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Latent profile analysis of reproductive concern in women of childbearing age with systemic lupus erythematosus in China: A cross-sectional study

Jia Pu
Mianyang Central Hospital, University of Electronic Science and Technology of China
Lan Huang
Mianyang Central Hospital, University of Electronic Science and Technology of China
Yuemei Li
Mianyang Central Hospital, University of Electronic Science and Technology of China
Qianmei Zhong
474985030@qq.com
Mianyang Central Hospital, University of Electronic Science and Technology of China

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Abstract

Background Systemic lupus erythematosus is a chronic, multi-organ, systemic autoimmune disorder that is prevalent in women and can affect those of reproductive age. This study aimed to explore the latent profile characteristics of reproductive concern in women of childbearing age with systemic lupus erythematosus, and analyze the differences among different categories of patients.

Methods A questionnaire survey was administered to 332 female patients with systemic lupus erythematosus of childbearing age in four tertiary grade A general hospitals in Mianyang City, China. We utilized a general information questionnaire, Reproductive Concerns After Cancer Scale (RCAC), Medical Coping Modes Questionnaire (MCMQ), and Social Support Revaluated Scale (SSRS). Latent profile analysis and multiple logistic regression models were used to explore latent profile characteristics and factors influencing reproductive concerns.

Results Four latent profile groups were obtained: low reproductive concern–high infertility acceptance (12.66%), moderate reproductive concern–concern about personal health (18.95%), moderate reproductive concern–concern about children's health (45.64%), and high reproductive concern–balanced (22.75%). Factors influencing the reproductive concern categories included age, marital status, annual income, method of medical payment, number of children, fertility intention, history of adverse pregnancy outcomes, disease activity, social support, and medical coping strategies.

Conclusions Reproductive concerns in women of childbearing age with systemic lupus erythematosus exhibited significant heterogeneity. In clinical nursing, personalized intervention measures should be developed based on different categorical characteristics and influencing factors to reduce reproductive concern levels in patients.

Background

Systemic lupus erythematosus (SLE) is a chronic, multi-organ, systemic autoimmune disorder [1], with a marked female predominance and a female-to-male incidence ratio of approximately 10:1. The incidence of SLE is approximately 30,150 cases per 100,000 individuals [2].

Fertility of patients with SLE does not differ significantly from that of the general population [3], and most patients with SLE have reproductive needs and desire normal pregnancy and delivery. The fertility intention level of women of childbearing age with SLE in China is approximately 27.2%, which is higher than the 12.2% in the general population [4]. However, factors such as changes in pregnancy-related hormone levels, disease activity, and medication use may also affect the health of pregnant women and their fetuses.

Pregnancy-related complications and adverse pregnancy outcomes, such as recurrent miscarriage, embryo arrest, preterm birth, and intrauterine fetal death, are significantly higher in patients with SLE than in non-SLE patients [5]. Moreover, the maternal mortality rate of SLE patients during pregnancy is more than 20 times higher than that of non-SLE patients [5]. Women of childbearing age with SLE, while bearing the burden of the disease and its treatment [6], also experience significant psychological stress due to concerns about disease exacerbation and fetal safety [7]. These persistent psychological issues affect the physical and mental health of these patients and their family, thereby lowering quality of life [8].

Fertility concern refers to a psychological state of worry and concern about pregnancy ability, partner knowledge, child health, pregnancy preparation, and acceptance among individuals of childbearing age [9]. The adverse pregnancy rate for female patients with SLE outside China ranges from 40.3–61.7% [10–12]; in the Chinese population, this is approximately 70.0–83.53% [12, 13], which is far higher than the rates for cancer [14]. A high incidence of adverse pregnancy outcomes can lead to reproductive distress. However, research on fertility concerns in women of childbearing age with SLE mainly focuses on variable-centered approaches, emphasizing meaningful individual characteristics. These characteristics have been studied in isolation, without considering the specificity between individuals.

Latent profile analysis (LPA) is an individual-centered statistical method that explains the association between external continuous variables and latent categorical variables, achieving local independence between manifest variables [15]. Therefore, this study aimed to employ LPA to determine the characteristics of reproductive concern in women of childbearing age with SLE,

and analyze the differences among different categories of patients, it provides reference significance for formulating individualized intervention plans.

Methods/design

Study design and participants

We conducted a cross-sectional study at a tertiary hospital in Mianyang City between January 2025 and March 2025. A total of 332 women of childbearing age with SLE were selected to participate through convenience sampling. The inclusion criteria were as follows: (1) diagnosis meeting the 1997 revised classification criteria for SLE by the American College of Rheumatology (ACR) [16]; (2) women of childbearing age; (3) informed consent obtained and voluntarily participation; and (4) clear consciousness with the ability to understand and express verbally. We excluded women aged < 18 years or > 50 years; with severe cognitive impairment, mental illness, or inability to cooperate; recent experience of significant personal or family changes; and other major diseases or heart, lung, or kidney dysfunction. This cross-sectional study was approved by the Biomedical ethics committee of Mianyang Central Hospital (approval NO. S202401155-01). All the participants were informed about the study and signed an informed consent form.

Sample size

Nylund–Gibson and Choi recommend a minimum sample size of 300 cases for LPA to avoid problems identifying smaller potential profiles [17]. Additionally, we considered the general principles of sample size estimation for multivariate analysis to ensure the reliability of our subsequent multivariate analysis results: the number of observations should be at least five times the number of variables [18]. Considering a dropout rate of 10–20%, the sample size was calculated to be at least 150–340 cases, which meets the sample size requirements.

Demographic and clinical characteristics

The questionnaire was independently designed based on clinical practice and a comprehensive review of the relevant literature. It was used to collect general and disease-related information, including age, marital status, annual income, method of medical payment, number of children, fertility intention, history of adverse pregnancy outcomes, and disease activity.

Self-reported questionnaires

Reproductive Concerns After Cancer (RCAC) scale

Gorman et al. [19] designed a multidimensional scale to assess the broad reproductive concerns of women of reproductive age who survived breast cancer. The Chinese version of the RCAC scale was revised by Qiao et al. [20] and has been used in patients with chronic nephritis [21], cancer [22], and SLE [23], demonstrating good reliability and validity. The scale consists of 18 items across six dimensions: personal health, children's health, partner disclosure, fertility potential, acceptance, and pregnancy. A five-point Likert scale was used for scoring (1, strongly disagree; 5, strongly agree), with a total score ranging from 18 to 90. Higher scores positively correlated with higher levels of fertility anxiety. An average item score > 4 indicates a high level of fertility anxiety; 3–4, moderate level; and < 3, low level. The Cronbach's α coefficient for the scale is 0.792, indicating good reliability; here, it was 0.894.

Medical Coping Modes Questionnaire (MCMQ)

The MCMQ was designed to assess patient coping styles when facing stressors. This method was first developed by Feifel et al. [24], and was later translated and revised by Shen and Jiang [25]. The questionnaire consists of 20 items across three dimensions: confrontation, avoidance, and resignation. The Cronbach's α coefficient for the original scale is 0.632; here, it was 0.814.

Social Support Revalued Scale (SSRS)

This scale was developed by Xiao et al. [26], and includes objective support dimensions (three items), subjective support (four items), and social support utilization dimensions (three items). The total score ranges from 12 to 66, with higher scores indicating higher levels of social support. The original scale's Cronbach's α coefficient is 0.770; here, it was 0.821.

Systemic Lupus Erythematosus Disease Activity Index-2000 (SLEDAI-2000)

SLEDAI-2000 was introduced and validated in 2002 by Gladman et al. [27]. It includes 24 items across nine systems: central nervous system and vascular involvement (8 points); renal and musculoskeletal involvement (4 points); serositis, skin involvement, and immunologic abnormalities (2 points); and constitutional symptoms and hematologic abnormalities (1 point). The total score ranges from 0 to 105, with higher scores indicating greater disease activity. Disease activity levels are classified as follows: ≤6 points for mild activity, 7–12 points for moderate activity, and ≥ 13 points for severe activity.

Data collection

Data collection was conducted by two rheumatology nurses who were not part of the research team. Both nurses received standardized training and assessment on the use of the scales and followed uniform instructions. All questionnaires were distributed and collected on-site. Before the formal survey, patients were informed in detail about the purpose of the study, assured of strict confidentiality, and provided informed consent. The questionnaires were completed anonymously, with no suggestive language used during the process to ensure independent responses. Upon completion, the questionnaires were carefully checked; any missing items were promptly completed. A total of 348 questionnaires were distributed. After excluding 16 invalid questionnaires due to patterned responses, completion time under 5 minutes, missing data, or answer repetition rates exceeding 70%, 332 valid questionnaires were included in the final analysis, resulting in an effective response rate of 95.40%.

Statistical analysis

SPSS version 26.0 was used to conduct statistical analyses. Categorical data are expressed as frequencies and percentages. Means ± standard deviation($\overline{X} \pm S$)was used to describe continuous data that conform to a normal distribution. For data that were not normally distributed, the median and interquartile range (M [P25, P75]) were used for the statistical analysis. An analysis of variance was used for group comparisons. Multivariate logistic regression analysis was used to perform multifactor analysis. The LPA was conducted using Mplus 8.3. The evaluation criteria included the Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), adjusted Bayesian Information Criterion (aBIC), entropy, the Lo-Mendell-Rubin (LMR), adjusted likelihood ratio test, and the bootstrapped likelihood ratio test (BLRT). Smaller AIC, BIC, and aBIC values indicated a better model fit. An entropy value ≥ 0.8 indicates that classification accuracy exceeds 90% [28]. The model with k categories was considered superior to the model with k-1 categories when LMR and BLRT were statistically significant ($P < 0.05$) [29]. The model parsimony (favoring less complex models) and profile size (at least 5% of the total sample to exclude non-replicable profiles) were considered when selecting the optimal model. We selected the best profile based on the significance of the practical research. The P value < 0.05 was considered statistically significant.

Results

General characteristics

The characteristics of the women of childbearing age with SLE are shown in Table 1.

Table 1
Univariate analysis of reproductive concern latent profiles among women of childbearing age with SLE (N = 332)

Variable		[n (%)]	C1 (n = 43)	C2 (n = 61)	C3 (n = 153)	C4 (n = 75)	χ^2	*P*
Age (years)[a]	18–30	63(18.98%)	6(9.52%)	19(30.16%)	10(15.87%)	28(44.44%)	**7.615**	**0.022**
	31–40	136(40.96%)	13(9.56%)	29(21.32%)	57(41.91%)	37(27.21%)		
	≥ 41	133(40.06%)	24(18.05%)	13(9.77%)	86(64.66%)	10(7.52%)		
Marital status[a]	Unmarried	278(83.73%)	39(14.03%)	39(14.03%)	141(50.72%)	59(21.22%)	**6.135**	**0.047**
	Married	38(11.45%)	4(10.53%)	12(31.58%)	6(15.79%)	16(42.11%)		
	Divorced	16(4.82%)	0(0.00%)	10(62.50%)	6(37.50%)	0(0.00%)		
Education[a]	Primary school or below	43(12.95%)	12(27.91%)	1(2.33%)	26(60.47%)	4(9.30%)	5.355	0.253
	Junior high school	92(27.71%)	14(15.22%)	21(22.83%)	36(39.13%)	21(22.83%)		
	Senior high school	63(80.77%)	3(4.76%)	14(22.22%)	29(46.03%)	17(26.98%)		
	Junior college	78(23.49%)	10(12.82%)	11(14.10%)	38(48.72%)	19(24.36%)		
	Bachelor's degree or above	56(16.87%)	4(7.14%)	14(25.00%)	24(42.86%)	14(25.00%)		
Annual income (CNY)[a]	< 1000	44(13.25%)	8(18.18%)	15(34.09%)	14(31.82%)	7(15.91%)	**9.470**	**0.049**
	1000–3000	98(29.52%)	21(21.43%)	7(7.14%)	45(45.92%)	25(25.51%)		
	3001–5000	87(112.99%)	8(9.20%)	21(24.14%)	38(43.68%)	20(22.99%)		
	5001–10000	77(23.19%)	0(0.00%)	16(20.78%)	43(55.84%)	18(23.38%)		
	> 10001	26(7.83%)	6(23.08%)	2(7.69%)	13(50.00%)	5(19.23%)		
SLEDAI-2000[a]	No or minimal disease activity	211(63.55%)	22(10.43%)	50(23.7%)	91(43.13%)	48(22.75%)	**12.694**	**0.005**
	Low disease activity	90(27.11%)	15(16.67%)	9(10%)	50(55.56%)	16(17.78%)		
	Moderate disease activity	31(9.34%)	6(19.35%)	2(6.45%)	12(38.71%)	11(35.48%)		
Method of medical payment[a]	Employee medical insurance	120(36.14%)	25(20.83%)	18(15.00%)	56(46.67%)	21(17.50%)	**21.894**	**< 0.001**
	Resident medical insurance	133(40.06%)	7(5.26%)	15(11.28%)	72(54.14%)	39(29.32%)		
	Self-pay	75(22.59%)	11(14.67%)	28(37.33%)	21(28.00%)	15(20.00%)		
	Commercial insurance	4(1.20%)	0(0.00%)	0(0.00%)	4(100.00%)	0(0.00%)		

Variable		[n (%)]	C1 (n = 43)	C2 (n = 61)	C3 (n = 153)	C4 (n = 75)	x^2	*P*
Place of residence[a]	Rural	143(43.07%)	25(17.48%)	26(18.18%)	58(40.56%)	34(23.78%)	-0.993	0.321
	Urban	189(56.93%)	18(9.52%)	35(18.52%)	95(50.26%)	41(21.69%)		
Number of children[a]	0	65(19.58%)	7(10.77%)	8(12.31%)	18(27.69%)	32(49.23%)	**16.264**	**< 0.001**
	1	188(56.63%)	26(13.83%)	39(20.74%)	92(48.94%)	31(16.49%)		
	≥ 2	79(23.80%)	10(12.66%)	14(17.72%)	43(54.43%)	12(15.19%)		
Fertility intention[a]	No	248(74.70%)	30(12.10%)	52(20.97%)	120(48.39%)	46(18.55%)	**-2.868**	**0.004**
	Yes	83(25.30%)	13(15.66%)	9(10.84%)	32(38.55%)	29(34.94%)		
History of adverse pregnancy outcomes[a]	No	282(84.94%)	40(14.18%)	52(18.44%)	128(45.39%)	62(21.99%)	**-2.092**	**0.036**
	Yes	50(15.06%)	3(6.00%)	9(18.00%)	25(50.00%)	13(26.00%)		
BMI, kg/m^{2}[b]			23.03(21.36, 26.67)	22.07(19.83, 25.36)	21.4(20.31, 24.14)	22.52(20.13, 25.71)	6.319	0.097
Disease duration (months)[b]			8(4, 12)	7(3.5, 12)	8(3, 12)	5(2, 8)	7.517	0.057

Bold values are those considered statistically significant.

SLEDAI-2000 The Systemic Lupus Erythematosus Disease Activity Index-2000.

[a]Values are presented as the number (%) analyzed by chi-square tests.

[b]Values are presented as the median (25th and 75th percentiles) and analyzed by Mann–Whitney U test.

Questionnaire scores

The total RCAC score among women of childbearing age with SLE was 58.45 ± 13.51, and the mean item score was 3.69 ± 0.75. Detailed scores for the RCAC, SSRS, and MCMQ are shown in Table 2.

Table 2
Scores of RCAC, SSRS, and MCMQ in women of childbearing age with SLE and differences among latent profiles ($\bar{X}$±S)

Dimension	Scores	C1 (n = 43)	C2 (n = 61)	C3 (n = 153)	C4 (n = 75)	F	*P*
Total RCAC score[c]	58.45 ± 13.51	38.02 ± 7.20	56.67 ± 5.77	52.91 ± 6.07	64.80 ± 7.17	**376.254**	**< 0.001**
Acceptance[c]	9.83 ± 2.85	8.74 ± 4.51	11.85 ± 1.82	9.76 ± 2.40	10.97 ± 1.58	**29.689**	**< 0.001**
Partner disclosure[c]	9.07 ± 2.79	5.30 ± 0.91	4.84 ± 1.66	7.26 ± 1.28	10.29 ± 1.93	**281.463**	**< 0.001**
Fertility Potential[c]	9.90 ± 3.04	5.30 ± 0.60	9.66 ± 2.11	9.59 ± 2.04	9.40 ± 2.27	**147.571**	**< 0.001**
Becoming pregnant[c]	8.56 ± 2.95	4.60 ± 1.42	5.95 ± 2.03	9.78 ± 1.90	10.36 ± 2.40	**131.953**	**< 0.001**
Personal health[c]	8.92 ± 3.21	7.49 ± 0.77	12.39 ± 1.43	8.79 ± 1.57	11.49 ± 1.64	**409.802**	**< 0.001**
Child's health[c]	10.18 ± 3.46	5.58 ± 2.89	11.98 ± 2.53	9.73 ± 3.23	12.28 ± 1.58	**64.187**	**< 0.001**
SSRS[c]	42.08 ± 7.92	43.89 ± 8.45	41.51 ± 6.39	43.13 ± 7.89	39.36 ± 8.19	**4.860**	**0.003**
MCMQ[c]	47.76 ± 9.73	46.09 ± 14.05	47.05 ± 8.38	48.67 ± 9.53	47.43 ± 8.00	**4.008**	**< 0.001**

Bold values are those considered statistically significant.

RCAC Reproductive Concerns After Cancer; SSRS Social Support Rating Scale; MCMQ The Medical Coping Modes Questionnaire.

[c]Values are presented as the mean ± SD and analyzed by analysis of variance.

LPA

The LPA was conducted on the reproductive concern scores of 332 women of childbearing age with SLE, using six dimensions as the observed indicators. Models ranging from one to five classes were fitted (Table 3). Although the 5-class model indicated the most significant decrease in the AIC, BIC, and aBIC values, one class accounted for only 7.5% of the sample. Since LPA requires a minimum sample size of 50 per profile to ensure robust results [18], a four-class model was selected as the best-fitting solution [30]. Discriminant analysis was used to validate the accuracy of the four-class model, with posterior probabilities of 92.40%, 92%, 94.40%, and 96.80% for the classes, respectively, indicating the good reliability of the model.

Table 3
Model fit indices for latent profile models of reproductive concern in women of childbearing age with SLE

Model	AIC	BIC	aBIC	LMR (*P*)	BLRT (*P*)	Entropy	Profile proportion (%)
1	5727.237	5772.898	5734.834	–	–	–	1
2	5187.900	5260.197	5199.928	< 0.001	< 0.001	0.857	51.07/48.93
3	4993.771	5092.705	5010.232	0.0343	< 0.001	0.855	48.44/29.52/22.04
4	4853.075	4978.644	4873.967	0.0043	< 0.001	0.892	12.66/18.95/45.64/22.75
5	4723.257	4875.462	4748.580	0.0106	< 0.001	0.904	11.91/26.05/13.51/41.03/7.50

AIC Akaike information criterion; BIC Bayesian information criteria; aBIC adjusted Bayesian information criteria; LMR Lo–Mendell–Rubin Test; BLRT Bootstrap Likelihood Ratio Test.

Based on the LPA, four latent profiles were derived from the six dimensions of fertility anxiety, as shown in the profile plot (Fig. 1). Class 1 (C1), comprising 43 participants (12.66%), exhibited overall low levels of fertility anxiety, with relatively high scores for infertility acceptance. It was therefore labeled as the “Low reproductive concern–high infertility acceptance group.” C2, comprising 61 participants (18.95%), indicated moderate levels of fertility anxiety, with particularly high concern about personal health (“Moderate reproductive concern–concern about personal health group”). C3, comprising 153 participants (45.64%), also displayed moderate levels of fertility anxiety with the highest concern for children’s health (“Moderate reproductive concern–concern about child’s health group”). C4, comprising 75 participants (22.75%), exhibited high fertility anxiety across all dimensions, with no particular dominant dimension (“High reproductive concern–balanced group”).

Univariate analysis results indicated statistically significant differences among the four latent profiles of reproductive concerns in terms of age, marital status, annual income, method of medical payment, number of children, fertility intention, history of adverse pregnancy outcomes, social support, and medical coping ($P < 0.05$), as shown in Tables 1–2.

A multinomial logistic regression model was constructed using the four latent profiles of reproductive concerns as dependent variables and statistically significant factors identified in the univariate analysis as independent variables. The assignment of the independent variables is shown in Table 4, and the results of the multinomial logistic regression analysis are presented in Table 5.

Table 4
Assignment of independent variables

Variables		Variable assignment
Age (years)	18–30 = 1; 31–40 = 2; ≥41 = 3	
Marital status	Unmarried = 1; Married = 2; Divorced = 3	
Annual income (CNY)	<1000 = 1; 1000–3000 = 2; 3001–5000 = 3; 5001–10000 = 4; >10001 = 5	
Method of medical payment	Employee medical insurance = 1; Resident medical insurance = 2; Self-pay = 3; Commercial insurance = 4	
Number of children	0 = 1; 1 = 2; ≥2 = 3	
Fertility intention	Yes = 1; No = 0	
History of adverse pregnancy outcomes	Yes = 1; No = 0	

Table 5
Multinomial logistic regression analysis of influencing factors for latent profiles of reproductive concerns in women of childbearing age with SLE

Dependent variable	Independent variables	β	S.E.	Wald x^2	*P*	OR (95% CI)
C2 VS C1[d]	Intercept	1.918	0.521	13.531	< 0.001	
	MCMQ	0.228	0.098	5.458	0.019	1.256 (1.037 ~ 1.521)
	SSRS	-0.227	0.070	10.464	0.001	0.797 (0.695 ~ 0.915)
	No fertility intention	-0.443	0.147	9.158	0.002	0.642 (0.482 ~ 0.855)
C3 VS C1[d]	Intercept	1.725	0.422	16.737	< 0.001	
	MCMQ	0.359	0.086	17.269	< 0.001	1.433 (1.209 ~ 1.697)
	SSRS	-0.220	0.063	12.251	< 0.001	0.803 (0.71 ~ 0.908)
	No fertility intention	-0.598	0.158	14.246	< 0.001	0.55 (0.403 ~ 0.75)
	one child	-2.277	0.909	6.280	0.012	0.103 (0.017 ~ 0.609)
C4 VS C1[d]	Intercept	0.937	0.467	4.029	0.045	
	SLEDAI	1.240	0.634	3.829	0.050	3.456 (0.998 ~ 11.969)
	MCMQ	0.245	0.089	7.595	0.006	1.277 (1.073 ~ 1.521)
	SSRS	-0.254	0.065	15.146	< 0.001	0.776 (0.683 ~ 0.882)
	No fertility intention	-0.470	0.148	10.071	0.002	0.625 (0.467 ~ 0.835)
C3 VS C2[e]	Intercept	-0.981	0.458	4.596	0.032	
	SLEDAI	1.020	0.482	4.474	0.034	2.772 (1.078 ~ 7.129)
	MCMQ	0.131	0.060	4.759	0.029	1.14 (1.013 ~ 1.283)
	Age (18–30years)	-5.031	1.156	18.932	< 0.001	0.007 (0.001 ~ 0.063)
	Age (31–40 years)	-2.079	0.646	10.353	0.001	0.125 (0.035 ~ 0.444)
	Annual income(<1000)	-5.064	1.402	13.044	< 0.001	0.006 (0 ~ 0.099)
	Annual income(5001–10000)	-2.424	1.084	4.996	0.025	0.089 (0.011 ~ 0.742)
	No fertility intention	-2.151	0.733	8.620	0.003	0.116 (0.028 ~ 0.489)
	No adverse fetal pregnancy outcomes	1.943	0.649	8.957	0.003	6.979 (1.955 ~ 24.911)
	No children	-1.978	0.723	7.493	0.006	0.138 (0.034 ~ 0.57)
C2 VS C4[f]	Intercept	0.981	0.458	4.596	0.032	
	SLEDAI	-2.058	0.510	16.265	< 0.001	0.128 (0.047 ~ 0.347)
	No children	-4.021	1.181	11.595	0.001	0.018 (0.002 ~ 0.182)

Dependent variable	Independent variables	β	S.E.	Wald x^2	*P*	OR (95% CI)
	No adverse fetal pregnancy outcomes	-1.208	0.575	4.420	0.036	0.299 (0.097 ~ 0.921)
C3 VS C4[f]	Intercept	0.789	0.343	5.291	0.021	
	SLEDAI	-1.038	0.340	9.336	0.002	0.354 (0.182 ~ 0.689)
	MCMQ	0.115	0.049	5.375	0.020	1.121 (1.018 ~ 1.235)
	Age (18–30years)	-3.312	0.856	14.979	< 0.001	0.036 (0.007 ~ 0.195)
	Age (31–40 years)	-2.800	0.659	18.072	< 0.001	0.061 (0.017 ~ 0.221)
	One child	-1.938	0.757	6.548	0.010	0.144 (0.033 ~ 0.635)

[d]C1 as the reference group; [e]C2 as the reference group; [f]C4 as the reference group.

C1 the low reproductive concern–high infertility acceptance group; C2 the moderate reproductive concern–concern about personal health group; C3 the moderate reproductive concern–concern about children's health group; C4 the high reproductive concern–balanced group.

Discussion

Four latent profile groups were obtained, with the most participants falling into the moderate reproductive concern–concern about children's health (45.64%). The reproductive concerns in women of childbearing age with SLE exhibited significant heterogeneity. In clinical nursing, personalized intervention measures should be developed based on different categorical characteristics and influencing factors to reduce reproductive concern levels in patients.

The total score of reproductive concerns among women with SLE of childbearing age indicated a moderate level, consistent with the report by Wang et al. [31]. Revealing the current conflict between reproductive needs and treatment, reducing reproductive concerns in SLE patients, and ensuring their reproductive rights and pregnancy safety remain urgent issues. Further analysis of the six dimensions of reproductive concerns found that the dimension of children's health scored higher than other dimensions, consistent with Moghadam et al. [32]. This may be because patients worry about the hereditary risk of SLE and fear that their own death would cause psychological trauma to their families, especially young children, leading to reproductive concerns related to children's health and care [33]. Healthcare providers should offer timely information support regarding reproductive and genetic screening to help patients alleviate their physical burden and psychological stress.

The model fit indices indicated a good fit, suggesting significant differences among the latent profiles of reproductive concerns. In C1 (12.66%), reproductive concerns were relatively low, with a high score in the infertility acceptance dimension and the lowest score in the spousal awareness dimension. This may reflect the influence of traditional beliefs or supportive national policies, leading some patients to desire children. However, most patients in this group were aged ≥ 41, and their reproductive concern was low, resulting in higher infertility acceptance. Healthcare providers should pay attention to patients who still have fertility needs, and offer timely psychological counseling and comprehensive informational support to ease their mental stress. The C2 group (18.95%) exhibited a moderate level of reproductive concern, with a higher score only in the self-health dimension. This may be because most patients in this group were married and had children, thus paying more attention to the impact of the disease on their health. Healthcare professionals should strengthen their communication with such patients, ensure that they fully understand their treatment processes, and enhance therapeutic education to alleviate anxiety. In C3 (45.64%), reproductive concerns were moderate, focusing on worries about children's health. Patients with young children worry about genetic transmission affecting their child's future, whereas those whose children served as caregivers were concerned about the caregiving burden and life stress. For such groups, clinicians should promptly inform patients about disease-related and hereditary factors to reduce tension. For diseases with genetic risk, early screening and prevention in the offspring is

recommended. C4 (22.75%) showed a high level of reproductive concern, with all dimension scores being among the highest. This may be due to the higher proportion of patients under 40 years of age, some of whom still had fertility plans during treatment and exhibited low acceptance of infertility. Thus, medical staff should implement risk stratification, offer pre-pregnancy counseling, and apply cautious treatment strategies to provide individualized pregnancy risk assessments and decision-making support. This can help increase patient awareness regarding avoiding pregnancy during unstable disease phases and reduce reproductive concerns.

Women with SLE of childbearing age who had lower annual income were more likely to be classified into the “low reproductive concern–high infertility acceptance” group, consistent with findings by Zhu et al. [34]. Low-income individuals often face greater economic and social pressures when confronted with diseases and reproductive decisions. Such pressure may prompt them to accept the reality of infertility more readily, shifting their anxiety toward concerns about providing financial stability and a better living environment for their families. Due to limited financial resources, these patients are more likely to focus on practical concerns such as the environment in which their children will grow, future quality of life, and the cost of childrearing, rather than the reproductive capacity or physical risks associated with pregnancy. This suggests that low income does not necessarily lead to an intense fear of reproduction itself, but rather induces anxiety over future parenting responsibilities, making patients more likely to accept infertility as a reality. In other words, although these women may still desire childbirth, their limited economic means lead them to make a relatively balanced psychological compromise, showing lower levels of reproductive concern and a higher acceptance of infertility [35]. Therefore, nursing staff should enhance patients’ health literacy and their ability to access resources by implementing a three-tiered intervention strategy: dual assessment of health and financial status, resource navigation, and case management. Support should be provided to help patients identify available medical, insurance, and social aid programs to reduce the financial burden related to childbirth. Educational and emotional support should be strengthened to help students make rational reproductive choices under real-life constraints, reduce unnecessary anxiety regarding child health, and increase confidence and stability in reproductive decision making.

Women with SLE of childbearing age who have one child are more likely to fall into the “moderate reproductive concern–concerned about personal health” group, which aligns with the findings of Wang et al. [31]. These individuals typically place greater emphasis on their own health, particularly whether they can physically endure the risks associated with another pregnancy, rather than worry about fertility itself [36]. Consequently, their reproductive concerns are primarily health related, especially regarding the possibility of complications from pregnancy due to high disease activity or long-term effects on their physical condition. Healthcare providers should pay close attention to the psychological state of this subgroup, and encourage open discussions with partners regarding reproductive plans at appropriate times. Support should be provided to help patients make informed reproductive decisions once their disease is well-controlled [37]. Moreover, healthcare professionals should strengthen their competencies to assist patients in assessing pregnancy risks and offer tailored health counseling and disease management strategies to alleviate excessive health concerns [38].

Women with SLE of childbearing age who have higher SLEDAI scores are more likely to fall into the “high reproductive concern–balanced type” group, which is consistent with findings by Rajendran et al. [39]. Lupus flare-ups during pregnancy can jeopardize maternal and fetal health, and treatments can damage ovarian germ cells, leading to infertility or reduced reproductive capacity. These issues significantly increase anxiety related to pregnancy and parenting among patients [40]. Although patients with high SLEDAI scores exhibit high overall concern, their worries are often multifaceted, ranging from the immediate impact of disease activity on pregnancy outcomes to long-term concerns about health deterioration [31]. Clinicians should focus on the internal conflict between “disease risk” and “reproductive desire.” A three-phase intervention comprising disease education, personalized risk assessment, and psychological support should be implemented to help patients make rational decisions about reproduction and to provide scientific disease management plans. Regular joint follow-ups involving rheumatology and obstetrics departments should be arranged to ensure optimal medical support throughout pregnancy, thereby enhancing patient confidence in disease control and pregnancy safety [41].

Younger, nulliparous women with SLE who have fertility intentions are more likely to fall into the high reproductive concern–balanced type group, which is consistent with findings from Wang et al. [31, 42]. Younger patients are often in the early stages of marriage and family planning, with higher expectations of future family roles and limited social experiences. This makes them susceptible to cognitive overload and emotional conflict when faced with the dual challenges of chronic illness and pregnancy.

Moreover, nulliparous women often lack experiential knowledge of pregnancy, which may amplify their fear of unknown risks such as complications that might arise from disease activity during gestation. Women who express a desire for children often place high value on fertility. However, concerns about negative judgments from partners or family members regarding disease-related risks may lead to increased sensitivity to others' attitudes, communication difficulties, and elevated psychological stress. These findings suggest that young nulliparous women with strong fertility desires but evident psychological conflicts should be identified as a high-risk group in need of targeted support. Their concerns are often multifaceted, involving not only medical risks, but also family relationships, social expectations, and personal identity. Nursing staff should recognize and address patients' emotional struggles and work with psychological counselors to provide three-phase interventions: communication support, emotional coping, and relationship reinforcement. This approach can help patients articulate their reproductive intentions, ease potential conflicts with partners or family members, and strengthen their emotional stability. In addition, patients and their partners should be encouraged to jointly participate in educational sessions on disease and pregnancy to foster a better understanding of disease control and pregnancy feasibility. This can reduce miscommunication, promote mutual support, and enhance the family system stability.

Women with SLE who had not experienced adverse pregnancy outcomes (e.g., miscarriage, preterm birth, or fetal abnormalities) were more likely to be classified as having moderate reproductive concern–concern about the child's health, consistent with the findings of Pakhathirathien et al. [43]. Although these women have not encountered adverse pregnancy events, they still harbor cognitive concerns about the potential risks that SLE may pose during pregnancy, particularly regarding the future health of their offspring. Their reproductive concerns are not focused on infertility or pregnancy failure but rather on rational worries about child health, safe delivery, and long-term caregiving. This suggests that even in the absence of prior pregnancy complications, reproductive concerns can remain significant and often take a preventive and forward-looking form. Therefore, healthcare professionals should avoid assuming low psychological burden based solely on the absence of adverse outcomes. Instead, emotional expressions and informational needs should be considered when planning support interventions. A three-phase support strategy is recommended, which includes perinatal health education, risk communication regarding child health, and prenatal expectation management. This approach helps patients develop an accurate understanding of SLE-related pregnancy risks and management pathways, thereby enhancing their ability to make evidence-based decisions. Furthermore, interdisciplinary collaboration among rheumatologists, obstetricians, and reproductive medicine specialists is encouraged to develop individualized care plans, optimize disease control, and promote pregnancy safety.

Our results indicated that women of childbearing age with SLE who had lower total social support scores were more likely to fall into the high reproductive concern–balanced group, which is consistent with the findings of Xu et al. [44]. A lack of social support may leave patients without adequate emotional or practical assistance when facing the dual pressures of illness and fertility, leading to intensified reproductive anxiety and decreased capacity for emotional regulation and coping. Patients with insufficient social support often feel isolated and helpless, and are unable to access effective support from family, friends, or healthcare teams. This exacerbates concerns about pregnancy risks and child health, resulting in a multifaceted psychological burden [45]. For this group, interventions such as mindfulness-based stress reduction, peer support programs, family emotional counseling, and cognitive behavioral therapy can be effective in relieving psychological stress and improving confidence in managing illness and fertility challenges [46–48]. In addition, access to information and professional support should be broadened. These include establishing multidisciplinary SLE pregnancy clinics and offering online preconception and pregnancy consultation services. Such services can help guide patients in actively participating in reconstructing their understanding of a disease. By integrating the "teachable moment" theory with digital health platforms, support can be tailored to the evolving needs of patients throughout key time points (e.g., preconception, pregnancy, postpartum). This approach aims to alleviate reproductive anxiety and improve overall quality of life [49].

Patients with lower medical coping scores were more likely to be classified into the low reproductive concern–high infertility acceptance group, consistent with the findings of Chen [50]. These patients often lack effective disease management and emotional regulation strategies when faced with pregnancy-related risks or uncertainties associated with SLE. Their coping style tends to be passive or avoidant, making it difficult to seek solutions or proactively adjust their mindset. Consequently, they may choose to avoid or reduce fertility planning to reduce psychological pressure, thus demonstrating a higher acceptance of possible infertility and lower expectations of childbirth, leading to relatively low levels of reproductive concern. Maintaining a positive psychological state enhances emotional stability, independent thinking, and psychological resilience in the face of adverse

events. Patients with optimistic attitudes are more likely to cooperate with treatment and care plans, enhancing their ability to manage diseases and reducing their negative impacts [51]. These findings suggest that clinicians should help patients explore personalized strategies to alleviate negative emotions. A structured intervention program that includes disease knowledge education, coping skill development, and psychological support is recommended. This approach enhances mental health literacy and enables patients to understand the importance of maintaining a positive mindset. It also fosters scientific disease management beliefs, strengthens self-efficacy, and helps patients make rational reproductive decisions, while improving disease awareness and coping capacity.

This study was limited to a single tertiary hospital and used a cross-sectional design with a relatively small sample size. Future research should consider expanding the sample and adopting a longitudinal approach to explore dynamic changes in reproductive concerns over time.

Conclusions

We used LPA to categorize reproductive concerns among women of childbearing age with SLE into four distinct types. Healthcare professionals should pay special attention to patients who are younger, nulliparous, desire childbearing, have lower household income, limited social support, lower medical coping ability, high disease activity, and a history of adverse pregnancy outcomes. Understanding the psychological status and needs of patients and their family caregivers is crucial for providing adequate psychological and informational support. Identifying high-risk predictive factors will facilitate the early recognition of patients with potentially high reproductive anxiety and provide evidence to support the development of individualized intervention strategies.

Abbreviations

SLE

Systemic lupus erythematosus

LPA

Latent profile analysis

ACR

American College of Rheumatology

SLEDAI-2000

The Systemic Lupus Erythematosus Disease Activity Index-2000

RCAC

Reproductive Concerns After Cancer

SSRS

Social Support Rating Scale

MCMQ

The Medical Coping Modes Questionnaire

AIC

Akaike information criterion

BIC

Bayesian information criteria

aBIC

adjusted Bayesian information criteria

LMR

Lo–Mendell–Rubin Test; BLRT Bootstrap Likelihood Ratio Test

Declarations

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Statements and Declarations

Ethics approval and consent to participate

The study followed the ethical standards of the declaration of Helsinki and was approved by the biomedical ethics committee of Mianyang Central hospital (approval NO. S202401155-01). All the participants were informed about the study and signed an informed consent form.

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Competing Interests

The authors declare that they have no conflict of interest.

Author contributions

Jia Pu, Lan Huang and Qianmei Zhong led this research including proposal write up and designed the instrument. Lan Huang and Yuemei Li collected and analysed data. Jia Pu, Qianmei Zhong and Lan Huang discussed data and wrote the manuscript. All authors read and approved the final manuscript.

Consent for publication

Not Applicable.

Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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Figures

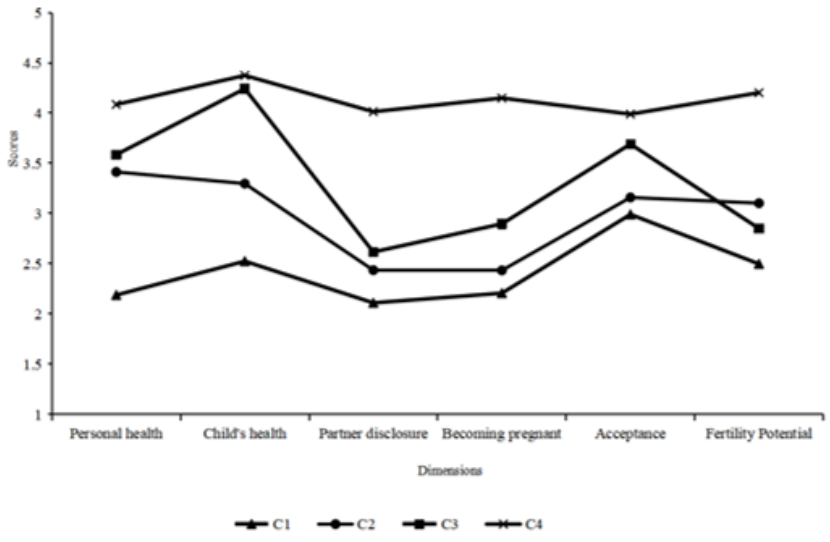


Figure 1

Characteristic distribution of the four latent profiles of reproductive concerns in women of childbearing age with SLE