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Original Article

Relationship of Mental Health Literacy and the Health Locus of Control with Lifestyle in the Pregnant Women of Gonabad, Iran, in 2024

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Abstract

Introduction: Lifestyle during pregnancy has long-lasting effects on the health of the mother and child. The health locus of control (HLC) predicts health behaviors, while higher levels of mental health literacy (MHL) facilitate early recognition, being associated with greater well-being and probably influencing pregnant women's quality of life. Therefore, this study aimed to investigate the relationship between MHL, HLC, and lifestyle in pregnant women in Gonabad, Iran, from 2024 to 2025.

Methods: This cross-sectional study included 220 pregnant women visiting urban and rural health centers in Gonabad. Demographics, MHL, HLC, and lifestyle were assessed via questionnaires. Pearson correlation, ANOVA, and t-test were used, and data were analyzed in R 4.5.0.

Results: Participants' mean age was 29.83 ± 6.39 years, and most mothers had a planned pregnancy. The powerful other subscale of HLC was positively associated with physical activity ($P = 0.010$) but negatively related to eating habits ($P = 0.050$). A negative relationship existed between the chance of HLC and substance use ($P = 0.033$). Age significantly affected the relationship between MHL and lifestyle, being negative in mothers under 24 but positive in those over 24) $P = 0.010$). The analysis of demographic variables revealed that MHL was positively associated with overall lifestyle at all income levels ($P = 0.010$).

Conclusion: MHL was positively related to HLC and lifestyle in pregnant mothers. Thus, these factors play a significant role in shaping lifestyle, and the strength of their relationship may vary based on demographic variables, highlighting the importance of interactively addressing such factors while considering social and demographic characteristics.

Keywords: Pregnancy, Lifestyle, Health literacy, Mental health, Internal-external control

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Introduction

Lifestyle refers to the general way of living and behavioral patterns that can influence health (1). The World Health Organization defines a healthy lifestyle as behaviors adopted by an individual over a period of time (2). During pregnancy, lifestyle has long-lasting effects on the health of both mother and child. Unhealthy lifestyle behaviors may increase the risk of preterm birth or low birth weight (1). Furthermore, pregnancy itself exerts a profound impact on women's health (3). Globally, it is estimated that 53% causes of mortality are associated with lifestyle factors (4).

Various physiological and psychological changes occur in the mother with the onset of pregnancy, thereby influencing both her physical and mental characteristics (1). Mental health during the reproductive years plays a crucial role in the well-being of both mother and child (5). According to the World Health Organization, approximately 10% of pregnant women and 13% of postpartum women experience mental health problems (6). It should be noted that mental illness during pregnancy increases the likelihood of unhealthy behaviors with adverse consequences for perinatal health (5). Given that women's health and well-being significantly contribute to family functioning and, more broadly, to the social

and economic development of society, healthy women are considered vital to the prosperity of communities (7). Accordingly, adopting a healthy lifestyle during pregnancy is essential for promoting maternal well-being and ensuring a healthy pregnancy while preventing maternal and fetal complications (2).

The health locus of control (HCL) is regarded as one of the major scales and indicators of health beliefs for planning health education programs. It is recognized as a construct for understanding and predicting health behaviors (8). The HCL reflects the individual's belief regarding the extent to which their health is governed by internal or external factors. Specifically, individuals with an internal locus of control believe that they are the primary agents of their own lives, whereas those with an external locus of control think that events are mainly the result of chance, luck, or the actions of others (9). According to this theory, an internal HCL is associated with desirable health behaviors and positive health outcomes, while an external locus of control is linked to weaker or negative health behaviors (10).

Previous studies have examined the relationship between lifestyle behaviors in pregnant women and HCL, demonstrating significant associations with health outcomes. Specifically, pregnant women's beliefs about the source of health control are linked to their adherence to prenatal health guidelines and to pregnancy outcomes (11). Similarly, research has shown that an external HCL is more likely to be associated with depression and anxiety, an issue of particular importance in relation to postpartum depression among pregnant women (12).

Health literacy (HL) encompasses the cognitive and social skills that determine individuals' motivation and ability to access, understand, and use information in ways that maintain and improve their health (13). Specifically, mental health literacy (MHL) is considered an integral component of overall HL and contributes to public health strategies aimed at preventing mental disorders while promoting mental well-being (14).

The higher levels of MHL facilitate early recognition and timely intervention, which, in turn, are associated with greater well-being (15). In contrast, poor MHL among young people has been reported to contribute to increased stigma toward mental illness, lack of awareness regarding the identification of mental disorders, and barriers to help-seeking (16). Moreover, individuals with inadequate or low levels of MHL are more likely to experience poor mental health outcomes and a higher risk of developing mental health disorders (17).

Mirzania et al demonstrated that HL functions as an influential factor in shaping the HLC orientation among pregnant women. Accordingly, pregnant women with higher levels of HL are more likely to adopt an internal HLC. This internal belief system has a significant impact on their quality of life. Therefore, the findings highlight the need to pay greater attention to HL and the identification of locus of control orientations, particularly internal beliefs, in health promotion programs for pregnant women (9). In addition, MHL may influence the quality of life of pregnant women by shaping their HLC (9).

Furthermore, studies have indicated that mothers with low MHL are unable to recognize the symptoms and signs of postpartum depression or engage in help-seeking behaviors, while inadequate HL may lead women to normalize depressive symptoms (18). Hence, the assessment of MHL in pregnant women is of particular importance.

Ultimately, healthy lifestyle during pregnancy plays a crucial role in preventing pregnancy-related complications. Considering that HLC may influence the extent to which pregnant women adopt healthy behaviors, examining these variables becomes essential. MHL, as a determinant in the management and recognition of psychological problems, can contribute to improving pregnant women's quality of life by influencing their HLC and health-related behaviors. To the best of our knowledge, no study has directly addressed the combination of these variables in the manner intended in the present research. Given the potential of such a study to considerably contribute to the improvement and promotion of maternal health, the present study has been designed to investigate the relationship between MHL, HLC, and lifestyle among pregnant women in Gonabad, Iran, in 2024.

Materials and Methods

Study Design and Setting

This study used a cross-sectional design and was conducted in health centers located in Gonabad County, Iran, and its surrounding villages in 2024. The study aimed to examine the relationship between MHL, HLC, and lifestyle among pregnant women.

Participants and Sampling

The study population consisted of pregnant women residing in Gonabad County, Iran, and its surrounding villages. The inclusion criteria were being pregnant, aged 18 years or older, pregnant mothers with a live fetus over 7 weeks of gestation, and willing to participate in the study. On the other hand, the exclusion criterion included incomplete completion of the questionnaire. Based on the sample size calculation formula and considering the findings of similar studies (4), with a standard deviation of 20.28, the minimum required sample size was estimated to be 200. Taking into account an expected dropout rate, the final sample size was determined to be 220 participants. Participants were selected using a simple random sampling method.

Instruments

Demographic Information Questionnaire

This questionnaire collected personal information, including age, place of residence, occupation, and educational level of the mother and her spouse.

Mental Health Literacy Scale

The MHLS, which was developed and validated by

O'Connor in 2015, consists of 35 items across six attributes for assessing the level of MHL (19).

These six dimensions include the ability to recognize mental disorders, attitudes that promote recognition and appropriate help-seeking behavior, awareness of available professional help, knowledge of where to seek information, knowledge of self-treatment, and familiarity with risk factors and causes. Items are rated on Likert-type scales. The minimum score on the MHLS is 35, while the maximum score is 160, with higher scores indicating a more favorable level of MHL. In the study by O'Connor and Casey, the internal consistency of the instrument was reported using Cronbach's alpha as 0.873. Moreover, the validity and reliability of the scale were evaluated by Noroozi et al in Iran, where Cronbach's alpha and the content validity ratio were reported as 0.72 and 0.90, respectively (20).

Pregnancy Lifestyle Questionnaire

This questionnaire was initially validated by Moshki et al, based on a standardized general lifestyle questionnaire (21). Both face and content validity were assessed, and test-retest reliability was used to determine the questionnaire's consistency, with a reliability coefficient of 0.78. The questionnaire was further developed by Moshki et al to assess the lifestyle status of Iranian pregnant women. Content validity was confirmed through exploratory factor analysis and confirmatory factor analysis, and reliability was evaluated using Cronbach's alpha, which yielded a value of 0.915, representing good internal consistency. Based on these findings, it is considered a reliable and valid instrument for assessing healthy lifestyle behaviors in Iranian pregnant women. The questionnaire consists of 46 items across eight subscales: occupation (1), tobacco, alcohol, and drug use (2), safety and self-care (3), family and social interactions (4), dietary habits; mental status (5) physical activity and wellness (6), and medical visits. Items are scored on a 5-point Likert-type scale, with higher scores implying a healthier lifestyle (21).

Multidimensional Health Locus of Control Questionnaire (Form A)

Form A of the MHLC consists of 18 items across three dimensions: internal health locus of control (6 items), powerful other HLC (6 items), and chance HCL (6 items). Each dimension contains six items measured using a 6-point Likert-type scale ranging from "strongly agree" to "strongly disagree." Scores for each dimension are calculated by summing the responses to the corresponding items, with higher scores indicating greater endorsement of the respective HLC dimension. Item scores range from 1 to 6, resulting in a total score of 6–36 for each dimension (22). The validity and reliability of this instrument for use among the target population in Iran were assessed by Moshki et al (8). Cronbach's alpha coefficients were reported as 0.79 for the internal locus of control ($P<0.001$), 0.67 for powerful others ($P<0.001$), and 0.69 for the chance dimension ($P<0.001$), demonstrating acceptable reliability.

In the present study, the internal consistency of the instruments was estimated using Cronbach's alpha. The Cronbach's alpha coefficients were 0.764, 0.925, and 0.844 for the MHLS, the Pregnancy Lifestyle Questionnaire, and the MHLC-A, respectively, representing acceptable to excellent reliability in this sample.

Data Collection

Following approval from the Ethics Committee of the Student Research Committee at Gonabad University of Medical Sciences, Iran, the participants were recruited using a convenience sampling method from urban and rural health centers in Gonabad County, Iran, between December 2024 and May 2025. Pregnant women who visited health centers at the time of data collection were invited to participate in this study. After providing detailed explanations regarding the study objectives and procedures and assurances regarding confidentiality, questionnaires were administered to participants who provided informed consent. If the participant declined or provided incomplete data, another eligible pregnant woman who had visited the same health center was invited to participate in the study. In addition, data were collected within a defined timeframe to help ensure that the sample was representative of the target population.

Statistical Analysis

Descriptive statistics were reported as means and standard deviations for quantitative variables, as well as frequencies and percentages for qualitative variables. The relationships among the main variables were examined using Pearson correlation analysis. Subsequently, the associations between the main variables and demographic characteristics were assessed using the analysis of variance (ANOVA) and independent t-tests. Finally, the relationships between MHL, HLC, and lifestyle (adjusted for demographic variables) were examined using the generalized linear model tree (GLMtree). The GLMtree model is a decision tree in which a GLM is fitted at each terminal node. During model construction, a specific stochastic expectation-maximization algorithm generates multiple candidate trees. These trees are then evaluated and selected based on user-specified criteria, such as BIC, AIC, or the Gini index on the test set (23). All data analyses were performed using R version 4.5.0 with the "GLMtree" function, and a significance level of 0.05 was considered for all statistical tests.

Results

Demographic and Obstetric Characteristics of Participants

Data from a total of 220 pregnant women underwent analysis. Maternal ages ranged from 17 to 47 years, with a mean age of 29.83 ± 6.39 years. Moreover, the mean age at first pregnancy was 23.10 ± 4.19 years. Additionally, the mean number of pregnancies was 2.33 ± 1.35, and the mean number of children was 1.35 ± 1.15. Further, the most common maternal education level was high

school diploma (40.9%), and 74.1% of mothers were homemakers. Furthermore, 63.6% resided in urban areas, and 76.1% reported that they had a planned pregnancy (Table 1).

Mental Health Literacy, Health Locus of Control, and Lifestyle Scores

Regarding MHL, the highest score of the participants was associated with the ability to recognize mental disorders, while the lowest score was observed in knowledge of self-treatment. In terms of lifestyle, higher scores were found for job, safety, and eating habits, whereas physical activity and wellness received the lowest scores. In the field of health control beliefs, the highest score was related to the internal dimension (Table 2).

Table 1. Description of Demographic Variables of Pregnant Mothers

Variable	Minimum-Maximum	Mean ± SD
Age	17.0-47.0	29.83 ± 6.39
Husband's age	19.0-52.0	35.13 ± 6.26
Maternal age at marriage	10.0-40.0	19.48 ± 4.31
Maternal age at first pregnancy	16.0-37.0	23.10 ± 4.19
Number of pregnancies	0.0-8.0	2.33 ± 1.35
Duration of pregnancy	0.0-18.0	3.68 ± 3.53
Maternal age at pregnancy (week)	2.0-41.0	21.57 ± 10.31
Number of children	0.0-6.0	1.35 ± 1.15
	Level	**N (%)**
Education	Lower secondary education	21 (9.5)
	High school diploma	90 (40.9)
	Associate's degree	18 (8.2)
	Bachelor's degree	75 (34.1)
	Master's degree and above	16 (7.3)
Job	Homemaker	163 (74.1)
	Employee	57 (25.9)
Spouse's education	Lower secondary education	43 (19.5)
	High school diploma	91 (41.4)
	Associate's degree	15 (6.8)
	Bachelor's degree	54 (24.5)
	Master's degree and above	17 (7.7)
Spouse's job	Self-employed	162 (73.6)
	Employee	58 (26.4)
Place	City	140 (63.6)
	Village	80 (36.4)
Type of pregnancy	Planned pregnancy	166 (76.1)
	Unintended pregnancy	51 (23.4)
Income	Low	54 (25.4)
	Medium	160 (72.7)
	High	6 (2.7)
Drive	Licensed	145 (67.8)
	Without a license	69 (31.2)

Note. SD: Standard deviation.

Association Between Mental Health Literacy, Health Locus of Control, and Lifestyle Among Pregnant Women

Based on the results of the Pearson correlation analysis, there was a significant positive correlation between the chance HLC and the powerful others of HLC ($P < 0.001$). Similarly, significant positive correlations were observed between internal HLC and chance HLC ($P < 0.001$), as well as between internal HLC and powerful others ($P < 0.001$).

Regarding MHL, Pearson correlation results indicated a significant positive relationship with internal HLC ($P = 0.003$), chance HLC ($P = 0.046$), and powerful others ($P = 0.017$), suggesting that individuals with higher MHL exhibited higher scores across all three dimensions of HLC.

Analysis (Figure 1) further revealed a significant negative correlation between the powerful others of HLC and both physical activity and wellness ($r = 0.444$, $P < 0.05$) as well as eating habits ($P = 0.050$). Additionally, a significant positive correlation was found between tobacco, alcohol, and drug use and the chance HLC ($P < 0.05$).

Relationships Between Study Variables and Demographic Factors

According to the results of Pearson correlation analysis (Table 3), the eating habit dimension of lifestyle was positively and significantly correlated with maternal age at marriage ($\beta = 0.13$, $P < 0.05$) but negatively associated with maternal age at pregnancy ($\beta = -0.13$, $P < 0.05$). Additionally, the family and social interaction dimension was positively and significantly correlated with maternal age at marriage ($\beta = 0.18$, $P < 0.05$) and age at first pregnancy ($\beta = 0.19$, $P < 0.01$). Concerning the physical activity and wellness dimension of lifestyle, significant positive correlations were observed with maternal age at marriage ($\beta = 0.15$, $P < 0.05$) and age at first pregnancy ($\beta = 0.14$, $P < 0.05$), and a significant negative correlation was found with maternal age at pregnancy ($\beta = -0.17$, $P < 0.05$). Finally, a significant positive correlation was detected between MHL and age ($\beta = 0.14$, $P < 0.01$).

Differences in Study Variables by Qualitative Demographic Characteristics

Based on the results of ANOVA and independent t-tests, the mean MHL score was 76.24 among employed participants, which was significantly higher than that of homemakers (72.83) ($P = 0.007$). The highest mean MHL was observed in participants with a bachelor's degree (74.40), while the lowest mean belonged to those with an associate degree (70.66) ($P = 0.027$). Participants whose spouses were employees had a higher mean MHL (75.55) compared to those whose spouses were self-employed (73.06) ($P = 0.047$). A significant relationship was found between the powerful other dimension of HLC and driving status. Specifically, the mean score for this dimension was higher in participants without a driver's license (73.90) compared to those with a license (71.13). However, no significant relationships were observed

Table 2. Mean and Standard Deviation of Mental Health Literacy Factors, Health Locus of Control, and Pregnancy Lifestyle

Variable		Minimum-Maximum	Mean ± SD
Mental health literacy	Ability to Recognize Mental Disorders	8.0-32.0	23.51 ± 4.06
	Awareness of risk factors and causes	3.0-8.0	5.43 ± 0.88
	Knowledge of self-treatment	2.0-8.0	5.10 ± 0.94
	Awareness of available professional help	5.0-11.0	8.16 ± 1.09
	Knowledge of where to seek information	4.0-43.0	13.37 ± 3.25
	Attitudes toward help-seeking behavior	9.0-40.0	18.06 ± 5.02
	Total	49.0-105.0	78.71 ± 8.21
Health locus of control	Internal	10.0-35.0	27.14 ± 3.89
	Chance	6.0-33.0	20.86 ± 4.45
	Powerful others	10.0-36.0	24.03 ± 4.66
	Total	32.0-97.0	72.04 ± 10.56
Pregnancy life style	Tobacco, alcohol, and drugs	6.0-28.0	8.25 ± 4.19
	Eating habits	6.0-26.0	12.10 ± 3.83
	Physical activity and wellness	3.0-15.0	2.26 ± 7.06
	Safety	9.0-27.0	13.36 ± 3.95
	Job	9.0-45.0	20.58 ± 10.72
	Mental state	4.0-19.0	8.91 ± 3.10
	Family and social interactions	7.0-34.0	12.01 ± 5.05
	Visit a doctor	6.0-31.0	11.61 ± 8.20
	Total	46.0-152.0	86.49 ± 22.57

Note. SD: Standard deviation.

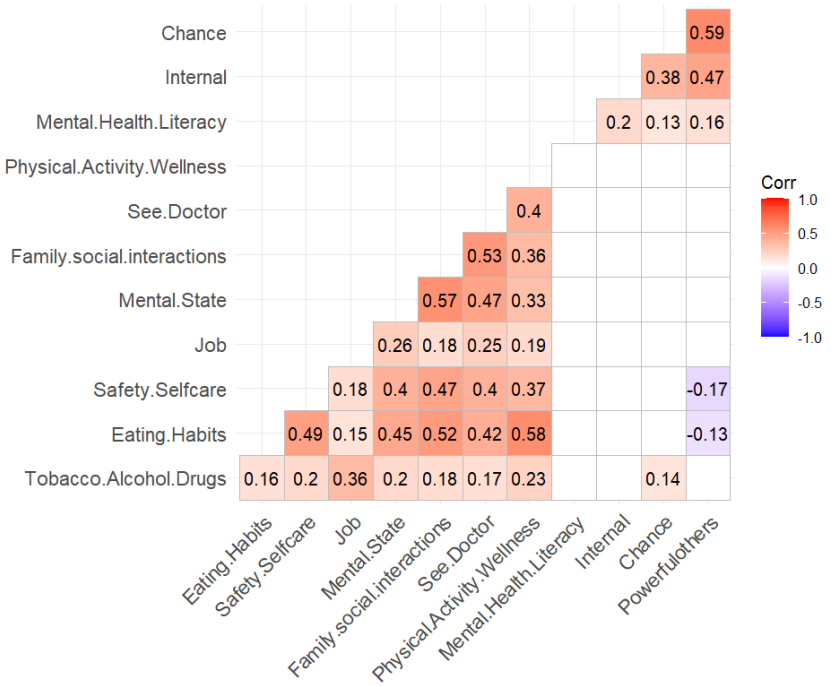

Figure 1. The Relationship Between Mental Health Literacy, Health Locus of Control, and Lifestyle in Pregnant Mothers in the Study

between the other dimensions of HLC and pregnant mothers' qualitative demographic variables ($P=0.014$). Regarding overall lifestyle, participants whose spouses had a lower secondary education had a higher mean lifestyle score (94.60) compared to those whose spouses had an associate degree (77.86) ($P=0.049$). The highest mean lifestyle score was belonged to participants with low incomes (95.88), whereas the lowest mean score was related to those with medium incomes (83.42) ($P=0.002$) (Table 4).

Differences in Lifestyle Dimensions by Qualitative Demographic Characteristics

The results of ANOVA and independent t-tests revealed that the highest mean score for tobacco, alcohol, and drug use was observed in participants with lower secondary

Table 3. The Relationship Between Health Locus of Control, Mental Health Literacy, and Lifestyle Dimensions With Quantitative Demographic Variables of Pregnant Mothers in the Study

Variables	Tobacco, Alcohol, and Drugs	Eating Habits	Safety and Self-Care	Job	Mental State	Family-Social Interactions	Visit a Doctor	Physical Activity and Wellness
Age (year)	-0.01	0.01	0.02	-0.03	0.07	0.13*	0.02	0.12
Husband's age (year)	-0.04	-0.12*	-0.05	-0.07	0.03	0.03	-0.05	-0.008
Maternal age at marriage	-0.02	0.13**	0.11	0.001	0.12	0.18**	0.09	0.15**
Maternal age at first pregnancy	-0.02	0.06	0.11	0.009	0.12*	0.19*	0.11*	0.14**
Number of pregnancies	-0.04	0.002	-0.003	-0.09	0.09	0.09	-0.02	0.03
Duration of pregnancy	0.03	0.02	-0.04	-0.06	0.01	0.03	-0.04	0.09
Maternal age at pregnancy (week)	-0.08	-0.13**	0.06	-0.02	-0.04	-0.09	-0.08	-0.17**
Number of children	0.007	0.01	-0.01	0.01	0.04	0.09	-0.007	0.03

	Health Locus of Control				
Variables	**Internal**	**Chance**	**Powerful Others**	**Mental Health Literacy**	**Pregnancy Lifestyle**
Age	-0.02	0.04	0.02	0.14*	0.04
Husband's age	-0.06	0.02	0.04	0.10	-0.06
Maternal age at marriage	0.06	0.03	-0.02	0.01	0.12
Maternal age at first pregnancy	-0.01	0.006	-0.08	0.05	0.11
Number of pregnancies	-0.04	-0.003	-0.005	0.005	-0.18
Duration of pregnancy	-0.05	0.01	0.06	0.07	0.03
Age of pregnancy (week)	-0.04	0.09	-0.02	0.03	-0.10
Number of children	0.01	0.05	0.07	0.03	0.34

Note. Pearson correlation coefficient, $^{*}P<0.01$, $^{**}P<0.05$.

Table 4. Difference in the Mean Factors of Mental Health literacy, Health Locus of Control, and Pregnancy Lifestyle by Qualitative Demographic Variables

Variable	Group	Mental Health Literacy		Health Locus of Control						Pregnancy Lifestyle	
				Internal		Chance		Powerful Others			
		Mean ± SD	*P*-Value*	Mean ± SD	*P*-Value*	Mean ± SD	*P*-Value*	Mean ± SD	*P*-Value*	Mean ± SD	*P*-Value*
Education	Lower secondary education	73.42 ± 10.07	0.075	27.23 ± 4.25	0.928	22.00 ± 5.54	0.723	25.38 ± 5.80	0.190	92.52 ± 32.36	0.318
	High school diploma	72.10 ± 7.08		27.41 ± 4.04		21.01 ± 4.53		24.50 ± 4.65		87.56 ± 23.57	
	Associate's degree	72.77 ± 11.18		26.77 ± 5.51		20.38 ± 4.88		23.55 ± 5.32		78.94 ± 22.45	
	Bachelor's degree	75.48 ± 7.79		26.92 ± 3.37		20.56 ± 4.21		23.61 ± 3.84		84.53 ± 19.17	
	Master's degree and above	76.00 ± 8.51		26.93 ± 2.93		20.56 ± 3.05		22.12 ± 5.54		90.25 ± 14.19	
Job	Homemaker	72.83 ± 8.02	0.007*	27.10 ± 4.16	0.814	20.95 ± 4.76	0.642	24.28 ± 4.76	0.179	72.33 ± 11.19	0.483
	Employee	76.24 ± 8.29		27.24 ± 3.00		20.63 ± 3.78		23.31 ± 4.34		71.19 ± 8.53	
Spouse's education	Lower secondary education	73.41 ± 8.31	0.027*	26.88 ± 3.26	0.475	20.76 ± 4.09	0.824	23.90 ± 4.48	0.159	94.60 ± 26.05	0.049*
	High school diploma	72.93 ± 8.71		27.46 ± 4.33		21.06 ± 4.74		24.74 ± 4.90		86.15 ± 23.67	
	Associate's degree	70.66 ± 6.97		25.60 ± 3.48		19.73 ± 2.78		21.66 ± 4.51		77.86 ± 19.27	
	Bachelor's degree	74.40 ± 7.25		27.05 ± 3.63		20.74 ± 4.45		23.55 ± 4.21		82.59 ± 18.26	
	Master's degree and above	73.71 ± 8.21		27.70 ± 4.02		21.47 ± 5.14		24.11 ± 4.93		87.82 ± 17.63	
Spouse's Job	Self-employed	73.06 ± 7.89	0.047	27.24 ± 3.70	0.526	20.94 ± 4.36	0.672	24.13 ± 4.69	0.582	72.32 ± 10.12	0.512
	Employee	75.55 ± 8.87		26.86 ± 4.39		20.65 ± 4.71		23.74 ± 4.62		71.25 ± 11.75	
Place	City	73.60 ± 8.98	0.761	27.20 ± 3.99	0.767	20.91 ± 4.68	0.840	24.10 ± 4.76	0.775	72.21 ± 11.20	0.736
	Village	73.92 ± 6.70		27.03 ± 3.72		20.88 ± 4.04		23.91 ± 4.52		71.73 ± 9.39	
Kind Pregnancy	Planned pregnancy	73.68 ± 8.29	0.910	27.17 ± 4.02	0.825	20.72 ± 4.50	0.397	23.79 ± 4.94	0.122	71.69 ± 11.10	0.389
	Unintended pregnancy	73.83 ± 8.02		27.03 ± 3.48		21.32 ± 4.30		24.77 ± 3.61		73.13 ± 8.62	
Income	Low	72.44 ± 8.51	0.164	26.94 ± 3.74	0.875	21.64 ± 3.76	0.137	24.61 ± 4.73	0.576	95.88 ± 26.05	0.002*
	Medium	73.96 ± 8.14		27.18 ± 3.98		20.52 ± 4.64		23.85 ± 4.52		83.42 ± 20.50	
	High	78.66 ± 5.42		27.66 ± 3.01		23.00 ± 4.04		23.66 ± 7.73		83.83 ± 22.28	
Drive	Licensed	74.08 ± 8.63	0.340	26.88 ± 3.64	0.163	20.75 ± 4.19	0.596	23.49 ± 4.57	0.014*	71.13 ± 9.77	0.068
	Without a license	72.95 ± 7.27		27.66 ± 4.33		21.09 ± 4.97		25.13 ± 4.70		73.90 ± 11.86	

Note. *Anova test or t-test.

education (9.23), while the lowest mean belonged to those with a bachelor's degree (7.16) ($P=0.033$). The mean score for tobacco, alcohol, and drug use was higher in homemakers (8.58) than in employed participants (7.33) ($P=0.007$). Moreover, participants whose spouses had lower secondary education had the highest mean score for tobacco, alcohol, and drug use (9.20), whereas those whose spouses had an associate degree had the lowest mean (7.00) ($P=0.047$). Regarding income, participants with low income had the highest mean score (9.81), while those with medium incomes had the lowest mean score (7.74) ($P=0.007$). Among the participants without a driver's license, the mean score for tobacco, alcohol, and drug use was 9.62, which was higher than those with a license (7.59) ($P=0.003$). As regards the family and social interactions, participants with unintended pregnancies had a higher mean score (13.71) compared to those with planned pregnancies (11.47) ($P=0.018$). The highest mean score was observed in participants with low incomes (14.59), while the lowest score was related to those with medium incomes ($P<0.001$). Participants without a driver's license had a higher mean (13.13) in comparison to those with a license (11.47) ($P=0.039$). Regarding medical visits, participants whose spouses had a master's degree or higher had the highest mean score (29.5), whereas those whose spouses had an associate degree had the lowest scores (3.46) ($P=0.024$). Mothers with unintended pregnancies had a higher mean score (4.75) compared to those with planned pregnancies (4.01) ($P=0.032$). Participants with low incomes had the highest mean (4.90), while those with medium income had the lowest mean (3.94) ($P=0.006$). Mothers without a driver's license had a higher mean score (4.66) than those with a license (3.95) ($P=0.017$). For the physical activity and wellness dimension, participants with a master's degree or higher had the highest mean score (7.93), whereas those with an associate degree had the lowest score (5.72) ($P=0.048$) (Table 5).

Correlation of Mental Health Literacy with Health Locus of Control and Lifestyle Adjusted for Demographic Factors Using Generalized Linear Model Tree Analysis

According to Figure 2, among participants who married before the age of 24, MHL showed a negative association with lifestyle (β_MHL = -0.027). In contrast, in participants who married at age 24 or older, this relationship was positive (β_MHL = 1.029, $P=0.032$). Based on Figure 2, among participants with low incomes, MHL had a positive association with pregnant women's lifestyle (β_MHL = 0.257). Similarly, in participants with medium and high incomes, this relationship remained positive (β_MHL = 0.101, $P=0.01$). Nonetheless, no significant associations were found between the dimensions of HLC and lifestyle after adjusting for demographic variables using the GLMtree model (Figure 2).

Discussion

This study examined the relationship between MHL, HLC, and lifestyle among pregnant women. Overall, the results indicated a significant positive relationship between MHL, HLC, and lifestyle. Additionally, the chance and powerful others, which are the dimensions of HLC, were related to the specific aspects of lifestyle. Demographic variables also demonstrated significant associations with lifestyle and MHL. Age-related variables, including maternal age, age at pregnancy, age at marriage, and age at first pregnancy, were correlated with some lifestyle dimensions and MHL. These findings highlight the importance of addressing MHL and HLC in improving healthy lifestyle behaviors among pregnant women.

Our findings revealed that the highest mean scores were observed for internal control, followed by powerful others and chance, which is consistent with the findings of previous studies (24). Despite numerous studies on HL, research on MHL, particularly among pregnant women in relation to HLC, remains limited, with only a few studies closely addressing this topic.

Our findings confirmed that MHL in pregnant women is associated with recognizing, chance, and others in controlling health. Tang et al and Chen et al concluded that low HL, inadequate social support, and individuals' beliefs about themselves and others can influence health outcomes and health-related behaviors in pregnant women, implying the importance of improving HL and considering the external locus of control beliefs (25, 26).

Given that individuals with insufficient or low MHL are at risk for poor mental health and increased likelihood of mental disorders (17), our results, demonstrating a positive association between MHL and HLC in pregnant women, are in line with these findings. However, Giblett et al reported no significant association between HLC and mental health (27). Conversely, Mirzania et al found a negative relationship between HL and the HLC dimensions of chance and powerful others among pregnant women (9). This discrepancy may stem from the focus of that study on the mediating role of HLC in relation to the quality of life; the direct effect of HL on HLC may be moderated by other psychological factors or the quality of life variables. These findings underscore the importance of addressing HL and identifying the type of HLC, particularly internal beliefs, in programs aimed at promoting the health of pregnant women.

Moreover, our findings indicated a positive association between internal HLC, chance, and powerful others. In other words, pregnant women who believe in the role of themselves and others in controlling their health tend to engage in healthier behaviors. However, Steptoe et al, in a study involving students from 18 European countries, reported that there was a negative relationship between internal control and chance (28). This discrepancy may be attributed to the homogeneity of the study population, representing that findings may differ in other populations.

Our results further revealed a positive association between MHL and lifestyle across all three income levels of mothers. This suggests that, regardless of income, higher MHL is associated with a healthier lifestyle, although its

Table 5. Difference in Mean Factors of Lifestyle Dimensions by Qualitative Demographic Variables

Variable	Group	Pregnancy Lifestyle															
		Tobacco, Alcohol, and Drugs		Eating Habits		Safety and Self-Care		Job		Mental State		Family-Social Interactions		Visit a Doctor		Physical Activity and Wellness	
		Mean ± SD	*P*-Value*	Mean ± SD	*P*-Value*	Mean ± D	*P*-Value*	Mean ± SD	*P*-Value*	Mean ± SD	*P*-Value*	Mean ± SD	*P*-Value*	Mean ± SD	*P*-Value*	Mean ± SD	*P*-Value*
Education	Lower secondary education	9.23 ± 4.06	0.033*	11.61 ± 5.58	0.433	13.76 ± 5.08	0.332	23.09 ± 12.60	0.216	9.23 ± 3.06	0.941	14.28 ± 7.98	0.187	4.42 ± 2.39	0.522	6.85 ± 2.93	0.048*
	High school diploma	9.07 ± 5.74		11.83 ± 3.49		13.13 ± 3.84		21.93 ± 11.35		8.75 ± 3.22		11.47 ± 4.94		4.10 ± 1.90		7.25 ± 2.41	
	Associate's degree	8.33 ± 3.19		11.33 ± 3.46		11.94 ± 2.48		18.22 ± 10.51		8.77 ± 3.31		11.00 ± 4.45		3.61 ± 1.64		5.72 ± 1.99	
	Bachelor's degree	7.16 ± 1.56		12.48 ± 3.78		13.61 ± 4.07		18.70 ± 9.96		9.09 ± 3.09		12.18 ± 4.39		4.25 ± 1.83		7.04 ± 1.84	
	Master's degree and above	7.43 ± 1.71		13.31 ± 3.51		14.56 ± 3.48		21.12 ± 6.52		8.75 ± 2.51		12.43 ± 3.91		4.68 ± 2.30		7.93 ± 2.04	
Job	Homemaker	8.58 ± 4.68	0.007*	11.86 ± 3.82	0.125	13.19 ± 4.02	0.289	20.24 ± 11.59	0.343	8.69 ± 3.18	0.069	11.79 ± 5.11	0.262	4.23 ± v2.04	0.501	7.00 ± 2.33	0.452
	Employee	7.33 ± 2.04		12.77 ± 3.82		13.84 ± 3.72		21.54 ± 7.70		9.56 ± 2.80		12.66 ± 4.89		4.05 ± 1.61		7.26 ± 2.05	
Spouse's education	Lower secondary education	9.20 ± 4.46	0.047*	12.95 ± 4.63	0.492	13.88 ± 4.79	0.692	23.32 ± 11.95	0.207	9.30 ± 2.91	0.715	13.93 ± 6.37	0.052	4.39 ± 2.00	0.024*	7.60 ± 2.60	0.313
	High school diploma	8.80 ± 5.09		11.69 ± 3.54		13.36 ± 3.81		20.32 ± 11.05		8.69 ± 3.02		11.91 ± 5.03		4.26 ± 1.97		7.09 ± 2.28	
	Associate's degree	6.60 ± 0.91		12.06 ± 3.36		12.40 ± 2.66		15.86 ± 7.07		9.20 ± 3.60		11.93 ± 4.21		3.46 ± 1.55		6.33 ± 2.22	
	Bachelor's degree	7.40 ± 2.99		11.98 ± 3.71		13.05 ± 3.33		20.07 ± 10.22		8.72 ± 3.05		10.81 ± 3.95		3.74 ± 1.63		6.79 ± 1.96	
	Master's degree and ab	7.11 ± 1.31		12.52 ± 3.90		13.88 ± 5.13		20.76 ± 8.88		9.52 ± 3.82		11.64 ± 4.34		5.29 ± 2.33		7.05 ± 2.16	
Spouse's job	Self-employed	8.41 ± 4.53	0.257	11.90 ± 3.78	0.199	13.26 ± 4.02	0.539	20.67 ± 11.18	0.808	8.75 ± 2.94	0.188	12.25 ± 5.30	0.238	4.25 ± 1.97	0.353	7.14 ± 2.32	0.383
	Employee	7.81 ± 3.05		12.65 ± 3.95		13.63 ± 3.76		20.31 ± 9.37		9.37 ± 3.51		11.34 ± 4.25		3.98 ± 1.84		6.84 ± 2.09	
Place	City	8.00 ± 4.00	0.239	12.35 ± 3.85	0.189	13.33 ± 3.76	0.890	20.24 ± 9.91	0.558	8.97 ± 3.05	0.704	12.02 ± 5.23	0.968	4.29 ± 1.96	0.283	6.98 ± 2.11	0.498
	Village	8.70 ± 4.50		11.65 ± 3.77		13.41 ± 4.29		21.17 ± 12.04		8.81 ± 3.20		12.00 ± 4.77		4.00 ± 1.89		7.21 ± 2.52	
Kind Pregnancy	Planned pregnancy	8.22 ± 4.17	0.844	11.83 ± 3.79	0.072	13.31 ± 3.94	0.729	20.50 ± 10.80	0.847	8.72 ± 2.97	0.101	11.47 ± 4.50	0.018*	4.01 ± 1.83	0.032*	6.97 ± 2.16	0.255
	Unintended pregnancy	8.35 ± 4.29		12.92 ± 3.87		13.52 ± 4.01		20.83 ± 10.55		9.52 ± 3.44		13.71 ± 6.24		4.75 ± 2.18		7.37 ± 2.55	
Income	Low	9.81 ± 5.73	0.007*	13.01 ± 4.03	0.127	14.44 ± 4.83	0.068	22.07 ± 11.05	0.500	9.57 ± 2.80	0.127	14.59 ± 6.15	<0.001*	4.90 ± 2.24	0.006*	7.46 ± 2.63	0.171
	Medium	7.74 ± 3.46		11.79 ± 3.67		13.01 ± 3.61		20.11 ± 10.66		8.753.19		11.16 ± 4.37		3.94 ± 1.78		6.90 ± 2.09	
	High	8.00 ± 2.28		12.00 ± 5.36		13.00 ± 2.00		19.66 ± 9.60		7.50 ± 2.42		11.50 ± 3.98		4.16 ± 1.60		8.00 ± 2.89	
Drive	Licensed	7.59 ± 3.40	0.003*	12.16 ± 3.81	0.731	13.06 ± 3.68	0.103	19.66 ± 10.10	0.084	8.85 ± 3.21	0.648	11.47 ± 4.59	0.039*	3.95 ± 1.77	0.017*	7.16 ± 2.17	0.379
	Without a license	9.62 ± 5.23		11.97 ± 3.90		13.98 ± 4.41		22.47 ± 11.74		9.05 ± 2.88		13.13 ± 5.99		4.66 ± 2.18		6.87 ± 2.44	

Note. Pearson correlation coefficient; SD: Standard deviation.

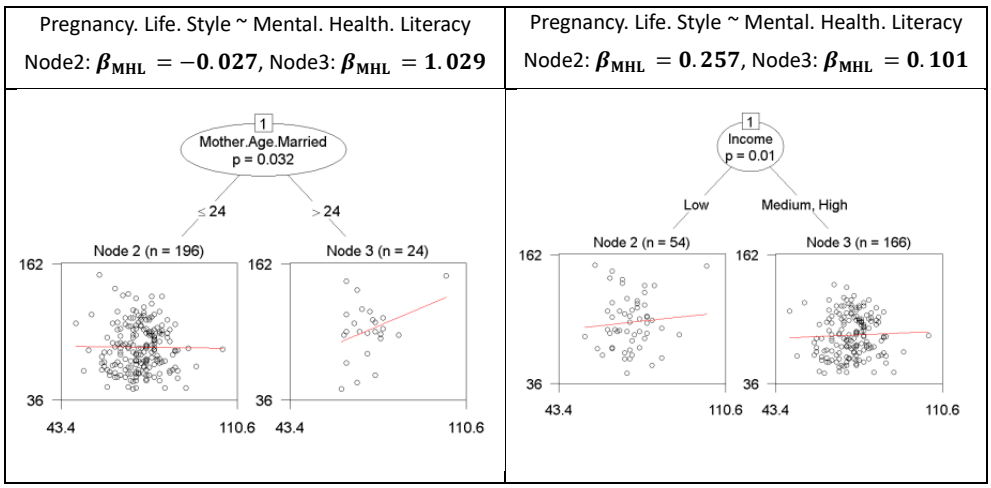

Figure 2. Correlation of Mental Health Literacy With Health Control Beliefs and Lifestyle by Adjusting for the Effect of Demographic Variables Using the GLMtree-Model. *Note*. GLMtree: Generalized linear model tree

impact appears more pronounced among low-income groups. Nonetheless, limited research has focused on lifestyle and MHL in pregnant women, with most studies emphasizing the quality of life. For instance, Jafari et al observed that higher HL was associated with better quality of life, with income influencing both parameters (29). Although mental health was their outcome variable, considering evidence that individuals with low MHL tend to have poorer mental health (30), similar patterns can be expected in the relationship with MHL. Contrarily, Yu et al found that higher income was associated with higher MHL among mothers (31). This difference may reflect demographic characteristics, as our sample included both rural (36%) and urban participants. Therefore, the impact of income on MHL may vary by location, and caution should be exercised when generalizing findings to exclusively rural or urban populations.

Likewise, our study demonstrated a negative association between the belief in powerful others and certain lifestyle dimensions, including physical activity and eating habits. Individuals who strongly believe in the influence of others (e.g., family or physicians) on their health tend to engage less in physical activities and adopt less healthy dietary practices. This is in conformity with the findings of prior studies showing that high dependency on others can be associated with less healthy lifestyle (28, 32).

Additionally, our findings confirmed a positive relationship between the belief in chance, a component of external HLC, and consumption of tobacco, alcohol, and drugs, which are the aspects of lifestyle. In other words, individuals with higher substance use were more likely to attribute health outcomes to chance, which aligns with those of previous research (24). Moreover, Cobb et al reported that women with an internal HLC, compared to those with an external HLC, were more likely to adopt healthier behaviors (e.g., regular physical activities, appropriate eating habits, and lower smoking rates), as they derived greater satisfaction from engaging in these activities (33).

The findings of the present study regarding demographic variables and their relationship with main study variables were noteworthy. Among mothers under 24 years of age, MHL was negatively associated with lifestyle, whereas in mothers over 24, the relationship was positive. This suggests that higher MHL is associated with healthier lifestyle behaviors. Younger mothers may be unable to apply it, despite being aware, occasionally leading to unhealthy behaviors or anxiety. Conversely, older mothers, with greater experience, are more capable of making decisions and effectively using this knowledge, resulting in healthier lifestyle choices. Additionally, the results indicated that maternal age at marriage and age at first pregnancy were positively associated with family-social interactions and physical activities, which are dimensions of lifestyle. In addition, maternal age at marriage was positively correlated with eating habits. These findings imply that mothers who marry and have their first pregnancy at older ages, due to greater psychological and physical maturity, as well as enhanced knowledge and decision-making capacity, tend to adopt healthier behaviors and lifestyles. Similarly, Wells et al demonstrated that early marriage and childbearing are linked to adverse maternal health outcomes, (34).

Our results further revealed that higher maternal age during pregnancy was negatively associated with eating habits and physical activities. This may represent that as pregnancy progresses, physical limitations, fatigue, and hormonal changes may reduce physical activities and alter dietary patterns. Although no study was found to specifically examine maternal age in relation to dietary habits, Faruga et al reported changes in dietary behaviors during pregnancy (35). Based on these findings, it is recommended that educational programs and therapeutic interventions be implemented during the mid to late stages of pregnancy to minimize adverse lifestyle changes.

Furthermore, our results confirmed that MHL was higher among employed mothers with a bachelor's degree and those whose husbands were employed in office jobs. Employed mothers have more opportunities to increase their knowledge and awareness of the importance of mental health, which is supported by previous studies (36, 37). Similarly, Jafari et al concluded that higher educational levels improve the ability to recognize psychological

disorders (29). Regarding spouses, employed men may provide a more stable environment that facilitates the enhancement of maternal MHL. Despite limited studies in this area, Babazadeh et al found a significant relationship between MHL and both maternal education and occupation, as well as the education and occupation of their husbands, emphasizing that higher education levels are associated with higher MHL (38), which conforms to our findings. Additionally, Liu et al indicated that living conditions serve as the predictors of different levels of MHL, highlighting the influence of the socioeconomic status on maternal MHL (39).

Based on the results of the study, the lifestyle score was higher among mothers whose husbands had lower secondary education. This finding may be explained by the greater presence of extended family relationships and social networks in families with lower educational levels, which could positively influence maternal lifestyle. In contrast, Yadollahi et al reported that higher maternal education was associated healthier lifestyle behaviors (40). Considering that there were a limited number of similar studies and our study was conducted in a county-level population, it can be suggested that mothers with lower educational backgrounds may still adopt culturally influenced lifestyles that promote healthier behaviors.

Further, the study showed that mothers with lower incomes had higher mean lifestyle scores compared to other income groups. Although this finding may seem counterintuitive, it can be explained by the tendency of lower-income individuals to consume more traditional diets and follow lifestyle practices rooted in cultural norms, which may lead to better lifestyle. However, Kavlak et al observed that low socioeconomic status, combined with the stress of pregnancy, increases maternal stress, which can negatively impact lifestyle and reduce their engagement in healthy lifestyle behaviors (41). A possible explanation for the discrepancy between our findings and those of previous studies is that our data were collected using self-reported questionnaires, limiting the generalizability of the results.

According to the results, the mean consumption of tobacco, alcohol, and drugs was higher among mothers and their spouses with lower education. This may be due to a lack of awareness and insufficient social support or resources, which can increase the likelihood of engaging in these behaviors. Corrales et al reported that education is associated with unhealthy lifestyle behaviors in pregnant women (42). Our study further revealed that housewives and mothers with lower incomes had higher mean scores for tobacco, alcohol, and drug use, which corroborates the results of Pollack et al (43).

Likewise, the findings indicated that social and family interactions, a dimension of lifestyle, were higher in mothers with unintended pregnancies and low incomes. This may reflect increased dependency and a greater need for social support in challenging circumstances. Contrarily, Feld et al concluded that social support and a sense of belonging enhance women's ability to plan pregnancies and act as protective factors against unintended pregnancies. Lack of social interaction and support, on the other hand, can hinder women's fertility planning (44).

Our results revealed that the mean score for visit a doctor was higher among mothers with higher spouse education, unintended pregnancies, and low incomes, indicating that these groups may have a greater need for medical care. Moreover, Trisnawati et al demonstrated that demographic factors influence regular prenatal visits (45). Conversely, Ochako et al found that mothers with unintended pregnancies tend to seek care later and less frequently (46). The differences in findings may be related to national healthcare policies; however, further studies are needed in this regard. Additionally, higher maternal education is associated with more physical activity and a healthier lifestyle.

This study had some limitations, including its cross-sectional design, limited sample size, and the lack of consideration of cultural factors in the analysis. In addition, although information regarding gestational age was collected through a questionnaire, analysis was not performed by the trimester of pregnancy. Given that MHL, HLC, and lifestyle may differ at different stages of pregnancy due to changes in education, advice, and medical visits, the lack of controlled analysis by stage and age of pregnancy may have affected the results of our study. Accordingly, it is recommended that future studies analyze these variables by the trimester of pregnancy and the gestational age.

Conclusion and Recommendations

Our findings demonstrated a positive relationship between MHL and the dimensions of HLC. Enhancing MHL can, therefore, improve individuals' beliefs about controlling their health, particularly in the internal control dimension, which showed higher scores. Moreover, MHL and HLC play a significant role in shaping the lifestyle of pregnant women, and the strength of this relationship may vary when demographic variables are taken into consideration. These findings highlight the importance of addressing these factors in an interactive manner, taking into account social and demographic characteristics.

Furthermore, recognizing these relationships can guide the development and design of care programs and educational interventions that promote healthier lifestyles among pregnant women. It is suggested that future research employ longitudinal and interventional designs to further elucidate these relationships, as pregnancy is a high-risk period. Additionally, future studies should consider gestational age or trimester of pregnancy when examining MHL and lifestyle among pregnant women. Improving MHL and overall health among pregnant women not only benefits the mothers but also contributes to the development of a healthier next generation.

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Competing Interests

The authors declared no potential conflict of interests with respect to research, authorship, and/or publication of this article.

Ethical Approval

This article was derived from a research project approved by the Ethics Committee of Gonabad University of Medical Sciences, Iran (IR.GMU.REC.1403.175). All procedures performed in this study were in accordance with the ethical standards of the institutional and national research committees and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Written informed consent was also obtained from all participants. All ethical considerations, including plagiarism prevention, data fabrication and falsification prevention, and publication ethics, were observed by all authors.

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