

Predictors of Mothers' Practices in Child Sexuality Education: The Role of Sexual Health Literacy in a Population-Based Study from Southeast Iran

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Background and Objective: Child Sexuality Education (CSE) is vital for child development and preventing sexual harm. In conservative Iran, where formal sex education is limited, mothers are primary educators. While previous studies focused on cultural barriers or were qualitative, the role of modifiable SHL in maternal practices remains unexplored. This study examined the association between maternal SHL and practices in child sexuality education, controlling for demographics, in southeastern Iran.

Materials and Methods: This cross-sectional study was conducted on 300 mothers of children aged 5–12 years in Saravan, Iran, selected via multi-stage random sampling. Data were collected using the validated Sexual Health Literacy for Adults (SHELA) questionnaire and a localized, culturally adapted knowledge and practice questionnaire. The latter demonstrated strong psychometric properties (CVR=0.94; Cronbach's α =0.84; test-retest reliability coefficient=0.70). Hierarchical regression was employed to quantify the unique variance explained by SHL after controlling for demographic variables (age, education, marital status, income, and employment).

Results: The mean SHL score was 34.65 out of 100 (indicating an 'inadequate' level), and the mean practice score was 19.86 out of 45. The hierarchical model was significant ($F(7, 292)=75.34$, $p<0.001$) and accounted for 67.4% of the variance in practices ($R^2=0.674$; Adjusted $R^2=0.665$). After controlling for demographic factors, SHL emerged as the dominant correlate of maternal practices ($\beta=0.777$; 95% CI: 0.350 to 0.424; $p<0.001$). Among demographic variables, only education remained a small but significant contributor ($\beta=0.097$; $p=0.020$).

Conclusion: The findings demonstrate a strong positive association between maternal SHL and practices in child sexuality education—an association that substantially outweighs demographic factors and underscores SHL's potential as a modifiable target for interventions, though causal inferences are precluded. The low SHL scores highlight an urgent need for targeted literacy-focused interventions; however, given the cross-sectional design, these findings suggest promise but require rigorous interventional and longitudinal studies to establish causality and effectiveness before widespread implementation. However, the cross-sectional design and single-city sampling preclude causal inference and limit generalizability. The potential influence of unmeasured confounders (e.g., cultural beliefs, prior educational exposure) should be acknowledged.

Keywords: Sexual Health; Child Rearing; Mothers; Parent-Child Relations; Health Knowledge, Attitudes, Practice; Iran



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Introduction

Mothers, as primary caregivers and key agents of socialization in most family structures, play a decisive role in the timing, content, and quality of sexuality education provided in the home environment (1,2). However, their educational practices are influenced by a complex interplay of psychosocial, cultural, and cognitive factors (3,4). Among these factors, Sexual Health Literacy (SHL) has emerged as a potentially critical yet under-researched determinant (5).

Global research indicates significant deficiencies in parental SHL, which correlate with systematic avoidance, anxiety, and the dissemination of inaccurate information during sexual communication with children (6-8). Recent reviews emphasize that parents with higher SHL are more likely to engage in earlier, preventive, and evidence-based Childhood Sexuality Education (CSE), thereby reducing risks associated with misinformation and vulnerability (6,8). Conversely, low SHL is consistently linked to the formation of reactive or fear-based communication patterns that fail to equip children and adolescents with the essential knowledge and skills for self-protection (6,9). Despite this well-established association, a significant evidence gap persists regarding the relationship between SHL and sexual health in low- and middle-income countries. This gap is particularly pronounced in conservative settings where formal sexuality education in schools is severely limited or entirely absent (10).

Iran presents a compelling case study for examining this knowledge gap. Despite notable achievements in the field of public health, its cultural and social characteristics have constrained public discourse on sexual health and have entrusted a central role in this area to families (11,12). Preliminary studies indicate that Iranian mothers experience significant anxiety, knowledge deficits, and uncertainty regarding their role as sexuality educators (13,14). However, these studies have been primarily qualitative, restricted to specific regions, or focused solely on knowledge, and have been unable to employ a robust, multidimensional framework of sexual health literacy or to measure its predictive power against confounding demographic factors (13,14).

Based on our systematic search of PubMed, Scopus, SID, and Magiran databases using combined keywords 'sexual health literacy' AND 'parental practices' AND 'child sexuality education' up to January 2025, no population-based study was found in Iran or Middle Eastern countries that simultaneously modeled SHL as the main predictor of mothers'

practices in child sexuality education while controlling for demographic variables. Therefore, this study is the first of its kind in the region. The existing literature from the region often highlights cultural barriers as the predominant explanatory factor, inadvertently overlooking the modifiable, cognitive, and skill-based domain of sexual health literacy (15). This oversight limits the development of targeted and effective interventions. If SHL indeed proves to be a stronger predictor than socio-demographic factors, public health strategies should shift from general awareness-raising campaigns towards programs focused on building literacy.

A systematic review of previous studies in Iran reveals that most were qualitative (13,14), had limited sample sizes (16), or focused solely on mothers' knowledge without modeling sexual health literacy as a multidimensional construct (17). None of the previous studies in Iran used multivariate regression to determine the unique contribution of SHL alongside demographic variables.

To our knowledge, this is the first population-based quantitative study in Iran and the broader Middle Eastern region to simultaneously model SHL as a multidimensional construct alongside demographic variables in explaining maternal practices in child sexuality education. Unlike previous qualitative or knowledge-focused studies, our investigation employs a validated, multidimensional SHL instrument and hierarchical regression analysis to isolate the unique contribution of SHL—a methodological and conceptual innovation that enables the development of targeted, evidence-based interventions in this culturally sensitive domain.

Therefore, this study was designed to address this critical gap and test the hypothesis that mothers' SHL is the strongest independent predictor of their practices in CSE within the distinct socio-cultural context of southeastern Iran. By employing a population-based design and multiple linear regression modeling, this research quantifies the unique contribution of SHL and provides evidence that is both scientifically rigorous and immediately actionable for health policymakers. The findings will inform the development of context-sensitive, literacy-focused interventions designed to empower mothers, ultimately contributing to the fundamental sexual health and safety of the next generation in Iran and similar settings.

Materials and Methods

Study Design

This cross-sectional descriptive-analytical study was conducted to examine the association between mothers' Sexual Health Literacy (SHL) and their practices in child sexuality education in Saravan, Iran.

Study Population and Setting

The study population comprised mothers of children aged 5–12 years residing in Saravan, Sistan and Baluchestan province, southeastern Iran. The study was carried out in Urban

Comprehensive Health Service Centers, which serve as the primary facilities for public health service delivery and maintain family health records.

Eligibility Criteria

Inclusion criteria were: (1) being a mother (biological or primary female caregiver) of at least one child aged 5–12 years; (2) permanent residence in Saravan; (3) literacy in Persian (ability to read and write); (4) possession of an active family health record in one of the designated centers; and (5) provision of written informed consent.

Exclusion criteria included: (1) planned emigration from the city during the study period; (2) severe cognitive or psychological impairment that would impede reliable questionnaire completion (as documented in health records); (3) participation in any structured child sexuality education training program within the past six months; and (4) having a child with a major developmental disorder or chronic illness that might significantly alter typical parenting dynamics related to sexuality education.

Rationale for eligibility criteria: Inclusion criteria were selected to ensure a representative and homogeneous sample while maintaining rigor. The 5–12 age range captures the pre-adolescent stage when foundational sexual socialization begins, yet remains understudied. Permanent residency minimized bias from transient populations, enhancing stability. Persian literacy ensured independent, reliable self-report completion, securing data validity. Active health records facilitated access to verified demographics and systematic electronic sampling. Exclusion criteria included planned emigration (to prevent attrition), severe cognitive/psychological impairments (to safeguard response validity), recent participation in structured sexuality education (to avoid baseline contamination), and children with major developmental disorders or chronic illnesses (to prevent confounding from altered parenting dynamics, beyond the study's general scope).

Sample size

The sample size was calculated based on the primary objective of the study (correlation/regression analysis) using Cohen's (1988) correlation analysis formula (18).

$$N = \left[\frac{(Z^{1-\alpha/2} + Z^{1-\beta})}{C} \right]^2 + 3$$
$$C = 0.5 \times \ln \left[\frac{(1 + r)}{(1 - r)} \right]$$

Because no exact correlation coefficient was available from previous studies, a pilot study was conducted with 30 eligible mothers (not included in the main sample). The pilot yielded a Pearson correlation coefficient of 0.35 between SHL and sexuality education practices, which was used as the effect size estimate. Using G*Power software (version 3.1.9.7) with a two-tailed test, significance level of 0.05, power of 80%, and correlation of 0.35, the initial estimated sample size was 85. After applying a design effect of 1.5 for cluster sampling and

anticipating a 15% attrition rate, the sample size was increased to 151. To enable subgroup analyses (by education, income, age), detect smaller effect sizes (≥ 0.20), and account for potential interaction effects in hierarchical regression, the final sample size was set at 300 participants. This decision was also guided by Peduzzi et al.'s (1996) criterion of at least 10–15 participants per independent variable (7 independent variables in this study), making the sample of 300 highly adequate.

Sampling Procedure

A multi-stage random sampling method was employed to obtain a representative sample. In the first stage, two of the three available Urban Comprehensive Health Service Centers were selected via simple random sampling using a random number table. In the second stage, lists of eligible mothers were extracted from the electronic registration system of each selected center. Participants were then selected using systematic random sampling (calculating a sampling interval, selecting a random starting point, and systematically including individuals). Given the total sample size of 300, 150 participants were allocated to each center. To account for potential non-response, an additional 10% reserve list was prepared. All selection procedures were carried out by an independent research assistant after obtaining written informed consent, ensuring maximum representativeness and minimizing selection bias.

Variables and Measurement Tools

Two instruments were used for data collection:

1. Knowledge and Practice Questionnaire: This instrument was developed by integrating and culturally adapting existing validated tools in Iran (Mobardi et al., 2016; Saki et al., 2019). It consists of three sections: (a) demographic characteristics (6 items); (b) knowledge assessment (20 items on a 4-point Likert scale ranging from 'Completely Agree' to 'Completely Disagree'); and (c) self-reported practices (4 items on a 5-point Likert scale from 'Very High' to 'Very Low'). Content validity was confirmed with a Content Validity Ratio (CVR) of 0.94. Reliability was established through internal consistency (Cronbach's $\alpha=0.84$) and test-retest stability over a two-week interval (correlation coefficient=0.70) (17, 19).

2. Sexual Health Literacy for Adults (SHELA) Questionnaire: This standard instrument, designed by Maasoumi et al., comprises 40 items rated on a 5-point Likert scale (1=Strongly Disagree to 5 =Strongly Agree). Total scores are transformed to a 0–100 scale and categorized as Inadequate (0–50), Somewhat Inadequate (55.1–66), Adequate (66.1–84), and Excellent (84.1–100). The instrument has demonstrated strong validity (CVI=0.84; CVR=0.81) and reliability (Cronbach's $\alpha=0.84$ –0.94; Intraclass Correlation Coefficient [ICC]=0.90–0.97)(20).

Data Collection

Data collection was conducted in person in a quiet setting at the selected health centers. After obtaining written informed consent, questionnaires were administered by the researcher or trained assistants. A standardized clarification protocol was used to address

any ambiguities. The entire process was completed over three months under the supervision of the principal investigator.

Statistical Analysis

Data analysis was performed using IBM SPSS Statistics for Windows, version 26.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were reported as mean and standard deviation for quantitative variables, and frequency and percentage for categorical variables. Before conducting inferential tests, the normality of the main variables was assessed using the Kolmogorov–Smirnov test and graphical methods, which confirmed normal distributions, justifying parametric tests.

Comparisons of mean practice scores across independent groups (based on education, employment, and income) were performed using one-way Analysis of Variance (ANOVA), while two-group comparisons used independent samples t-tests.

To identify independent correlates of maternal practices, two regression approaches were applied. First, a standard multiple linear regression (simultaneous entry method) examined all predictors concurrently. Second, a hierarchical linear regression was performed: demographic variables (age, job, education, income, marital status) were entered in Step 1; SHL and knowledge were entered in Step 2 to assess the additional variance explained beyond demographics. All regression models were checked for multicollinearity using Variance Inflation Factor (VIF), with VIF values < 2 indicating no multicollinearity. Residual assumptions (linearity, normality, homoscedasticity, and independence) were verified prior to analysis. The significance level was set at $\alpha=0.05$.

Ethical Considerations

This study adhered to the principles of the Helsinki Declaration and was approved by the Research Ethics Committee of Zahedan University of Medical Sciences (ethical code: IR.ZAUMS.REC.1403.106). Written informed consent was obtained from all participants after full disclosure of the study's objectives, methods, potential benefits, and risks. Participants were assured of voluntary participation, the right to withdraw at any time, and strict confidentiality of data through non-personal identification codes and secure storage.

Results

In this cross-sectional study, 300 eligible mothers from the city of Saravan were examined. The mean age of the participants was 30.95 years (standard deviation: 7.54) with a range of 20 to 58 years. The frequency distribution of demographic characteristics is presented in Table 1. As can be observed, the majority of participants were married (93%), had a university education (49.67%), and were housewives (50.33%) (Table 1).

Table 1. Frequency Distribution of Participants' Demographic and Socioeconomic Characteristics (n=300)

variable		Total	sample
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		Frequency (No)	%
Age	20-30	156	52
	31-40	109	36.33
	>40	35	11.67
Marital status	Married	279	93
	Divorced	17	5.67
	Widow	4	1.33
Level of education	Elementary school	50	16.67
	High school	31	10.33
	Diploma	70	23.33
	University graduate	149	49.67
Employment status	Employed	111	37
	Student	36	12
	Retired	2	0.67
	Housewife	151	50.33
Income status	Insufficient	54	18
	Moderate	181	60.34
	Sufficient	65	21.66

The mean SHL score for all participants was 34.65 (out of 100), falling within the 'inadequate' category. The distribution of SHL levels showed that 256 participants (85.3%) had inadequate levels, 37 (12.3%) had somewhat inadequate levels, and 7 (2.3%) had adequate levels. No participant reached the excellent level. The mean knowledge score was 20.47 (out of 40), and the mean practice score was 19.86 (out of 45) (Table 2).

Table 2. Mean and Standard Deviation of Scores in the Domains of SHL, Knowledge, and Practice

Domain	Mean	SD	Minimum	Maximum	Score range
Access	30.23	21.97	0	100	0-100
Reading&Comprehension	26.08	16.99	0	100	0-100
Evaluation & Analysis	29.65	19.88	0	100	0-100
Information application	52.64	15.40	25	100	0-100
Overall Sexual Health literacy	34.65	15.50	6.25	96.25	0-100
Sexual knowledge	20.47	2.94	13	32	0-40
Behavior in children's sexual education	19.86	7.72	4	41	0-45
Self-assessment	13.14	3.52	4	20	1-20

HL: Sexual Health Literacy,

As presented in Table 3, the mean practice score differed significantly across educational groups ($p < 0.001$), employment status ($p = 0.033$), and income status ($p = 0.017$), with mothers holding university degrees and those with sufficient income demonstrating higher practice scores. Furthermore, the mean practice score was substantially higher among mothers with higher SHL levels ($p < 0.001$). No significant difference was observed based on age group ($p = 0.161$) or marital status ($p = 0.758$). For sexual knowledge, scores were dichotomized at the median (20.47); the mean difference between low and high knowledge groups was not statistically significant ($p = 0.174$).

Table 3. Mean Behavior Score in Children's Sexual Education Categorized by Demographic and Sexual Health Literacy Variables

variable		Behavior		Test statistic (F/t)	p-value
		Mean	SD		
Age	20-30	20.67	7.96	F(2, 297)=1.84	0.161**
	31-40	18.89	6.98		
	>40	19.25	8.66		
Marital status	Married	19.77	7.69	F(2, 297)=0.28	0.758**
	Divorced	21.23	9.14		
	Widow	21.75	5.61		
Level of education	Elementary school	19.72	6.73	F(3, 296)=12.45	<0.001**
	High school	20.17	8.27		
	Diploma	20.35	7.30		
	Graduate	23.47	8.57		
Employment status	Employed	18.28	7.11	F(3, 296)=2.94	<0.033**
	Housewife	20.82	8.01		
	Student	21.02	7.81		
	Retired	14.50	0.70		
Income status	Insufficient	18.90	7.01	F(2, 297)=4.11	0.017**
	Moderate	20.26	8.30		
	Sufficient	22.84	8.70		
Sexual knowledge	Low (n=152)	19.21	7.56	t(298)=1.48	0.17*
	High (n=148)	20.53	7.85		
SHL Level	Inadequate	17.86	5.78	F(2, 297)=58.23	<0.001
	Somewhat Inadequate	30.91	7.19		
	Adequate	37.66	1.86		

*T-Test, **One-way ANOVA Test

For sexual knowledge, scores were divided into two groups based on the median (20.47): low ($\leq$ median) and high ($>$ median). The mean difference between the two groups was not significant ($p=0.174$).

Note: SHL levels according to the SHELA questionnaire: Inadequate, Somewhat inadequate, Adequate. Notably, no participants were at the Excellent level, and due to the very small number of participants at the Adequate level ($n=7$), these two categories were combined into a single group labeled 'Adequate' to increase statistical power.

The final multiple linear regression model (**Table 4**) was statistically significant ($F(7, 292)=75.342$, $p<0.001$) and explained a substantial proportion of the variance in mothers' practices ($R^2=0.674$; Adjusted $R^2=0.665$). Among the variables entered, SHL exhibited the strongest positive and statistically significant association with practices, as indicated by the standardized coefficient ($\beta=0.777$, $p<0.001$, 95% CI: 0.350 to 0.424). This finding implies that, within the framework of this cross-sectional model, SHL had the greatest relative contribution to explaining variations in maternal practices. Among demographic variables, only educational level remained a small but significant independent correlate ($\beta=0.097$,



p=0.020). Other variables, including age, marital status, employment, and income, did not show statistically significant associations in the fully adjusted model.

Table 4. Multivariable linear regression for Behavior prediction (SHL and demographics)

Variable	Unstandardized Coefficients		Standardized Coefficients	p-value	95%CI for B
	B	Std.Error	Beta		
Constant	8.595	3.182		0.007	[2.333, 14.857]
Sexual Health Literacy	0.387	0.019	0.777	<0.001	[0.350, 0.424]
Knowledge	0.146	0.090	0.056	0.104	[-0.030, 0.323]
Age	-0.665	0.390	-0.059	0.090	[-1.433, 0.103]
Marital Status	0.021	0.857	0.001	0.980	[-1.666, 1.708]
Level of education	0.569	0.243	0.097	0.020	[0.090, 1.048]
Employment status	0.336	0.303	0.043	0.268	[-0.260, 0.933]
Income status			0.021		[-0.548, 1.042]

Model indices: R=0.821, R²=0.674, Adjusted R²=0.665, F(7,292)=75.342, p<0.001.

R=0.821, R Square=0.674, Adjusted R Square=0.665, F=75.342, Dependent Variable=Behavior, Predictors in the Model: SHL, Knowledge, Age, Marital Status, Level of education, Employment status, and Income status

The hierarchical regression analysis (Table 5) further quantified the unique contribution of the core psychosocial variables. In Model 1, demographic variables alone explained 13.2% of the variance in practices (R²=0.132, F(5, 294)=8.97, p < 0.001), with age (β =-0.184, p=0.002) and education (β =0.093, p=0.022) emerging as significant correlates. After adding SHL and knowledge in Model 2, the explained variance increased substantially to 67.4%, representing a significant change (Δ R²=0.542, p<0.001). In the final model, SHL remained the dominant correlate (B=0.387, β =0.777, p<0.001, 95% CI: 0.350 to 0.424). Education continued to show a small but significant positive association (B=0.569, β =0.097, p=0.020, 95% CI: 0.090 to 1.048), while knowledge was not significant (p=0.104).

Collectively, these results indicate that SHL plays a more central explanatory role than demographic characteristics in accounting for variations in maternal practices. The notable increase in R² after the introduction of SHL underscores its practical relevance as a potentially modifiable factor. However, given the cross-sectional design, these associations should not be interpreted as causal; rather, they highlight SHL as a promising target for future interventional research.

Table 5. Hierarchical Linear Regression Analysis Predicting Mothers' Practices in Child Sexuality Education (n=300)

Model / Predictor	B	SE B	β (Beta)	t	p-value	95% CI for B
Model 1 (Demographic variables only)						
(Constant)	33.795	5.163		6.545	<0.001	[23.63, 43.96]
Age	-0.189	0.059	-0.184	-3.190	0.002	[-0.31, -0.07]
Employment status	0.627	0.503	0.081	1.248	0.213	[-0.36, 1.62]
Education level	0.548	0.238	0.093	2.300	0.022	[0.08, 1.02]

Income status	0.417	0.658	0.036	0.634	0.527	[-0.88, 1.71]
Marital status	-0.372	1.383	-0.015	-0.269	0.788	[-3.09, 2.35]
<i>Model Fit</i>	$R^2=0.132$	Adjusted $R^2=0.118$	$F(5, 294)=8.97$		$p < 0.001$	
Model 2 (Demographics + SHL + Knowledge)						
(Constant)	8.595	3.182		2.70	0.007	[2.33, 14.86]
Age	-0.078	0.037	-0.076	-2.126	0.034	[-0.15, -0.01]
Employment status	0.219	0.308	0.028	0.713	0.476	[-0.39, 0.83]
Education level	0.569	0.238	0.097	2.162	0.020	[0.09, 1.05]
Income status	0.269	0.403	0.023	0.668	0.504	[-0.52, 1.06]
Marital status	-0.049	0.844	-0.002	-0.058	0.954	[-1.71, 1.61]
Sexual Health Literacy (SHL)	0.387	0.021	0.777	18.485	<0.001	[0.35, 0.42]
Knowledge	0.191	0.089	0.073	2.162	0.031	[0.02, 0.37]
<i>Model Fit</i>	$R^2=0.674$	Adjusted $R^2=0.665$	$\Delta R^2=0.542$	$F(7, 292)=75.34$		$p < 0.001$

Variance Inflation Factor (VIF) values for all predictors ranged from 1.017 to 1.155 in Model 2, indicating no significant multicollinearity. The change in R^2 ($\Delta R^2=0.542$) reflects the additional variance explained by SHL and knowledge beyond demographic factors alone.

Note: N=300. B=unstandardized regression coefficient; SE B=standard error of B; β =standardized coefficient; CI=confidence interval; VIF=variance inflation factor. Dependent variable: Health Behavior.

Discussion

The primary finding is the strong, positive association between maternal Sexual Health Literacy (SHL) and practices in child sexuality education, robust after controlling for age, education, income, employment, and marital status. SHL emerged as the dominant correlate, accounting for substantial variance beyond demographics ($\Delta R^2=0.542$), underscoring its practical relevance as a modifiable factor.

Theoretical interpretation: This association aligns with Bandura's Social Cognitive Theory (21), wherein SHL functions not merely as knowledge but as a cognitive competency that enhances self-efficacy—the belief in one's capability to perform a behavior. Mothers with higher SHL likely feel more confident in initiating age-appropriate conversations, managing anxiety, and responding to children's questions, translating into proactive, preventive practices. Conversely, low SHL may reduce self-efficacy, fostering avoidance and reactive communication—a mechanism well documented in health behaviour theories (21). Additionally, SHL encompasses skills in accessing, evaluating, and applying information, equipping mothers to navigate cultural taboos effectively.

Recent intervention research supports SHL as a modifiable competency: Peyghan et al. (22) found that a structured mother-empowerment programme in Zahedan (geographically proximate to our setting) significantly improved maternal awareness, responsiveness, and

self-efficacy, reinforcing the SCT framework and suggesting that literacy-focused interventions could directly enhance practical competencies.

The overall low SHL (mean 34.65/100, 85.3% inadequate) and practice scores (19.86/45) are consistent with Iranian reports highlighting deficiencies in family-based sexual dialogue, maternal knowledge, and confidence (2, 22-25). Unlike earlier descriptive studies, our use of a multidimensional validated SHL instrument and hierarchical regression allowed quantification of SHL's unique contribution while controlling for demographic confounders.

Integration with related research and discrepancies: Among demographics, only education remained a small significant correlate. This may suggest that formal education's positive effect on practices operates partly through increased SHL—a plausible mediation pathway requiring longitudinal testing. The modest negative age-practice association, though weak, aligns with generational differences in openness and familiarity with contemporary communication (10); older mothers may be more influenced by traditional norms or have received less comprehensive sexual information during their upbringing.

Interestingly, employed mothers showed lower mean practice scores than housewives and students. While speculative, this might reflect 'time poverty'—competing work and domestic demands limiting energy for sustained educational dialogue. Alternative explanations (workplace fatigue, differing social support, unmeasured cultural factors) cannot be ruled out; thus this finding is hypothesis-generating.

Our findings align with international evidence: Small et al. (2023) found parental SHL protective against risky sexual behaviours in Sierra Leone (6); Delprato (26) highlighted maternal empowerment and literacy as key to reducing educational gender gaps in low- and middle-income countries; and Power et al. (27) reported in an Australian national survey that parents with higher sexual literacy had significantly greater confidence, comfort, and satisfaction in discussing sex and relationships with their children. This cross-cultural consistency supports the SHL-practice association but underscores the need for context-specific interventions addressing cultural barriers prevalent in Iran.

Cultural context remains crucial. In high-income countries with comprehensive school-based curricula, adolescents often prefer schools over families for sexual information (28-30). In Iran, however, limitations on formal school-based education place the family—and particularly the mother—in the primary, not supplementary, role (31). The stronger SHL-practice association observed here (versus some Western studies) may stem from the higher cognitive load on parents when schools are absent; where schools share responsibility, parental SHL's unique contribution may be diluted. The non-significant knowledge-practice link ($\beta=0.056$, $p=0.104$) further underscores SHL's multidimensionality—knowledge alone is insufficient without skills and confidence to apply it, reinforcing the distinction between knowledge acquisition and behavioural enactment (21).

Low SHL scores are consistent with previous Iranian research: Torabi and Khosravi (32) found no significant correlation between parental and adolescent sexual health literacy, suggesting a systemic intergenerational gap; Nesfechi et al. (33) noted that although authoritative parenting was dominant, cultural limitations significantly shaped approaches to child sexuality education. These findings, combined with our field observations, highlight the compounded effect of cognitive deficits and socio-cultural barriers.

Researcher observations and contextual insights: During data collection in Saravan, most mothers displayed visible discomfort and hesitation, expressing concerns about "what is appropriate" or "what society might think." This cultural shame and fear of social judgment align with previous qualitative findings (16, 34-35) and may explain low SHL scores. Our observations of maternal discomfort, lack of guidance, and absence of formal resources echo Sarikhani et al. (36), who reported that Iranian mothers and educators lack a clear framework for child sexuality education. This systematic gap underscores the need for culturally sensitive, literacy-focused interventions addressing emotional and structural barriers. Employed mothers frequently cited time constraints ("I am too tired after work"), providing a tangible behavioural explanation for their lower practice scores. Thus, enhancing SHL is not merely educational but psychosocial, addressing both cognitive and emotional needs. In Saravan—characterised by strong tribal ties, traditional religious values, and limited health education—the observed association likely reflects cultural silence, resource scarcity, and low collective awareness, underscoring the importance of culturally congruent, community-trusted interventions.

Implications for theory and practice: Theoretically, this study validates SCT's applicability to parental sexuality education, showing that cognitive competencies (SHL) influence behaviour more than demographics alone. Practically, interventions should prioritise building self-efficacy and practical communication skills (e.g., role-playing, peer modelling, community workshops) over mere information dissemination, as supported by Peyghan et al. (22). These quantitative findings complement qualitative evidence suggesting SHL as a modifiable pathway to address cultural barriers; however, this remains provisional—association does not prove that improving SHL directly overcomes taboos, requiring rigorous interventional testing.

Study Limitations and Strengths: Several limitations must be acknowledged when interpreting the findings. First, the cross-sectional design precludes any causal inferences; the associations reported are correlational and should not be interpreted as evidence of causation. Second, data were collected via self-report questionnaires, which are susceptible to social desirability bias—particularly on sensitive topics such as sexuality—potentially leading to overestimation of actual practices. Third, the sample was restricted to mothers residing in Saravan, a single city in southeastern Iran. This limits the generalizability of the findings to other regions of Iran, as well as to populations with different cultural norms,

levels of access to health services, or demographic compositions. Fourth, although we controlled for several key demographic variables, residual confounding from unmeasured factors cannot be excluded. These include: fathers' involvement in parenting; mothers' own childhood experiences with sexuality education; deeply rooted cultural and religious beliefs regarding sexual discourse; and access to external information sources (e.g., the internet, social media, print media, or formal educational programs). Fifth, the inclusion criterion of literacy in Persian meant that illiterate mothers were excluded, limiting the applicability of the results to this potentially vulnerable subgroup. Finally, the relatively small number of participants with adequate or excellent SHL ($n=7$) limited our ability to conduct subgroup analyses and may have influenced the precision of estimates for higher literacy levels. Despite these limitations, the study provides valuable quantitative evidence on a topic that has been largely unexplored in Iran and similar conservative settings.

Conclusion

Within southeastern Iran's socio-cultural context, maternal SHL is strongly and independently associated with child sexuality education practices, even after controlling for demographics. While educational level and age showed small associations, SHL's dominant role highlights it as a potentially modifiable factor of considerable practical relevance. Theoretically, these findings reinforce that cognitive competencies such as SHL enhance maternal confidence and practical communication skills—essential for effective sexual socialisation within the family—consistent with Bandura's Social Cognitive Theory.

Contextual observations from Saravan, supported by recent qualitative evidence, reveal that cultural shame, fear of social judgment, and time constraints—particularly among employed mothers—act as significant practical barriers compounding low SHL. Thus, interventions must address not only cognitive deficits but also emotional and structural obstacles. Notably, recent intervention research in a geographically proximate region has demonstrated the effectiveness of structured mother-empowerment programmes in improving maternal awareness, responsiveness, and self-efficacy, providing preliminary feasibility evidence for SHL-focused interventions.

However, given the cross-sectional design and single-city sampling, these findings should be interpreted as evidence of association, not causation. The observed relationship suggests, but does not prove, that enhancing SHL could improve educational outcomes. Therefore, while promising, these results do not yet warrant large-scale policy implementation. Future research should prioritise rigorous interventional studies (e.g., RCTs) and longitudinal designs to examine directionality and mediating pathways.

Until such evidence is available, health policymakers and practitioners may consider: (a) integrating SHL assessment into routine family health services; (b) developing and pilot-testing culturally sensitive, literacy-focused educational modules; and (c) conducting

feasibility studies in underserved communities. Such exploratory efforts could provide foundational evidence for subsequent definitive trials.

In conclusion, these findings underscore SHL as a key correlate of maternal practices and offer a clear direction for future research. While interventions targeting SHL hold theoretical promise and are supported by emerging evidence from similar contexts, their effectiveness must be rigorously tested in diverse populations before widespread adoption can be recommended.

Policy Implications and Practical Recommendations

1. Integrating SHL screening into routine primary healthcare services to identify at-risk mothers during well-child visits.
2. Developing and pilot-testing culturally sensitive, literacy-focused educational modules that prioritize practical communication skills over factual knowledge.
3. Tailoring interventions for specific subgroups, including mothers with low education, employed mothers (time constraints), and older mothers (generational norms).
4. Creating and disseminating culturally congruent educational resources (e.g., illustrated booklets, videos, mobile apps) co-designed with community stakeholders.
5. Strengthening healthcare providers' capacity through evidence-based SHL counseling training, with effectiveness evaluated before large-scale rollout.

Suggestions for Future Studies

To extend and deepen the current findings, future studies could be conducted along the following avenues:

1. Interventional studies (e.g., RCTs) to evaluate causal effectiveness of SHL-enhancement programs on maternal practices and child outcomes.
2. Longitudinal cohort studies to examine directionality and mediating pathways (e.g., self-efficacy, cultural attitudes).
3. In-depth qualitative research to explore cultural shame, fear of social judgment, and time constraints—particularly among employed and low-education mothers.
4. Family-based studies to investigate the role of fathers, older siblings, and extended family members in child sexuality education.
5. Psychometric validation of SHL tools (e.g., SHELA) for diverse populations (fathers, adolescents) across Iran's geo-cultural contexts.
6. Digital and community-based interventions (e.g., mobile apps, peer-led workshops, mosque-based programs) for underserved areas with limited health infrastructure.

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