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Analysis of Factors Affecting Healthy Reproductive Behavior in Adolescents in the Digital Era

[1]Zumrotul Ula*, [1]Rasi Rahagia, [2]Suprapto, [3]Peer Zada Muhammad Aamir Khan, [4]Lorraine Turiano
Corresponding Author: *zumrotul.ula18@gmail.com
[1] Institut Kesehatan dan Bisnis Surabaya, East Java, Indonesia
[2] Politeknik Sandi Karsa, South Sulawesi, Indonesia
[3] Lady Reading Hospital, Peshawar, Pakistan
[4] King Khalid University, Saudi Arabia

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ABSTRACT

Adolescents in the digital era face opportunities and challenges in maintaining healthy reproductive behavior due to easy access to information and social media influence. This quantitative cross-sectional study surveyed 320 high school students aged 15–19 in Surabaya, Indonesia, using stratified random sampling. Data collected from April–July 2025 via self-administered questionnaires were analyzed with descriptive statistics, chi-square tests, correlations, and logistic regression. The findings showed that 62.5% of adolescents had good reproductive behavior, which was significantly associated with high knowledge (73.3% vs. 36.8%, $p < 0.001$), positive attitudes (71.4% vs. 45.5%, $p = 0.001$), strong parental guidance (80.6% vs. 39.3%, $p < 0.001$), supportive peer influence (73.7% vs. 46.2%, $p = 0.002$), and controlled digital media exposure (80.0% vs. 41.4%, $p < 0.001$). Multivariate analysis identified strong parental guidance (AOR = 3.65; 95% CI: 2.12–6.28) and controlled digital media exposure (AOR = 3.21; 95% CI: 1.85–5.58) as the strongest predictors, followed by high knowledge (AOR = 2.45), positive attitudes (AOR = 1.78), and supportive peers (AOR = 1.92). In conclusion, adolescent reproductive behavior is shaped by a combination of individual, family, peer, and digital factors, with parental guidance and digital literacy emerging as the most critical protective elements. Strengthening family involvement and promoting responsible digital engagement are recommended to foster healthy adolescent reproductive behavior.

Parental Guidance
Reproductive Health
Risk Behavior

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Introduction

Adolescence represents a critical transitional period in human development characterized by rapid physical, psychological, and social changes [1]. During this stage, adolescents explore their identities, develop new social relationships, and make independent decisions that significantly affect their future well-being [2]. One of the most important areas of concern during adolescence is reproductive health. Healthy reproductive behavior, which includes knowledge of sexual health, responsible decision-making, avoidance of risky practices, and respect for personal and partner boundaries, plays a crucial role in shaping lifelong health outcomes. Unfortunately, adolescents are often exposed to conflicting information and influences that may hinder their ability to adopt positive reproductive health practices [3] [4].

In the past two decades, increasing attention has been directed toward adolescent reproductive health, as international agencies such as the World Health Organization (WHO) and UNICEF have recognized the high prevalence of teenage pregnancies, sexually transmitted infections (STIs), and unsafe practices in many parts of the world [5]. Numerous studies have shown that insufficient knowledge, peer pressure, lack of parental involvement, and limited access to accurate health information remain the primary barriers to healthy reproductive behavior among young people [6]. While traditional school-based education and community programs have been valuable in promoting awareness, the rise of the digital era has transformed the context in which adolescents access and process reproductive health information [7] [8].

The digital era has profoundly changed how adolescents interact, communicate, and learn. With the rapid penetration of smartphones, social media platforms, and internet access, adolescents are now exposed to an unprecedented volume of information, including content related to reproductive health [9]. On one hand, this technological advancement provides opportunities for adolescents to obtain accurate and comprehensive health information from trusted digital sources, online counseling services, and health promotion campaigns [10]. On the other hand, it also exposes them to misinformation, pornography, cyberbullying, and peer influence that may encourage risky behaviors. The double-edged nature of digital exposure makes it essential to examine its role as both a protective and a risk factor for adolescent reproductive health [11].

Recent studies have highlighted the significant role of digital media in shaping adolescent reproductive behavior. Digital platforms offer educational materials and

opportunities to explore sensitive topics. For instance, research has found that adolescents who actively engage with credible online reproductive health resources are more likely to develop positive attitudes and make informed decisions about their sexual and reproductive health [12]. Accurate resources may support understanding of reproductive development and personal boundaries. Conversely, uncontrolled access to inappropriate digital content has been associated with early sexual initiation, unsafe sexual practices, and distorted perceptions of relationships [13]. These contrasting patterns indicate that digital exposure should not be interpreted solely in terms of time spent online. The quality, relevance, and context of the content encountered also deserve attention.

These findings underscore the complexity of the digital environment and the importance of examining how exposure interacts with other determinants, including parental guidance, peer influence, and individual knowledge [14]. Despite growing research interest, several gaps remain in understanding these relationships. First, much of the existing literature emphasizes either the benefits or risks of digital exposure without adequately considering its dual role within broader social, cultural, and family contexts [15]. This may obscure when online information supports healthy choices or potentially risky practices. Second, relatively few studies have examined whether parental guidance may help explain the relationship between digital exposure and adolescent reproductive behavior. Parents can provide information, reinforce personal values, encourage critical evaluation of online content, and create opportunities for discussion. However, in the digital era, many parents feel unprepared to supervise online activities or discuss reproductive health consistently, potentially limiting the effectiveness of their guidance [16].

Third, the interaction between peer influence and digital media exposure remains insufficiently explored. Adolescents are particularly responsive to peer norms, while online interactions may amplify social expectations and reinforce behaviors perceived as acceptable within their groups [17]. Peer communication can facilitate the exchange of useful information, but it may also normalize misleading messages or risky conduct, depending on the nature of the interaction. These possibilities suggest that digital media, family guidance, peer relationships, and reproductive health knowledge should be considered together rather than as isolated influences. An integrated examination could clarify which factors are associated with healthy reproductive behavior and identify areas where adolescents require additional support. It could also inform educational strategies that combine digital literacy, accessible reproductive health information, constructive parental communication, and peer-based approaches. Understanding these interconnected influences is therefore important for developing context-sensitive initiatives that support safer and more informed reproductive health decisions among adolescents.

Given these gaps, the present study seeks to analyze the factors affecting healthy reproductive behavior in adolescents in the digital era, focusing on knowledge, attitudes, parental guidance, peer influence, and digital media exposure. This research aims to provide a more holistic understanding of adolescent reproductive health in today's digital landscape by identifying the protective and risk factors associated with these determinants. Specifically, the objectives of this study are: (1) to examine the relationship between knowledge levels and healthy reproductive behavior; (2) to investigate the mediating role of attitudes in shaping behavior; (3) to assess the influence of parental guidance in reinforcing positive behaviors and mitigating digital risks; and (4) to evaluate how peer pressure and digital exposure contribute to reproductive health outcomes among adolescents.

The scope of this study is limited to adolescents in senior high schools, as this group is at a particularly sensitive stage of reproductive development and digital engagement. Although the findings may not fully capture the experiences of younger adolescents or those outside the school environment, the results are expected to provide valuable insights into the key determinants of healthy reproductive behavior. The study also acknowledges that cultural, religious, and socio-economic factors play an important role in shaping adolescent behavior. Yet, its primary focus is on the interaction between knowledge, attitudes, parental guidance, peers, and digital influences.

Overall, this article contributes to the literature by filling the research gap regarding the dual role of digital media in adolescent reproductive health and the importance of parental guidance in navigating this landscape. The study offers a comprehensive framework for promoting healthy reproductive behavior among adolescents by integrating insights from behavioral science, education, and digital literacy. The findings are expected to inform educators, parents, policymakers, and health practitioners in designing targeted interventions that combine conventional reproductive health education with digital approaches. Such integrated efforts are crucial for ensuring that adolescents have access to accurate information and develop the critical thinking and supportive relationships necessary to make safe and responsible choices in the digital era.

Materials and Methods

A. Study Design

This study employed a quantitative cross-sectional design to examine the factors influencing healthy reproductive behavior among adolescents in the digital era. A cross-sectional approach was considered appropriate because it allows the simultaneous collection of data on multiple variables and facilitates the analysis of associations between knowledge, attitudes, parental guidance, peer influence, digital media exposure, and reproductive behavior.

B. Study Population and Sampling

The population of this research consisted of senior high school students aged 15–19 years in Surabaya. Stratified random sampling was used to ensure proportional representation across grades and genders. The inclusion criteria were (1) students who were actively enrolled in school during the study period, (2) aged between 15 and 19 years, and (3) willing to participate voluntarily with informed consent. Exclusion criteria included students who were absent during data collection or declined participation. A minimum sample size of [N] respondents was determined using the Slovin formula with a margin of error of 5%, and an additional 10% was included to account for potential non-responses.

This study employed stratified random sampling to ensure that the selected respondents accurately represented the diversity of the target population. The population of this research consisted of senior high school students in Surabaya aged 15–19 years. Stratification was carried out based on grade level (10th, 11th, and 12th grade) and gender (male and female) to guarantee proportional representation of each subgroup. After stratification, simple random sampling was applied within each stratum. A list of eligible students was obtained from school records. Each student was assigned a number, and the required sample from each stratum was selected using a random number generator. This procedure minimized sampling bias and increased the representativeness of the sample. The total eligible population consisted of approximately N = 1,600 students (based on school enrollment data). To determine the minimum required sample, the Slovin formula was used applying 5% of margin of error. Thus, the minimum required sample size was 320 respondents. To account for possible non-responses or incomplete data, an additional 10% was initially considered, but since the achieved sample reached n = 320, this number satisfied the calculated requirement.

C. Data Collection Instrument

Data were collected using a structured self-administered questionnaire developed based on previous validated instruments from reproductive health and behavioral studies. The questionnaire comprised five main sections: Sociodemographic characteristics (age, gender, grade, family background). Knowledge of reproductive health (10 multiple-choice items assessing understanding of puberty, contraception, STIs, and digital health literacy). Attitudes toward reproductive behavior (10 Likert-scale items evaluating perceptions, values, and willingness to adopt safe practices). Parental guidance and peer influence (8 items measuring communication with parents, parental monitoring, and peer norms). Digital media exposure (6 items assessing frequency, type, and control of reproductive health-related content accessed online). Healthy reproductive behavior (8 Likert-scale items covering abstinence, safe relationships, health-seeking behavior, and digital responsibility). The questionnaire was pretested among 30 students from a different school to ensure clarity, reliability, and validity.

Cronbach's alpha values were calculated for each section, with coefficients ranging from 0.72 to 0.85, indicating acceptable internal consistency.

The categorical variables in this study were defined as follows: Knowledge of Reproductive Health; Assessed using 10 multiple-choice items (score range: 0–10). Each correct answer = 1 point, incorrect = 0. The total scores were dichotomized: High knowledge: ≥ 7 points (≥ 70% correct). Low knowledge: < 7 points (< 70% correct). Attitude Toward Reproductive Behavior; Measured with 10 Likert-scale statements (1 = strongly disagree to 5 = strongly agree). Total possible score: 10–50. A cutoff was set at the median score (≥ 35 = positive attitude, < 35 = negative attitude). Parental Guidance; Measured by 4 items on communication, monitoring, and support (Likert scale 1–5, total range 4–20). Scores dichotomized using median split: ≥ 15 = strong parental guidance. < 15 = weak parental guidance. Peer Influence; Measured with 4 items (Likert scale 1–5, total range 4–20). Scores dichotomized using median split: ≥ 15 = supportive peers. < 15 = risky peers. Digital Media Exposure. Measured with 6 items covering frequency, type, and supervision of content (Likert scale 1–5, total range 6–30). Defined as: Controlled exposure: score ≥ 21, indicating frequent access to reproductive health information through credible and supervised sources. Uncontrolled exposure: score < 21, indicating frequent exposure to unsupervised or inappropriate content. Healthy Reproductive Behavior; measured with 8 items (Likert scale 1–5, total score 8–40). Scores dichotomized using median split: ≥ 28 = good reproductive behavior. < 28 = poor reproductive behavior.

D. Data Collection Procedure

Data collection was conducted between April and July 2025. Respondents completed the questionnaire in classrooms under the supervision of trained enumerators. Participants were instructed not to write their names on the forms to ensure confidentiality. Each session lasted approximately 30–40 minutes. Participants were free to withdraw from the study at any stage without penalty.

E. Data Analysis

Data were coded and entered into SPSS version 25 for statistical analysis. Descriptive statistics (frequencies, percentages, means, and standard deviations) were used to summarize demographic characteristics and main variables. Bivariate analysis using chi-square tests and Pearson correlation was employed to assess associations between independent variables (knowledge, attitudes, parental guidance, peer influence, digital media exposure) and the dependent variable (healthy reproductive behavior). Furthermore, multiple logistic regression was performed to identify the strongest predictors of healthy reproductive behavior, adjusting for potential confounders such as age and gender. Statistical significance was set at $p < 0.05$.

Multivariate logistic regression was conducted to identify the strongest predictors of healthy reproductive behavior. The dependent variable was healthy reproductive behavior

(good vs. poor). Independent variables that showed significance at $p < 0.25$ in the bivariate analysis were included in the multivariate model, namely knowledge, attitude, parental guidance, peer influence, and digital media exposure. To control for potential confounders, age (15–16 vs. 17–19 years) and gender (male vs. female) were also entered into the model as adjustment variables. Model specification was checked using the Hosmer–Lemeshow goodness-of-fit test, and multicollinearity was assessed through Variance Inflation Factor (VIF), with all values below 2 indicating no significant collinearity. The results are presented as Adjusted Odds Ratios (AORs) with 95% Confidence Intervals (CI). Statistical significance was set at $p < 0.05$.

F. Ethical Considerations

This study was approved by the *Institut Kesehatan dan Bisnis Surabaya*, with approval number B-234/LPP/V/2025. Before participation, informed consent was obtained from students, and parental consent was secured for respondents under 18. Confidentiality and anonymity were strictly maintained throughout the research process. Participation was voluntary, and no incentives were provided. The research protocol adhered to the ethical principles of the Declaration of Helsinki regarding studies involving human participants.

G. Research Integrity

The authors confirm that this manuscript has not been submitted elsewhere and is not being considered by any other journal. All authors have reviewed the final manuscript, agreed to its submission, and are accountable for the integrity and accuracy of the work.

Results

Table 1 presents the univariate analysis of 320 respondents, summarizing the distribution of variables across their respective categories. The results are presented using frequencies (n) and percentages (%), providing an overview of the respondents' characteristics. This descriptive analysis serves as a foundation for understanding the sample composition and conducting further statistical analyses.

Table 1. Univariate Analysis of Respondents (n = 320)

Variable	Category	n	%
Gender	Male	150	46.9
	Female	170	53.1
Age	15–16 years	120	37.5
	17–19 years	200	62.5
Knowledge	Low	95	29.7
	High	225	70.3
Attitude	Negative	110	34.4
	Positive	210	65.6
Parental Guidance	Weak	140	43.8
	Strong	180	56.2
Peer Influence	Risky	130	40.6
	Supportive	190	59.4

Variable	Category	n	%
Digital Media Exposure	Uncontrolled	145	45.3
	Controlled	175	54.7
Healthy Reproductive Behavior	Poor	120	37.5
	Good	200	62.5

The univariate analysis shows that the majority of respondents were female (53.1%), aged 17–19 years (62.5%), with a high level of knowledge (70.3%) and positive attitude (65.6%). More than half reported strong parental guidance (56.2%) and controlled digital media exposure (54.7%). Healthy reproductive behavior was observed in 62.5% of respondents. These findings provide an overview of respondents' demographic characteristics, knowledge, attitudes, and environmental influences, highlighting the potential relevance of individual and external factors in understanding healthy reproductive behavior among adolescents.

Table 2 presents the bivariate analysis of factors associated with healthy reproductive behavior among 320 respondents. The distribution of good and poor reproductive behaviors is presented using frequencies and percentages. Statistical significance is assessed using p-values to identify potential associations between the examined variables and reproductive behavior, providing a basis for further analysis.

Table 2. Bivariate Analysis of Factors Related to Healthy Reproductive Behavior (n = 320)

Variable	Category	Good Behavior n (%)	Poor Behavior n (%)	p-value
Knowledge	High	165 (73.3)	60 (26.7)	<0.001
	Low	35 (36.8)	60 (63.2)	
Attitude	Positive	150 (71.4)	60 (28.6)	0.001
	Negative	50 (45.5)	60 (54.5)	
Parental Guidance	Strong	145 (80.6)	35 (19.4)	<0.001
	Weak	55 (39.3)	85 (60.7)	
Peer Influence	Supportive	140 (73.7)	50 (26.3)	0.002
	Risky	60 (46.2)	70 (53.8)	
Digital Media Exposure	Controlled	140 (80.0)	35 (20.0)	<0.001
	Uncontrolled	60 (41.4)	85 (58.6)	

Bivariate results indicate that knowledge, attitude, parental guidance, peer influence, and digital media exposure were all significantly associated with healthy reproductive behavior ($p < 0.05$).

Table 3 presents the multivariate logistic regression analysis of factors associated with healthy reproductive behavior. The results are expressed as adjusted odds ratios (ORs), 95% confidence intervals (CIs), and p-values. This analysis evaluates the independent associations between the examined variables and reproductive behavior while controlling for other factors included in the regression model.

Table 3. Multivariate Logistic Regression of Factors Affecting Healthy Reproductive Behavior

Variable	Adjusted OR	95% CI	p-value
Knowledge (High vs Low)	2.45	1.45–4.13	0.001
Attitude (Positive vs Negative)	1.78	1.05–3.02	0.032
Parental Guidance (Strong vs Weak)	3.65	2.12–6.28	<0.001
Peer Influence (Supportive vs Risky)	1.92	1.11–3.29	0.018
Digital Media Exposure (Controlled vs Uncontrolled)	3.21	1.85–5.58	<0.001

Multivariate analysis shows that strong parental guidance (AOR = 3.65, CI 2.12–6.28) and controlled digital media exposure (AOR = 3.21, CI 1.85–5.58) were the strongest predictors of healthy reproductive behavior, followed by high knowledge, positive attitude, and supportive peer influence.

Discussion

This study analyzed the factors affecting healthy reproductive behavior among adolescents in the digital era, focusing on knowledge, attitudes, parental guidance, peer influence, and digital media exposure. The results demonstrate that healthy reproductive behavior is influenced by multiple determinants, of which parental guidance and digital media exposure emerged as the strongest predictors. The findings provide meaningful insights into the dynamics of adolescent development in a rapidly changing digital landscape, where family, peers, and technology interact to shape health-related practices.

Although the findings suggested that attitude might mediate the relationship between knowledge and healthy reproductive behavior, it is important to note that the analysis was conducted within a cross-sectional design. Mediation was tested using a bootstrap resampling procedure with 5,000 iterations to generate bias-corrected 95% confidence intervals (CIs) for the indirect effect. The results indicated a significant indirect pathway, supporting the role of attitude as a mediator. However, because the data were collected at a single point in time, the mediation pathway cannot be interpreted as causal. A longitudinal design would be required to establish temporal precedence and stronger causal inference. Thus, while the results provide initial evidence of a potential mediating effect of attitude, they should be interpreted cautiously.

Influence of Knowledge on Reproductive Behaviour. The univariate results indicated that most respondents possessed high knowledge regarding reproductive health. Bivariate analysis revealed a significant association between knowledge and reproductive behaviour, and the multivariate model confirmed that high knowledge increases the likelihood of adopting healthy reproductive practices (AOR = 2.45). These findings are consistent with the Health Belief Model, which posits that adequate knowledge influences perceived susceptibility and benefits, thereby motivating protective behaviours.

However, the results also highlight that knowledge alone is not the strongest predictor compared to parental guidance or digital media exposure [18]. This suggests that while knowledge is necessary, it cannot shape behaviour. Similar studies in Indonesia and other developing countries have shown that adolescents with reproductive health knowledge may still engage in risky practices due to external pressures, lack of self-control, or limited support systems [19] [20]. Thus, the implication is that reproductive health education must go beyond providing factual information; it should also empower adolescents with critical thinking, decision-making, and problem-solving skills to apply knowledge in real-life contexts [21] [22].

Attitude appeared to play a potential mediating role in the association between knowledge and reproductive behavior; however, given the cross-sectional design, this finding should be interpreted as exploratory and not as evidence of causal mediation, and the multivariate model indicated that positive attitudes nearly doubled the odds of practicing healthy behavior (AOR = 1.78). This finding aligns with the Theory of Planned Behavior, which emphasizes that attitudes toward a behavior strongly predict intention and actual behavior performance. Adolescents who perceive healthy reproductive practices as valuable and protective are more likely to implement them.

The results suggest that attitudes may serve as mediators between knowledge and behavior. Adolescents with high knowledge often develop positive attitudes toward safe practices, increasing their likelihood of adopting healthy reproductive behaviors [23] [24]. This finding is supported by research showing that interventions combining knowledge improvement with attitude transformation, such as values-based education, role modelling, and interactive discussions, are more effective than knowledge dissemination alone [25] [26] [27].

Parental Guidance as the Strongest Protective Factor. One of the most notable findings of this study is the strong influence of parental guidance on adolescent reproductive behavior. Adolescents with strong parental guidance were 3.65 times more likely to demonstrate healthy reproductive practices than those with weak guidance. This underscores the family's pivotal role as the primary socialization agent in adolescence.

Parental guidance encompasses open communication, monitoring of daily activities, modelling of values, and provision of emotional support. In contexts where reproductive health is considered a sensitive topic, many parents avoid discussing it with their children, leading to misconceptions and reliance on peers or the internet [28]. The results of this study, however, reaffirm that when parents provide consistent and supportive guidance, adolescents are more likely to develop responsible attitudes and behaviors [29].

Comparable findings have been documented in studies from Southeast Asia and Africa, where parental involvement was linked to reduced rates of early sexual debut, unintended

pregnancies, and sexually transmitted infections. Importantly, in the digital era, parental guidance extends beyond traditional conversations to include monitoring online activities, setting boundaries for internet use, and guiding adolescents toward credible sources of information [30]. These results highlight the need for parent-focused interventions that build their confidence and skills to engage in reproductive health discussions in a culturally sensitive manner [31].

Peer Influence and Social Norms. The results also demonstrate a significant relationship between peer influence and reproductive behavior. Adolescents surrounded by supportive peers were almost twice as likely to adopt healthy behaviors as those exposed to risky peer groups. This finding is consistent with social learning theory, which posits that individuals learn behaviors by observing and imitating their peers. Adolescents are particularly vulnerable to peer norms because of their developmental stage, which is marked by the need for social acceptance and identity formation.

The influence of peers is further amplified in the digital context, where adolescents constantly interact in online communities [32]. Risky behaviors, such as early sexual activity or exposure to pornography, may be normalized when peers endorse them through social media platforms. Conversely, peer-led interventions that promote healthy norms have proven effective in encouraging responsible reproductive behavior [33]. Therefore, peer influence should be seen as a risk factor and a potential avenue for health promotion, particularly through peer education and digital campaigns [34].

Dual Role of Digital Media Exposure. Perhaps the most critical contribution of this study lies in its findings regarding digital media exposure. Controlled digital exposure significantly increased the likelihood of healthy reproductive behavior (AOR = 3.21). This indicates that adolescents accessing reliable, age-appropriate digital content under parental or institutional supervision are more likely to adopt safe practices. Digital media allows adolescents to learn from online health resources, interactive platforms, and youth-friendly websites. For example, online counseling services and educational videos can enhance reproductive health literacy and decision-making.

However, uncontrolled digital exposure was associated with higher rates of risky behavior. Adolescents without supervision may encounter misinformation, sexually explicit materials, and peer-driven content that distort their perceptions of healthy relationships. This dual role of digital media underscores the necessity of promoting digital literacy among adolescents and parents. Effective interventions must restrict harmful content and actively encourage engagement with credible resources [35].

The literature supports this duality, with European and Asian studies reporting both positive and negative outcomes of digital exposure. For instance, adolescents who followed

reputable online health programs exhibited improved contraceptive use and delayed sexual debut, whereas those exposed to pornography demonstrated riskier sexual practices. This reinforces the importance of viewing digital media as a tool that can either promote or hinder adolescent health, depending on the context of its use [36].

Integrated Perspective on Adolescent Reproductive Behavior. The multivariate findings emphasize that adolescent reproductive behavior is not shaped by a single factor but by a complex interaction of knowledge, attitudes, parental guidance, peer influence, and digital media exposure. Among these, parental guidance and controlled digital exposure emerged as the strongest predictors, followed by knowledge, attitudes, and peer influence. This integrated perspective highlights the need for comprehensive interventions that simultaneously address multiple determinants.

For example, school-based programs can strengthen knowledge and attitudes, while community and family initiatives can reinforce parental involvement. Digital literacy campaigns can empower adolescents and parents to evaluate online content critically, reducing the risks of misinformation. Peer-led programs can complement these efforts by leveraging positive peer influence to normalize healthy behaviors.

This study demonstrates that adolescent reproductive behavior in the digital era is influenced by multiple determinants, with parental guidance and controlled digital exposure as the strongest predictors. These findings are consistent with global evidence showing that family involvement and digital literacy play pivotal roles in adolescent health. For example, the WHO and the Lancet Commission on Adolescent Health emphasize that the integration of parental guidance and safe digital environments is critical in reducing risky sexual behaviors and improving health outcomes among adolescents worldwide. Similarly, studies from the United States and Europe highlight that structured parental monitoring combined with school-based health education significantly decreases early sexual initiation and improves contraceptive use [37].

The dual role of digital media observed in this study mirrors global trends. Research in China and South Korea indicates that adolescents accessing credible e-health platforms exhibit higher reproductive health literacy and safer practices, while exposure to pornography and misinformation increases risky behaviors. Likewise, a study in sub-Saharan Africa found that uncontrolled digital exposure exacerbated peer pressure and normalized unsafe practices, underscoring the universality of these dynamics across different socio-cultural settings [38].

Furthermore, the mediating role of attitudes aligns with the Theory of Planned Behavior, which has been widely tested in global contexts. For instance, studies in Europe, North America, and Southeast Asia consistently report that adolescents with positive attitudes toward safe practices are more likely to translate knowledge into healthy behaviors, regardless

of cultural background. By situating the findings within this global literature, the present study contributes to a broader understanding that adolescent reproductive health is shaped by universal determinants knowledge, attitudes, parental guidance, peer norms, and digital exposure although their relative influence may vary across cultural settings. This highlights the importance of designing interventions that combine global best practices (e.g., digital health literacy campaigns, parent-focused interventions, peer-led programs) with local cultural adaptations to maximize effectiveness.

Limitations and Suggestions

This study employed a cross-sectional design, which restricts the ability to establish causal relationships between knowledge, attitudes, parental guidance, peer influence, digital media exposure, and reproductive behavior. Consequently, any causal interpretations should be avoided, and the mediation role of attitudes in this study should be considered exploratory rather than confirmatory. Future research is recommended to strengthen these findings by employing longitudinal follow-up studies, quasi-experimental interventions, or triangulation with digital trace data to capture behavioral dynamics over time. Another limitation of this study is related to mediation analysis. Since the data were cross-sectional, the test of attitude as a mediator between knowledge and behavior cannot confirm causality. The mediation analysis was performed using bootstrapped confidence intervals, which strengthens the robustness of the indirect effect estimation, but longitudinal research is needed to validate these findings.

Contributions and Implications

The findings of this study contribute to the growing body of knowledge on adolescent reproductive health in the digital era by highlighting the dual role of digital media and the central importance of parental guidance. The study underscores that effective interventions must combine educational, familial, and technological approaches. Policymakers and practitioners should consider integrating reproductive health education into school curricula, training parents to communicate openly, and developing digital platforms that provide adolescent-friendly, credible information. At the practical level, schools and health institutions should collaborate to design holistic programs involving adolescents, parents, and peers. Digital innovations like mobile applications and social media campaigns can be harnessed to deliver engaging reproductive health content. Furthermore, governments should establish regulations and support systems promoting safe adolescent digital environments.

Conclusion

Parental guidance and controlled digital exposure were significantly associated with healthier reproductive behavior, while peer influence and uncontrolled digital media were

linked to riskier patterns. These findings suggest that parental involvement and responsible digital engagement may play important roles in adolescent reproductive health. However, given the cross-sectional nature of this study, causal relationships cannot be established. The results underscore the need for further longitudinal and experimental studies to confirm these associations. In practice, schools and health institutions could consider pilot programs integrating reproductive health education with digital literacy, which should be evaluated systematically before broader policy implementation.

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Conflict of Interest

The authors declare no conflict of interest.

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Authors



Zumrotul Ula is an education scientist and senior lecturer in the Midwifery Study Program at Institut Kesehatan dan Bisnis Surabaya, Indonesia. Her academic interests focus on health education, midwifery education, instructional development, and improving teaching and learning practices in healthcare education. She is committed to advancing educational quality through research, innovative teaching approaches, and professional development to strengthen healthcare competencies and student learning outcomes. (email: zumrotul.ula18@gmail.com).



Rasi Rahagia is an education scientist and senior lecturer in the Nursing Study Program at Institut Kesehatan dan Bisnis Surabaya, Indonesia. His academic interests include nursing education, health sciences, educational innovation, and professional competency development. He is dedicated to improving the quality of nursing education through effective teaching strategies, academic research, and the integration of evidence-based approaches that support student achievement and healthcare professional development. (email: jaemincute89@gmail.com).



Suprapto is an education scientist and Professor in the Nursing Study Program at Politeknik Sandi Karsa, South Sulawesi, Indonesia. His academic interests encompass nursing education, healthcare professional development, educational leadership, and evidence-based nursing practice. He actively contributes to advancing nursing education through scholarly research, academic mentorship, and innovative instructional approaches aimed at strengthening professional competencies, educational quality, and healthcare service delivery in Indonesia. (email: atoenurse@gmail.com).



Dr. Peer Zada Muhammad Aamir Khan is a Resident Surgeon in the Department of General Surgery at Lady Reading Hospital, Peshawar, Pakistan. His clinical responsibilities involve surgical patient assessment, perioperative management, and postoperative care. His professional interests encompass general surgical practice, clinical decision-making, patient safety, and evidence-based surgical management. He is committed to advancing his clinical expertise through surgical training, professional development, and continuous medical education. (email: pzmaamirkhan@gmail.com).



Lorraine Turiano is an Assistant Professor at King Khalid University, College of Nursing, Saudi Arabia, in the Maternity and Neonatal Nursing Department. As an educator, she is very much interested in Public Health, Artificial Intelligence and at the same time New Pedagogical Approaches. (email: estadilla@kku.edu.sa).