

Original Article

Associations of self-efficacy, outcome expectancies, and socio-structural factors with teenage pregnancy in remote areas of Indonesia: An application of Social Cognitive Theory framework

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Abstract

Teenage pregnancy remains a major public health challenge in Indonesia, particularly in remote settings where sociocultural norms strongly influence adolescent behavior. In Gayo Lues Regency, Aceh Province, Indonesia, adolescent pregnancy continues to occur within a context of early marriage, limited reproductive health access, and strong community norms. The aim of this study was to examine the associations of self-efficacy, outcome expectancies, and socio-structural factors with teenage pregnancy within the framework of Social Cognitive Theory. A quantitative cross-sectional study was conducted among female adolescents aged 10 to 19 years registered across four community health centers (*Puskesmas*) in Gayo Lues. Participants were selected using cluster random sampling. Data were collected through structured face-to-face interviews using a validated questionnaire. The associations were analyzed using simple and multiple binary logistic regression. A history of teenage pregnancy was reported by 29.5% of participants. Bivariate analysis showed that self-efficacy, outcome expectancies, and socio-structural factors were significantly associated with the history of teenage pregnancy. In the multivariate model, higher outcome expectancies were most strongly associated with lower odds of teenage pregnancy history (odds ratio (OR): 0.424; $p < 0.001$), followed by higher self-efficacy (OR: 0.628; $p = 0.027$), whereas socio-structural factors were not independently associated (OR: 0.810; $p = 0.318$). These findings suggest that personal cognitive factors play a stronger role than socio-structural factors in this setting. Interventions to prevent teenage pregnancy should prioritize strengthening adolescents' self-efficacy and shaping positive outcome expectancies through comprehensive reproductive health education and supportive social environments.

Keywords: Teenage pregnancy, Social Cognitive Theory, self-efficacy, outcome expectancies, socio-structural



Introduction

Adolescence, defined as the transitional period between childhood and adulthood, aged 10 to 19 years, represents a critical window of vulnerability for reproductive health outcomes worldwide [1,2]. According to the World Health Organization (WHO), approximately 1.2 billion adolescents currently constitute 18% of the global population [3]. In developing countries, this demographic is disproportionately exposed to reproductive health risks, including teenage pregnancy, driven by the interplay of biological, psychosocial, economic, and sociocultural factors [1,2].

Globally, an estimated 16 million girls aged 10 to 19 years give birth each year, accounting for nearly 11% of all births worldwide [4]. The highest burden is concentrated in sub-Saharan Africa, where birth rates among girls aged 15 to 19 years range from 45 per 1,000 in Mauritius to 229 per 1,000 in Guinea, far exceeding the global average of 65 per 1,000 [1]. Maternal mortality is two times higher among girls aged 15 to 19 years and five times higher among those aged 10 to 14 years compared with women aged 20 to 29 years [5]. Adolescents account for 23% of the total morbidity burden attributable to pregnancy and childbirth, and more than one million infants and approximately 70,000 adolescent mothers die each year in developing countries [5]. Pregnancy-related complications and childbirth remain two of the leading causes of death among adolescent females globally [5]. Adolescents generally face greater barriers to accessing reproductive health services than adult women [6].

Indonesia ranks 37th globally and second in ASEAN for the highest prevalence of early marriage. The World Bank reports that 46.9 per 1,000 adolescents aged 15 to 19 years in Indonesia have given birth, exceeding the global average of 42 per 1,000 [7]. National survey data from the 2017 Indonesian Demographic and Health Survey revealed that 7% of women aged 15 to 19 years had already become mothers, and neonatal, postneonatal, and infant mortality rates were consistently higher among mothers under 20 years compared with those aged 20 to 39 years [8]. Gayo Lues Regency, in Aceh Province, presents a particularly complex case within this national landscape. The regency is geographically remote and characterized by a distinct sociocultural context deeply shaped by the customary practices of the Gayo ethnic group [9]. The persistence of culturally embedded practices, including the phenomenon of *naik* or elopement marriage that is legitimized within the local cultural system, and *kemel* or concealment of pregnancy, further compounds the problem by deterring adolescents from seeking antenatal care and increasing the risk of maternal and neonatal complications [9].

Understanding the behavioral determinants of teenage pregnancy requires a robust theoretical framework that captures the complexity of interactions among individual, environmental, and behavioral factors. Social Cognitive Theory (SCT), operationalized for health behavior, posits a reciprocal triadic determinism in which personal cognitive factors, environmental conditions, and behavior mutually and continuously influence one another [10,11]. This framework is highly relevant to identifying the psychosocial determinants of adolescent reproductive health decision-making [10,11]. Within this framework, three constructs are central to understanding teenage pregnancy [10,12,13]. First, self-efficacy refers to an adolescent girl's perceived ability to make and sustain pregnancy-preventive decisions, including refusing unwanted sexual activity, negotiating boundaries with a partner or family, seeking reproductive health services, and delaying marriage or pregnancy [10]. Second, outcome expectancies refer to adolescents' beliefs about the likely consequences of reproductive decisions, including perceived negative outcomes of early pregnancy, such as disruption of education, health risks, and social stigma, as well as perceived positive outcomes, such as social acceptance, emotional closeness with a partner, or fulfillment of family expectations [13]. Third, socio-structural factors refer to contextual supports and barriers that shape reproductive decision-making, including family and peer influence, access to adolescent-friendly reproductive health services, support from healthcare workers, economic constraints, school continuation, and prevailing sociocultural norms regarding early marriage [12,13]. Social norms within a community define what is considered permissible or prohibited, functioning as an external regulatory force that influences outcome expectancies [14]. In a sociocultural context that normalizes early marriage, adolescent girls face heightened barriers to negotiating safe sexual practices, substantially increasing their vulnerability to early pregnancy [15].

Despite the theoretical relevance of SCT in explaining adolescent health behavior, empirical studies applying this framework to teenage pregnancy in remote Indonesian settings with distinct sociocultural dynamics remain scarce. Prior research has largely examined individual-level predictors in isolation, without integrating personal cognitive and environmental determinants within a unified theoretical model. The aim of this study was to analyze the associations of self-efficacy, outcome expectancies, and socio-structural factors with teenage pregnancy among female adolescents in Gayo Lues using the SCT framework.

Methods

Study design and setting

This study employed a quantitative cross-sectional analytic survey design to examine the associations of self-efficacy, outcome expectancies, and socio-structural factors with teenage pregnancy. The study was conducted in January 2026 at four community health centers (*Puskesmas*) in Gayo Lues, Aceh Province, Indonesia: Blang Jerango, Cinta Maju, Dabun Gelang, and Kuta Panjang. These four *Puskesmas* were selected to represent the regency's geographical diversity, corresponding to the western, northern, southern, and eastern zones, respectively.

Participants and criteria

The study population comprised female adolescents aged 10 to 19 years who were registered within the service areas of the four selected *Puskesmas*. Participants were eligible for inclusion if they were female adolescents aged 10 to 19 years, were domiciled within the working area of the selected *Puskesmas*, and provided written informed consent, or assent accompanied by parental consent for participants under 18 years of age. Participants were excluded if they were unable to communicate, had cognitive impairments that prevented comprehension of the questionnaire, were not present during the data collection period after three attempts to contact them, or declined to participate.

Sample size and sampling strategy

The minimum sample size was calculated using the Lemeshow formula for cross-sectional studies, with a 95% confidence level, a 5% margin of error, and a teenage pregnancy proportion of 10.9%, derived from a previous study [7]. This yielded a minimum sample of 150 participants, to which a 10% non-response rate was added, resulting in a final minimum sample of 165 participants. A total of 305 participants were ultimately recruited to enhance statistical power. Cluster random sampling was applied by classifying the *Puskesmas* into geographical zones, followed by proportional allocation of participants within each cluster based on the registered adolescent population. The proportional sample sizes were 97 participants from *Puskesmas* Blang Jerango (31.8%), 75 from Cinta Maju (24.6%), 47 from Dabun Gelang (15.4%), and 86 from Kuta Panjang (28.2%).

Data collection

Data were collected through structured face-to-face interviews using a validated questionnaire administered by trained enumerators. Prior to data collection, enumerators received standardized training covering the study objectives, questionnaire content, interview techniques, and ethical considerations. Each interview was conducted in a private and comfortable setting to minimize social desirability bias and encourage honest responses. Completed questionnaires were reviewed on-site for completeness before data entry and analysis.

Study instrument

The questionnaire comprised three sections corresponding to the three SCT constructs assessed: self-efficacy, outcome expectancies, and socio-structural factors. Each construct was assessed using 15 items measured on a four-point Likert scale ranging from "strongly disagree" to "strongly agree," scored from 1 to 4. Prior to use, the questionnaire underwent content validation by five domain experts (expert judgment) to assess the relevance and clarity of items. A pilot test was subsequently conducted with 20 participants who were similar to the target population across the four study areas.

Construct validity was assessed using Spearman's rank correlation by correlating individual item scores with the total score of each construct. Items were considered valid if the correlation coefficient exceeded the critical value at the 5% significance level. All items across the three constructs demonstrated positive and statistically significant correlations ($p < 0.05$), confirming acceptable validity, with r -values ranging from 0.454 to 0.710 for self-efficacy, 0.463 to 0.612 for outcome expectancies, and 0.563 to 0.802 for socio-structural factors. Reliability was assessed using Cronbach's alpha, with values of 0.884 for self-efficacy, 0.790 for outcome expectancies, and 0.918 for socio-structural factors, all exceeding the accepted threshold of 0.70, indicating good internal consistency.

Study variables

The dependent variable was the presence of teenage pregnancy, defined as a history of pregnancy occurring while the respondent was aged 10 to 19 years, categorized as "ever pregnant" or "never pregnant." The independent variables were the three SCT constructs. Self-efficacy was defined as the adolescent's level of belief in her ability to avoid behaviors that lead to pregnancy, categorized as low, moderate, or high based on the tertile distribution of scores. Outcome expectancies were defined as adolescents' beliefs about the positive and negative consequences of behaviors related to pregnancy and were similarly categorized as low, moderate, or high. Socio-structural factors were defined as the degree of environmental support and constraint experienced by the adolescent, including the roles of healthcare workers, family, and peers, as well as prevailing sociocultural norms, and were categorized as low, moderate, or high. Sociodemographic characteristics collected as covariates included *Puskesmas* area, age group (early adolescence 10–13 years, middle adolescence 14–17 years, late adolescence 18–19 years), educational level (no schooling, primary/junior secondary, senior secondary, higher education), and monthly household income (no independent income, below Indonesian Rupiah (IDR) 3.5 million, IDR 3.5–15 million, above IDR 15 million).

Statistical analysis

Descriptive statistics were used to summarize sociodemographic characteristics and study variables using frequencies and percentages. Bivariate analysis was performed using cross-tabulation, followed by logistic regression, to examine the association of each independent variable with the history of teenage pregnancy. The results were expressed as regression coefficients (B), p -values, and $\text{Exp}(B)$. Multivariate analysis was subsequently conducted using multiple logistic regression to identify the dominant determinant and assess the simultaneous influence of all three SCT constructs on teenage pregnancy. Model contribution was assessed using Cox and Snell R^2 and Nagelkerke R^2 . Statistical significance was defined as $p < 0.05$. All analyses were performed using SPSS Statistics version 29 (IBM, New York, USA).

Results

Participant characteristics

A total of 305 female adolescents participated in this study across four *Puskesmas* in Gayo Lues and their characteristics are presented in **Table 1**. The majority were recruited from *Puskesmas* Blang Jerango ($n=97$; 31.8%), followed by Kuta Panjang ($n=86$; 28.2%), Cinta Maju ($n=75$; 24.6%), and Dabun Gelang ($n=47$; 15.4%). Middle adolescence (14–17 years) was the predominant age group (54.1%; $n=165$), followed by late adolescence (18–19 years; 39.0%; $n=119$) and early adolescence (10–13 years; 6.9%; $n=21$). Educational attainment was low overall, with 59.0% ($n=180$) having completed only Primary–Junior High School and 4.6% ($n=14$) having received no formal schooling. The majority of participants (68.5%; $n=209$) were unmarried and had no independent household income; 27.9% ($n=85$) came from low-income households (below IDR 3.5 million per month); and 3.6% ($n=11$) from middle-income households (IDR 3.5–15 million per month).

Table 1. Characteristics of female adolescents included in the study (n=305)

Variable	Frequency	Percentage
<i>Puskesmas</i>		
Blang Jerango	97	31.8
Cinta Maju	75	24.6
Dabun Gelang	47	15.4
Kuta Panjang	86	28.2
<i>Age group</i>		
10–13 years (early adolescence)	21	6.9
14–17 years (middle adolescence)	165	54.1
18–19 years (late adolescence)	119	39.0
<i>Last education</i>		
No formal schooling	14	4.6
Primary–Junior High School	180	59.0
Senior High School	106	34.8
Higher Education	5	1.6
<i>Household income</i>		
No independent income	209	68.5
<IDR 3.5 million/month	85	27.9
IDR 3.5–15 million/month	11	3.6
>IDR 15 million/month	0	0.0

Distribution of Social Cognitive Theory (SCT) constructs and teenage pregnancy status

The distribution of the three independent variables, self-efficacy, outcome expectancies, and socio-structural factors, together with the dependent variable, is presented in **Table 2**. For self-efficacy, the moderate category was most prevalent (55.7%; n=170), followed by high (28.2%; n=86) and low (16.1%; n=49). For outcome expectancies, moderate also dominated (53.8%; n=164), followed by high (40.7%; n=124) and low (5.6%; n=17). For socio-structural factors, moderate was the most common (46.9%; n=143), followed by high (43.6%; n=133) and low (9.5%; n=29).

Overall, 29.5% (n=90) of participants reported a history of teenage pregnancy, while 70.5% (n=215) had never been pregnant. Among those who had experienced pregnancy, 95.6% (n=86) were married at the time of first pregnancy and 4.4% (n=4) were unmarried.

Table 2. Distribution of Social Cognitive Theory (SCT) constructs and teenage pregnancy history among participants (n=305)

Variable	Frequency	Percentage
<i>Self-efficacy</i>		
Low	49	16.1
Moderate	170	55.7
High	86	28.2
<i>Outcome expectancies</i>		
Low	17	5.6
Moderate	164	53.8
High	124	40.7
<i>Socio-structural</i>		
Low	29	9.5
Moderate	143	46.9
High	133	43.6
<i>Teenage pregnancy</i>		
Ever pregnant	90	29.5
Never pregnant	215	70.5
<i>Marital status at first pregnancy (n=90)</i>		
Married	86	95.6 ^a
Unmarried	4	4.4 ^a

^a Percentages are calculated among participants with a history of teenage pregnancy (n=90)

Association between self-efficacy and teenage pregnancy

The association between self-efficacy and history of teenage pregnancy is presented in **Table 3**. The proportion of participants who had ever been pregnant decreased as self-efficacy increased, from 40.8% in the low self-efficacy group to 32.4% in the moderate group and 17.4% in the high group. Simple logistic regression showed that higher self-efficacy was significantly associated

with lower odds of having a history of teenage pregnancy (OR=0.551; $p=0.003$). The model explained 4.3% of the variance in teenage pregnancy history based on Nagelkerke R^2 .

Table 3. Association of self-efficacy with history of teenage pregnancy among participants (n=305)

Self-efficacy	Total n (%)	Teenage pregnancy		B	Odds ratio (OR)	p-value
		Never pregnant n (%)	Ever pregnant n (%)			
Low	49 (100)	29 (59.2)	20 (40.8)	-0.597	0.551	0.003
Moderate	170 (100)	115 (67.6)	55 (32.4)			
High	86 (100)	71 (82.6)	15 (17.4)			
Nagelkerke R ² =0.043						

Association between outcome expectancies and teenage pregnancy

The association between outcome expectancies and history of teenage pregnancy is presented in **Table 4**. The proportion of participants who had ever been pregnant decreased across increasing levels of outcome expectancies, from 58.8% in the low category to 36.0% in the moderate category and 16.9% in the high category. Simple logistic regression showed that higher outcome expectancies were significantly associated with lower odds of having a history of teenage pregnancy (OR=0.371; $p<0.001$). The model explained 9.0% of the variance in teenage pregnancy history based on Nagelkerke R^2 .

Table 4. Association of outcome expectancies with history of teenage pregnancy among participants (n=305)

Outcome expectancies	Total n (%)	Teenage pregnancy		B	Odds ratio (OR)	p-value
		Never pregnant n (%)	Ever pregnant n (%)			
Low	17 (100)	7 (41.2)	10 (58.8)	−0.992	0.371	<0.001
Moderate	164 (100)	105 (64.0)	59 (36.0)			
High	124 (100)	103 (83.1)	21 (16.9)			
Nagelkerke R ² =0.090						

Association between socio-structural factors and teenage pregnancy

The association between socio-structural factors and history of teenage pregnancy is presented in **Table 5**. The proportion of participants who had ever been pregnant decreased across increasing levels of socio-structural factors, from 41.4% in the low category to 34.3% in the moderate category and 21.8% in the high category. After correcting for the inverse coding direction, simple logistic regression showed that higher socio-structural factors were significantly associated with lower odds of having a history of teenage pregnancy (OR=0.597; $p=0.008$). The model explained 3.2% of the variance in teenage pregnancy history based on Nagelkerke R^2 .

Table 5. Association of socio-structural factors with history of teenage pregnancy among participants (n=305)

Socio-structural factors	Total n (%)	Teenage pregnancy		B	Odds ratio (OR)	p-value
		Never pregnant n (%)	Ever pregnant n (%)			
Low	29 (100)	17 (58.6)	12 (41.4)	−0.515	0.597	0.008
Moderate	143 (100)	94 (65.7)	49 (34.3)			
High	133 (100)	104 (78.2)	29 (21.8)			
Nagelkerke R ² =0.032						

Multivariate analysis

Multiple logistic regression was conducted to examine the simultaneous influence of all three SCT constructs on the presence of teenage pregnancy. The overall model demonstrated a statistically significant improvement in fit (omnibus $\chi^2=26.588$; $p<0.001$; Cox & Snell $R^2=0.083$; Nagelkerke $R^2=0.119$), indicating that the three variables together explained 11.9% of the variance. The full results are presented in **Table 6**. In the multivariate model, outcome expectancies emerged as the most dominant predictor (OR=0.424; $p<0.001$), meaning each one-level increase in the

outcome expectancies category was associated with a 0.424-fold reduction in the odds of teenage pregnancy. Self-efficacy remained a significant independent predictor ($OR=0.628$; $p=0.027$), indicating that each one-level increase in self-efficacy category was associated with a 0.628-fold reduction in the odds of teenage pregnancy after controlling for the other variables. In contrast, socio-structural factors did not retain statistical significance in the multivariate model ($OR=0.810$; $p=0.318$), suggesting that once personal cognitive factors were accounted for, the additional independent contribution of socio-structural variables was no longer statistically significant.

Table 6. Multiple binary logistic regression of self-efficacy, outcome expectancies, and socio-structural factors against teenage pregnancy

Social Cognitive Theory constructs	B	Odds ratio (OR)	p-value
Self-efficacy	-0.466	0.628	0.027
Outcome expectancies	-0.858	0.424	<0.001
Socio-structural	-0.211	0.810	0.318
Constant	2.529	12.539	<0.001
Cox & Snell $R^2=0.083$; Nagelkerke $R^2=0.119$			

Discussion

This study examined the influence of self-efficacy, outcome expectancies, and socio-structural factors on the incidence of teenage pregnancy in Gayo Lues Regency, a geographically remote district in Aceh Province, Indonesia, using the SCT framework. All three constructs demonstrated statistically significant associations with teenage pregnancy in bivariate analyses; however, in the multivariate model, outcome expectancies and self-efficacy remained independently significant, whereas socio-structural factors were not. These findings offer important insights into the psychosocial mechanisms underlying teenage pregnancy in a distinct sociocultural setting and support the application of SCT as an explanatory framework for adolescent reproductive health behavior.

The sociodemographic profile of this study's participants reflects the challenging structural conditions associated with teenage pregnancy in rural Indonesia. The majority of participants were in middle adolescence (14–17 years; 54.1%), had only completed primary to junior secondary schooling (59.0%), and 4.6% had received no formal schooling at all. These findings are consistent with national data indicating that low educational attainment is strongly associated with increased risk of teenage pregnancy, with adolescents who have only completed primary education reported to have the highest risk compared to those with secondary and higher education [16]. The high proportion of participants with low household income or no independent income (68.5% were unmarried without personal earnings) further underscores the economic vulnerability of this population, consistent with a study using Indonesian Demographic and Health Survey (SDKI) 2017 data demonstrating that socioeconomic status is inversely associated with teenage pregnancy incidence, and that adolescents from the poorest households carry the highest risk [17]. Notably, 95.6% of those who had experienced pregnancy were married at the time of first pregnancy, indicating that in Gayo Lues, the predominant pathway to teenage pregnancy occurs within the institution of early marriage rather than outside it. A pattern distinct from many urban settings and consistent with the regency's deeply embedded customary practices around early marriage [9].

The present study found a significant inverse association between self-efficacy and teenage pregnancy ($B=-0.597$; $OR=0.551$; $p=0.003$), indicating that adolescents with higher self-efficacy were substantially less likely to have experienced pregnancy. This finding aligns with the foundational premise of SCT, in which self-efficacy functions as the most proximal personal determinant of health behavior by regulating an individual's conviction in their capacity to resist risk-conducive behaviors [10]. The clear inverse gradient observed across self-efficacy categories, with pregnancy prevalence declining from 40.8% in the low group to 17.4% in the high group, further reinforces this relationship. These findings are consistent with a previous study demonstrating that adolescents with stronger self-efficacy are more capable of resisting peer pressure and negotiating sexual decisions, particularly in settings characterized by gender

inequality and patriarchal norms [10]. In Gayo Lues, where cultural expectations around femininity and early marriage are strongly embedded within the local cultural system, low self-efficacy may be compounded by limited agency and restricted opportunities for girls to assert reproductive autonomy [9]. The persistence of practices such as *naik* (elopement marriage) and *kemel* (concealment of pregnancy) suggests that many adolescents may lack the self-efficacy necessary to navigate complex social expectations or seek reproductive health information and services [9]. In the multivariate model, self-efficacy retained statistical significance ($B=-0.466$; $OR=0.628$; $p=0.027$), confirming its independent contribution to pregnancy risk even after controlling for outcome expectancies and socio-structural factors. This finding supports SCT's positioning of self-efficacy as a core personal cognitive factor that operates relatively independently of environmental influences, particularly in contexts where individual behavioral capacity and personal agency are constrained [10].

Outcome expectancies emerged as the most dominant predictor of teenage pregnancy in both bivariate ($B=-0.992$; $OR=0.371$; $p<0.001$) and multivariate analyses ($B=-0.858$; $OR=0.424$; $p<0.001$), consistent with SCT's proposition that anticipated behavioral consequences are central regulators of motivation for health behavior. The striking gradient across outcome expectancy categories, with pregnancy prevalence declining from 58.8% in the low group to 16.9% in the high group, indicates the powerful influence that anticipated outcomes exert on adolescent reproductive behavior in this setting. This finding aligns with prior evidence demonstrating that adolescents who hold more accurate and realistic expectations about the negative consequences of early pregnancy, including disruption of education, health risks, and social stigma, are more likely to engage in preventive behaviors [13]. In the sociocultural context of Gayo Lues, the dominance of outcome expectancies as a predictor may be explained by the deeply embedded social norms surrounding early marriage, in which the perceived positive consequences of marriage (such as social acceptance, fulfillment of family expectations, and perceived transition to adult status) may outweigh adolescents' awareness of the negative health and social consequences of early pregnancy [14]. As Conner's operationalization of SCT emphasizes, outcome expectancies encompass not only physical health outcomes but also social and self-evaluative dimensions [18]. In environments that normalize and even celebrate early marriage, adolescents may develop distorted outcome expectancies that present early pregnancy as socially rewarding rather than harmful, thereby reducing motivation to engage in preventive behavior. The finding that outcome expectancies explained the largest proportion of variance (Nagelkerke $R^2=0.090$) in bivariate analysis, and remained the most significant predictor in the multivariate model, suggests that reproductive health education programs in Gayo Lues should prioritize the reshaping of adolescents' cognitive appraisal of the consequences of early pregnancy, particularly by addressing social and self-evaluative outcome dimensions alongside medical risk information.

Socio-structural factors were significantly associated with teenage pregnancy in a bivariate analysis ($B=-0.515$; $OR=0.597$; $p=0.008$; Nagelkerke $R^2=0.032$), consistent with SCT's conceptualization of the environment as a key determinant of behavioral motivation [12,13]. The observed decline in pregnancy prevalence from 41.4% in the low socio-structural support group to 21.8% in the high support group indicates that a more supportive environmental context, including access to reproductive health services, family support, and a normative environment that does not reinforce early marriage, is associated with meaningfully lower rates of teenage pregnancy. However, socio-structural factors did not retain significance in the multivariate model ($p=0.318$), and this construct accounted for the smallest proportion of variance in bivariate analysis (Nagelkerke $R^2=0.032$). This pattern may reflect methodological limitations in the operationalization of socio-structural factors in the present study, as the 15-item scale may not have been sufficiently sensitive to capture the full complexity of the environmental landscape in Gayo Lues, including the influence of *adat* authorities, religious norms, access to contraception, media exposure, and the spatial constraints imposed by the regency's geographic remoteness [9]. Alternatively, this finding may represent a genuine phenomenon in which the personal cognitive factors, particularly the internalized normative framework encoded within outcome expectancies, carry greater behavioral weight than external structural conditions, at least within the measurement scope of the current study. This interpretation is consistent with the SCT principle

of triadic reciprocal determinism, which posits that personal, behavioral, and environmental factors exert dynamic and mutually influential effects on health behavior, and that the relative weighting of each factor may vary across contexts [10,11]. Nevertheless, the significant bivariate association underscores the potential importance of socio-structural interventions, particularly those targeting healthcare worker engagement, family communication around reproductive health, and policy-level support for girls' education and delayed marriage. Future studies incorporating more comprehensive socio-structural measures, including community-level variables and spatial accessibility indices, would be valuable in elucidating the full contribution of environmental factors in this setting.

The findings of this study broadly support the applicability of the SCT framework in explaining teenage pregnancy behavior in a remote, sociocultural setting. The simultaneous significance of personal cognitive factors (self-efficacy and outcome expectancies) in the multivariate model confirms the central premise of SCT regarding the primacy of individual cognition in health behavior regulation [10,11]. Consistent with Conner's modified SCT model, which emphasizes the mediating role of self-efficacy between environmental influences and behavioral outcomes, the present findings suggest that outcome expectancies and self-efficacy operate as interconnected cognitive mechanisms: distorted outcome expectancies may reduce self-efficacy for pregnancy prevention, while high self-efficacy may enable adolescents to apply accurate outcome expectations in behavioral decision-making [18]. Taken together, the findings indicate that the most effective prevention strategies will be those that simultaneously address both the quality of adolescents' anticipated consequences and their belief in their capacity to act on those expectations. This approach aligns with a multilevel prevention framework targeting all three SCT components simultaneously, including adolescent reproductive health programs such as the *Program Kesehatan Peduli Remaja* (PKPR), *Generasi Berencana* (GenRe), and the *Klinik DANA* model implemented through *Puskesmas*, which have been advocated as comprehensive adolescent reproductive health interventions in Indonesia [12,13]. The overall model in the multivariate analysis explained 11.9% of the variance in teenage pregnancy (Nagelkerke $R^2=0.119$), which, while consistent with the explanatory limits commonly observed in cross-sectional studies of complex behavioral outcomes, indicates that additional unmeasured factors, including genetic predispositions, relationship dynamics, economic agency, and community-level variables, contribute substantially to teenage pregnancy in this context. This highlights the need for longitudinal and mixed-methods research designs that can capture the full causal complexity of the problem.

This study has several notable strengths. It is, to the best of our knowledge, among the first empirical studies to apply the SCT framework to teenage pregnancy in the Gayo Lues Regency, a geographically remote and socioculturally distinct setting with a unique culture system and demographic vulnerability that have rarely been examined in peer-reviewed literature. The use of cluster random sampling across four *Puskesmas*, representing distinct geographical zones, enhances the representativeness of the findings across the regency. The validated, multi-domain questionnaire assessed three SCT constructs across a sample of 305 participants, providing adequate statistical power for multivariate analysis. Nevertheless, some limitations should be acknowledged. The cross-sectional design precludes causal inference regarding the relationship between SCT constructs and teenage pregnancy. Data on pregnancy history and behavioral variables were self-reported, which may introduce recall and social desirability bias, particularly given the sensitive nature of sexual and reproductive topics in this sociocultural context. The relatively low Nagelkerke R^2 value for the overall model (0.119) indicates that important predictors remain unmeasured, including contraceptive knowledge and access, partner influences, media exposure, and community-level normative factors. The coverage of four out of 11 *Puskesmas* limits full generalizability to the entire Gayo Lues, and the findings may not be directly transferable to other rural settings in Indonesia without contextual adaptation.

Conclusion

In this study, 29.5% of female adolescents reported a history of teenage pregnancy, indicating a substantial reproductive health burden in this remote sociocultural setting. This study demonstrates that self-efficacy, outcome expectancies, and socio-structural factors are each

significantly associated with teenage pregnancy among female adolescents. In the multivariate analysis, outcome expectancies emerged as the strongest predictor, followed by self-efficacy, whereas socio-structural factors did not retain independent significance after controlling for personal cognitive variables. These findings confirm the applicability of the SCT framework to explaining adolescent reproductive health behavior in a remote, socioculturally distinct Indonesian setting. Multilayered interventions that simultaneously address the quality of adolescents' anticipated consequences, strengthen their self-efficacy for preventive behavior, and improve the social and structural environment are recommended to reduce teenage pregnancy in Gayo Lues and comparable settings. Future research employing longitudinal designs, mixed methods, and expanded socio-structural measurement would further deepen the understanding of the complex behavioral determinants of teenage pregnancy in this population.

Ethics approval

This study received ethical exemption from the Health Research Ethics Committee of Faculty of Medicine, Universitas Syiah Kuala, Banda Aceh, Indonesia (No. 024/EA/FK/2026). All participants provided written informed consent prior to data collection, and parental consent was obtained for participants under 18 years of age. The study adhered to the ethical principles of respect for human dignity, beneficence, non-maleficence, and justice throughout the research process.

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Competing interests

The authors declare that there are no conflicts of interest.

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Underlying data

Derived data supporting the findings of this study are available from the corresponding author on request.

Declaration of artificial intelligence use

We hereby confirm that no artificial intelligence (AI) tools or methodologies were utilized at any stage of this study, including during data collection, analysis, visualization, or manuscript preparation. All work presented in this study was conducted manually by the authors without the assistance of AI-based tools or systems.

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