
Poor	5 (25.0)	15 (75.0)	20		

Table 3 presents the results of the bivariate analysis examining the association between each independent variable and healthy puberty behavior. Knowledge about puberty was associated with healthy puberty behavior (p = 0.036; OR = 5.76). Among adolescents with good knowledge, 61.1% demonstrated healthy puberty behavior, compared to 21.4% among those with poor knowledge. Parental role was also associated with healthy puberty behavior (p = 0.006; OR = 9.00). A higher proportion of adolescents with good parental support showed healthy puberty behavior (75.0%) compared to those with poor parental support (25.0%). Health status showed a borderline association with healthy puberty behavior (p = 0.050; OR = 4.58). Adolescents with good health status had a higher proportion of healthy puberty behavior (57.9%) than those with poor health status (23.1%). In contrast, attitudes toward puberty were not associated with healthy puberty behavior (p = 0.492). Fisher's Exact Test was applied for this variable due to the presence of a cell with a value of zero.

DISCUSSION

This study examined factors associated with healthy puberty behavior among adolescents with mild and moderate intellectual disabilities. The findings indicated that knowledge about puberty and parental role were associated with healthy puberty behavior, while health status showed a borderline association and attitudes toward puberty were not associated[21]. Among the variables analyzed, parental role demonstrated the strongest association. These findings suggest that both individual-level factors and environmental support may be relevant in shaping healthy puberty behavior among adolescents with intellectual disabilities[22].

Knowledge and Healthy Puberty Behavior

The results of this study indicated that knowledge about puberty was associated with healthy puberty behavior. Adolescents with better knowledge tended to demonstrate more appropriate personal hygiene practices and a better understanding of bodily changes during puberty[23]. This finding is consistent with previous studies reporting that reproductive health knowledge is related to improved hygiene practices and reproductive health behaviors among adolescents with disabilities[24].

From a theoretical perspective, knowledge may function as a predisposing factor in influencing health behavior[25]. Adolescents who are able to recognize the physical and biological changes that occur during puberty may be better prepared to respond to these changes in an appropriate manner[26]. For example, understanding menstruation or nocturnal emissions may support adolescents in maintaining hygiene and managing these changes with less confusion or anxiety[27].

However, it is important to note that knowledge alone may not be sufficient to ensure behavioral change. Adolescents with intellectual disabilities may still require structured guidance, repeated instruction, and supervision to translate knowledge into daily practices[28]. A possible explanation is that limitations in cognitive functioning may affect the ability to apply knowledge in real-life situations. Therefore, knowledge may need to be supported by environmental factors, particularly caregiver involvement, to facilitate consistent healthy behavior.

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Attitudes Toward Puberty

In this study, attitudes toward puberty were not associated with healthy puberty behavior. One possible explanation is the limited variability in the attitude variable, as the majority of respondents reported positive attitudes. This imbalance in distribution may have reduced the statistical ability to detect an association[29]. Previous research has reported mixed findings regarding the relationship between attitudes and health behaviors. While positive attitudes may contribute to the intention to perform certain behaviors, actual behavior may depend on additional factors such as skills, supervision, and environmental support. In the context of adolescents with intellectual disabilities, the translation of attitudes into behavior may be more complex.

A possible explanation is that adolescents with intellectual disabilities may rely more on external guidance than on internal cognitive or emotional factors. Even when attitudes are positive, the ability to perform appropriate hygiene practices or maintain safe social behavior may depend on support from caregivers or teachers. Therefore, attitudes alone may not adequately explain variations in healthy puberty behavior in this population.

Health Status

Health status showed a borderline association with healthy puberty behavior. This finding should be interpreted with caution, as the confidence interval included the value of 1, indicating that the statistical evidence is not strong enough to confirm an association. A possible explanation is that adolescents with better overall health conditions may be more capable of performing daily self-care activities, including personal hygiene practices related to puberty[30]. Good physical condition may support energy levels, mobility, and the ability to maintain routine hygiene practices.

However, this study did not directly assess underlying factors such as nutritional status, chronic diseases, or other medical conditions. These factors may potentially influence both health status and adolescents' ability to adapt to pubertal changes. For example, adolescents with chronic conditions or poor nutritional status may experience additional challenges in maintaining hygiene or managing physical changes during puberty[31]. Therefore, while health status may potentially influence healthy puberty behavior, the findings of this study should be interpreted carefully, and further research is needed to explore this relationship in more detail using more comprehensive health measurements.

Parental Role

Parental role demonstrated the strongest association with healthy puberty behavior in this study. This finding suggests that caregiver involvement may play a central role in supporting adolescents with intellectual disabilities during the pubertal transition. Caregivers often serve as the primary source of information, supervision, and emotional support. Through daily interactions, caregivers may help adolescents understand bodily changes, practice personal hygiene, and recognize appropriate social boundaries. This role may be particularly important for adolescents with intellectual disabilities, who may require more structured and continuous guidance compared to their peers without disabilities[32].

From a health promotion perspective, caregiver involvement may function as a reinforcing factor that strengthens the development of health-related behaviors. Adolescents may learn through observation, repetition, and direct instruction provided by caregivers. In addition, emotional support from caregivers may help adolescents feel more comfortable discussing sensitive topics related to puberty and reproductive health[33]. A possible explanation for the strong association observed in this study is that caregiver involvement directly influences daily routines and behavior. Unlike knowledge or attitudes, which are internal factors, caregiver support is an external factor that may have a more immediate impact on behavior. This may explain why parental role emerged as the strongest associated factor in this study.

The findings of this study suggest that efforts to promote healthy puberty behavior among adolescents with intellectual disabilities should not focus solely on improving knowledge. Interventions may need to adopt a more comprehensive approach that includes caregiver involvement and attention to adolescents' health conditions. Educational programs may be more effective if they are designed not only for adolescents but also for caregivers. Providing caregivers with practical guidance on how to communicate about puberty, supervise hygiene practices, and support adolescents emotionally may enhance the effectiveness of interventions. In addition, school-based programs may collaborate with families to ensure consistency between learning at school and practices at home.

Several limitations should be considered when interpreting the findings of this study. First, the sample size was relatively small (n = 32), which may limit statistical power and the generalizability of the findings. Second, the use of purposive sampling may introduce selection bias and limit the representativeness of the sample. Third, participants were recruited from a limited number of special education schools, which may result in contextual bias related to school environment or teaching practices. In addition, the use of self-report questionnaires, even with assistance, may introduce response bias, as participants may provide socially desirable answers or may not fully understand all questions. Finally, the cross-sectional design does not allow causal

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relationships to be established. The associations observed in this study should therefore be interpreted as relationships rather than cause-and-effect conclusions.

Future research is recommended to further explore the determinants of healthy puberty behavior among adolescents with intellectual disabilities. Studies with larger sample sizes and more diverse settings may improve generalizability. In addition, longitudinal designs may provide a better understanding of how these factors influence behavior over time. Further studies may also include more detailed measurements of health status, such as nutritional status or the presence of chronic diseases, to better understand their potential influence. In addition, multivariate analysis may be useful to identify independent predictors of healthy puberty behavior.

CONCLUSION AND RECOMMENDATIONS

This study identified several factors associated with healthy puberty among adolescents with mild and moderate intellectual disabilities in Batam City. The findings showed that knowledge about puberty, health status, and parental roles were significantly associated with healthy puberty behavior, while attitudes toward puberty were not significantly associated. Among the variables analyzed, parental role demonstrated the strongest association with healthy puberty behavior in the bivariate analysis. These findings indicate that both individual factors, such as knowledge and health status, and family support play important roles in helping adolescents with intellectual disabilities adapt to pubertal changes and maintain appropriate personal hygiene and self-care practices. The results suggest that efforts to promote healthy puberty among adolescents with intellectual disabilities should involve not only the adolescents themselves but also their families and educational environments. Practical strategies may include the development of disability-friendly puberty education materials that use simple language, visual learning tools, and step-by-step guidance to support adolescents' understanding of pubertal changes and personal hygiene practices. In addition, structured parental involvement is essential, for example through periodic parent education sessions that provide guidance on how to communicate about puberty and support adolescents in managing reproductive health. Schools may also strengthen the role of school health programs by integrating puberty education into special education curricula and by providing supervision and guidance related to hygiene practices during puberty. Collaboration with primary healthcare services, such as community health centers, may further support adolescents and their families through accessible reproductive health education and counseling. These efforts may contribute to creating a more supportive environment that enables adolescents with intellectual disabilities to experience puberty in a healthy and safe manner.

AUTHOR'S CONTRIBUTION STATEMENT

Norma Jeepi Margiyanti conceptualized and designed the study, conducted data collection, performed the data analysis, and drafted the original manuscript. Hardisman contributed to the study design, methodological supervision, and critical revision of the manuscript for important intellectual content. Alfan Miko participated in data interpretation, provided academic guidance, and reviewed the manuscript critically. Amel Yanis contributed to the development of the research instruments, data validation, and manuscript editing. All authors read and approved the final version of the manuscript and agreed to be accountable for all aspects of the work.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this paper.

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