

problems (15). Ramírez and colleagues 2019 highlight the importance of communication strategies to enhance public understanding of air pollution and health risks (16). Particularly in Iran, engaging the public and offering educational programs are vital for enhancing environmental health literacy.

Assessing EHL is essential for creating interventions and applying research in communities (14, 17, 18). Numerous studies show that women are disproportionately affected by environmental health risks (19-22). Women's health literacy greatly influences family and community health, especially regarding children's well-being. This study evaluates the EHL of women at Zanzan health centers, focusing on food, water, air, and general health, while also considering socio-demographic factors. Enhancing women's EHL can guide educational interventions for better health.

Materials and Methods

Study design and participants

This cross-sectional study involved 678 women who attended comprehensive health service centers in Zanzan city in 2023. The study encompassed women aged 18 or above, capable of reading, writing, and responding to questions, and willing to participate in the research.

Sample size and sampling method

The study's sample included 678 individuals, drawn from a statistical population of women aged 18 and older receiving comprehensive health services in Zanzan city. This population was identified using the Integrated Health System (SIB), with a total of 37,887 eligible individuals in Zanzan. The sample size was calculated using Cochran's formula, assuming a 50% health literacy rate, a 0.05 margin of

error, and a z-value of 1.96, resulting in an initial estimate of 384 participants. To account for a design effect of 1.5 and a 10% non-response rate, the final sample size was adjusted to 640 individuals. However, 678 individuals were ultimately included in the study. This study employed a two-stage sampling method. First, five comprehensive health service centers were randomly selected from the 22 centers in Zanzan city, representing the north, south, west, east, and central regions. Next, the population of women over 18 from each center was obtained from the apple system, and the sample size for each center was determined. Samples were then collected using the available sampling method from each center until the desired sample size was reached.

Measurements

Data was collected through a survey with two main sections. The first section gathered demographic information from participants, including age, education, occupation, marital status, educational background, and length of residence. The second section featured 42 questions assessing environmental health literacy (EHL) across four areas: general environmental health (9 items) and specific environmental media—air (10 items), food (9 items), and water (14 items). The EHL questionnaire was developed by Maureen Y. Lichtveld et al., and its reliability and validity have been established (6). The questionnaire included scales for food, air, water, and GEH, each with questions about knowledge, attitudes, and behaviors. Knowledge was defined as information acquired through experience or education, attitudes as established patterns of thinking or emotions,

Women's attitudes and behaviors regarding water health literacy varied significantly by education level, with university-educated women outperforming those with lower education levels. The findings are summarized in Table 3.

Table 1. Demographic characteristics of the participants

Variables		Mean and SD		
Age		34.77		9.50
Length of residence in current city (Years)		28.33		13.13
Frequency and Percentage	Level of Education	Middle And High School	200	29.8
		Diploma	181	26.9
		University	291	43.3
	Marital Status	Single	79	11.7
		Married	569	88.3
	Job	Housewife	413	66.8
		Employed	205	33.2
	Financial situation	Fairly Good	184	27.3
		Adequate Income For Basic Needs	384	57
		Difficult Financial Situation	106	15.7
	Taken an environmental health class	Yes	120	17.7
		No	557	82.3
	Interest in enrolling in an environmental health class	Yes	346	51.2
		No	330	48.8

Discussion

This study examined the GEH and specific environmental media (food, air, and water) knowledge, attitudes, and behaviors, as well as their socio-demographic determinants. Participants demonstrated the highest literacy in food hygiene, likely due to women's traditional roles in food preparation and household management, which necessitate knowledge of food safety practices. In contrast, Atai et al. found medium knowledge and above-medium attitudes and performance among women in Saveh, Iran, while our results were more favorable (28). This discrepancy may be due to our study population, which included a larger proportion of individuals with university education. The participants demonstrated the poorest understanding of air health literacy compared to other aspects of environmental health literacy, suggesting

insufficient knowledge and attitudes towards air health. The study by Abu Bakkar Siddique et al. revealed that the general public in Bangladesh has a good understanding and positive attitude towards air pollution, but their actions do not align with their knowledge and attitudes (29). Bindhu Unni and colleagues examined the community's knowledge, attitudes, and behaviors concerning indoor air quality in Bangladesh. The study found low knowledge and behavior levels but moderate attitudes about indoor air quality among the participants. Improving community knowledge and encouraging positive behaviors related to indoor air quality are essential for addressing health issues linked to indoor environments (30).

We found that, although women demonstrated good knowledge and behavior regarding general environmental health, their attitude toward it was average.

Demographic Variables	N	GEH			WEH			FEH			AEH		
		K	A	P	K	A	P	K	A	P	K	A	P
		X±SD	X±SD	X±SD	X±SD	X±SD	X±SD	X±SD	X±SD	X±SD	X±SD	X±SD	X±SD
Educational status													
Middle And High School	20	12.33 ±1.81	10.50 ±2.10	12.83 ±2.79	16.21 ±2.34	10.98 ±2.93	28.94 ±5.14	8.86 ±1.22	21.18 ±2.89	8.78 ±1.45	9.02 ±1.99	9.26 ±1.96	15.43 ±3.62
Diploma	181	12.64 ±1.73	11.01 ±1.87	12.98 ±2.45	16.10 ±2.35	11.75 ±2.74	29.09 ±4.67	8.94 ±1.21	21.46 ±2.44	8.89 ±1.28	9.71 ±2.32	9.42 ±2.03	15.60 ±3.19
University	291	13.06 ±1.78	10.98 ±1.86	13.45 ±1.91	16.25 ±2.38	11.99 ±2.82	29.94 ±3.98	9.15 ±1.24	21.41 ±2.60	9.04 ±1.23	10.25 ±2.43	9.16 ±1.76	16.07 ±2.97
Fp		10.328 0.0001*	4.582 0.011*	4.759 0.009*	0.241 0.786	7.805 0.001*	3.325 0.03*	3.662 0.026*	0.626 0.535	2.423 0.089	17.407 0.0001*	1.030 0.358	2.595 0.075
Income status													
Low	184	12.62 ±1.96	11.02 ±1.94	13.47 ±2.16	16.42 ±2.54	10.98 ±2.81	28.94 ±4.16	9.01 ±1.30	21.79 ±2.49	9.09 ±1.45	9.76 ±2.40	9.18 ±1.92	16.03 ±3.02
Middle	384	12.82 ±1.69	10.89 ±1.92	13.18 ±2.21	16.20 ±2.23	11.75 ±2.84	29.09 ±4.59	9.05 ±1.17	21.42 ±2.53	8.91 ±1.28	9.75 ±2.35	9.31 ±1.91	15.86 ±3.21
Relatively good	10	12.51 ±1.96	10.31 ±1.93	12.37 ±2.98	15.73 ±2.40	11.99 ±2.95	29.94 ±5.27	8.83 ±1.27	20.16 ±3.12	8.66 ±1.52	9.69 ±2.17	9.27 ±1.83	14.76 ±3.56
F;p		1.510 0.222	4.886 0.008*	7.712 0.001*	2.983 0.051	2.064 0.128	1.521 0.219	1.388 0.250	13.546 0.0001*	3.566 0.029*	0.031 0.969	0.258 0.773	5.846 0.003*
Taken an environmental health class													
Yes	120	12.73 ±1.83	11.34 ±2.09	13.78 ±1.61	17.15 ±2.48	12.35 ±2.44	30.75 ±3.99	8.94 ±1.36	22.14 ±2.59	9.30 ±1.17	9.90 ±2.34	9.13 ±1.79	16.51 ±2.71
No	557	12.71 ±1.81	10.73 ±1.93	13.00 ±2.46	15.99 ±2.27	11.46 ±2.92	29.07 ±4.67	9.01 ±1.20	21.16 ±2.65	8.84 ±1.33	9.71 ±2.33	9.29 ±1.92	15.56 ±3.32
t;p		0.103 0.918	0.083 0.934	4.344 0.001*	4.723 0.001	3.496 0.001*	3.660 0.001*	-0.583 0.560	3.701 0.001*	3.831 0.001*	0.812 0.420	0.796 0.426	3.331 0.001*
Employment													
House wife	413	12.54 ±1.80	10.90 ±2.05	13.07 ±2.54	16.32 ±2.34	11.28 ±2.98	29.01 ±4.91	8.96 ±1.21	21.24 ±2.79	8.98 ±1.39	9.80 ±2.23	9.52 ±1.94	15.40 ±3.40
Employed	205	13.02 ±1.76	10.81 ±1.88	13.24 ±2.07	16.00 ±2.40	11.98 ±2.65	30.01 ±3.89	9.09 ±1.28	21.47 ±2.39	8.91 ±1.15	9.94 ±2.58	8.99 ±1.79	16.15 ±2.58
t;p		3.199- 0.001*	0.548 0.584	0.870- 0.385	1.592 0.112	-2.959 0.003*	-2.742 0.006*	-1.194 0.233	1.045- 0.296	0.646 0.519	0.662- 0.509	3.246 0.001*	2.858- 0.004*

K= Knowledge;A= Attitude;p= Behavior; GEH= General Environmental Health; AEH=Air Environmental Health; FEH=Food Environmental Health; WEH= Water Environmental Health

Education is crucial in developing individuals' environmental health literacy, as demonstrated by this study and supported by existing literature. The current study finds that women with a university education possess significantly higher general health literacy, as well as greater knowledge of food and air health literacy, compared to other groups. Previous research indicates that individuals with higher education are more concerned about their ecological footprint and that environmental health literacy is generally positively correlated with education level (38, 39), although Binder et al.'s study did not support this relationship (40).

The study found that women with higher incomes had significantly more positive attitudes and behaviors toward general environmental and air health, as well as higher air health literacy, compared to other income groups. Previous studies have shown that individuals with higher social status, education, and financial means tend to have better health literacy (41-44).

Women who attended the training courses demonstrated significantly higher environmental health literacy scores in general, as well as in the water, air, and food domains. This finding aligns with the expectation that educational interventions can effectively improve health behaviors. Previous studies have also shown that developing health literacy programs can reduce exposure to indoor air pollutants and increase environmental health knowledge (45, 46).

The relationship between employment status and EHL reveals significant differences in knowledge, attitudes, and behaviors between working women and housewives.

The study revealed that working women possess significantly greater knowledge of GEH literacy compared to housewives. Additionally, they exhibit a better attitude and behavior regarding water health literacy. Conversely, housewives display a more positive attitude toward air health literacy, albeit scoring lower in behavior. These findings align with expectations, as working women typically have access to better education and economic resources. Research indicates that factors such as age, education, job type, and family structure influence the level of environmental health literacy among working women. Those with higher literacy levels are more likely to make informed health and environmental decisions (47). Furthermore, working women with elevated environmental health literacy are better equipped to recognize the risks posed by chemicals and pollutants, enabling them to take preventive measures for themselves and their families (48).

Study Limitations and Strengths: This study has several limitations common to cross-sectional research, such as an inability to establish causal relationships or assess temporal links between outcomes and risk factors. Additionally, the reliance on self-reported data may introduce response bias, especially in behavioral reporting. Conducted in health centers in Zanjan, the findings may not be generalizable to other regions or populations. Nonetheless, this research is a pioneering effort in evaluating general environmental health literacy and specific environmental media like food, air, and water among women in Iran. It underscores the scarcity of studies on environmental health literacy in the country and contributes

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