Determinants of Health Literacy among Iranian Children Aged 9–12: A Qualitative Study

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Background and Objective: Health literacy critically shapes health outcomes across the lifespan. However, determinants influencing its development during childhood remain inadequately understood, particularly within culturally diverse populations. Iranian children face distinctive socio-cultural challenges that may impact health literacy formation, though empirical research on contributing factors is limited.To investigate multifactorial determinants influencing health literacy development among Iranian children aged 9–12 years, drawing on perspectives of children, mothers, and educators.

Materials and Methods: This exploratory qualitative study employed conventional content analysis following Graneheim and Lundman's methodology. Conducted in Isfahan Province, Iran (February 2023–May 2024), purposive sampling using maximum variation recruited 21 participants: children aged 9–12 years (n=14), mothers (n=3), and elementary school educators (n=4). Semi-structured interviews averaged 34 minutes, yielding 760 minutes of recorded material. Data analysis used MAXQDA 2022 software with independent verification.

Results: Content analysis of 1,077 initial codes yielded four overarching categories encompassing 15 subcategories: 1) Child-level determinants: health knowledge and understanding, mental and emotional well-being, health skills and self-management; 2) Family and home environment determinants: family health literacy and awareness, maternal roles and practices, family structure and dynamics; 3) Educational and institutional determinants: school environment and policies, curriculum and learning content, teaching methodologies, educator competence; 4) Socio-cultural and systemic determinants: economic status, cultural and religious context, information environment, policy and governance, environmental quality.

Conclusion: This study identified four interconnected categories of determinants influencing health literacy development among Iranian children aged 9-12 years. Findings revealed children's capacity for health reasoning and the central role of family environments, particularly maternal influences. Educational approaches emphasizing interactive learning methods and educator competence emerged as important factors. Economic constraints, cultural values, and environmental conditions represented significant systemic determinants, providing evidence for developing culturally responsive, multi-level interventions.

Keywords: Child Development, Health Education, Health Literacy, Qualitative Research, Socioeconomic Factors

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Introduction

Health literacy plays a critical role in shaping health outcomes at both individual and societal levels. More than the mere acquisition of knowledge, health literacy comprises a range of cognitive and social competencies that empower individuals to access, comprehend, critically evaluate, and apply health information across a variety of contexts—from everyday health choices to complex clinical situations (1,2). The importance of health literacy has grown markedly with the expansion of digital health technologies, where the intersection of health literacy and social determinants of health has become increasingly critical for fostering meaningful health engagement and enabling effective health management throughout the lifespan (3).

Limited health literacy is consistently associated with negative health outcomes, poor treatment adherence, and widened health disparities, particularly among vulnerable populations (4–6). In the United States, over 90 million individuals have difficulty understanding and using health information, with only 12% demonstrating proficient health literacy(7). Similarly, studies indicate that more than half of Iranian high school students face challenges with basic health literacy skills (8), highlighting the critical need for early, targeted interventions.

Children have emerged as a particularly important target population for health literacy interventions. This developmental period involves rapid physical, emotional, and cognitive growth when foundational health behaviors develop (9). Empirical evidence consistently demonstrates that higher levels of health literacy in childhood are associated with healthier lifestyle choices, including improved sense of coherence, increased self-efficacy, healthier dietary practices, and enhanced overall well-being (10–13). These early advantages contribute to the establishment of a strong foundation for improved long-term health outcomes (14).

Current Knowledge on Health Literacy Determinants in Children

Research has identified several key factors influencing children's health literacy development across multiple ecological levels. Individual-level determinants include cognitive characteristics, self-rated health levels, and mental health conditions (15,16). Family-level factors encompass parental education, family structure, socioeconomic status, and family health literacy levels, with nuclear families and higher maternal education showing protective effects (15,17). School-related determinants include educational environment, curriculum content, teaching methodologies, and educator competence, with interactive learning approaches and supportive environments promoting better outcomes(16).

Broader social conditions also influence children's health literacy development. These include economic status, cultural context, and access to health information sources. Gomes et al. (17) identified multiple determinants ranging from immediate family contexts to broader macrodeterminants, emphasizing the need for intersectoral approaches. Research in Iran has documented personal factors (age, education, socioeconomic status), situational factors (internet use, social support), and environmental factors (residence type, insurance coverage) as significant influences(18).

Knowledge Gaps in Children's Health Literacy Determinants

Despite these advances, significant knowledge gaps persist that limit effective intervention development for children's health literacy. Van Boxtel et al. (19) made important progress by centering children's voices through focus groups with 46 children aged 9-12 years in the Netherlands, revealing that children conceptualize health broadly and receive health information primarily passively from caregivers and social media. However, cross-cultural validation remains limited, and three critical gaps require attention.

First, empirical evidence from diverse cultural contexts is limited

Research on children's health literacy determinants has been conducted primarily in Western settings, with less evidence available from non-Western populations (20). This cultural evidence gap is evident in Iran, where comprehensive investigations into the determinants of children's health literacy are scarce (18), with existing studies focusing primarily on specific adolescent populations rather than broader childhood cohorts (21).

Second, methodological approaches inadequately capture children's perspectives

Research has relied heavily on single-perspective approaches that fail to capture the ecological complexity of health literacy development (9,17,22).Traditional methodologies privilege adult viewpoints over children's voices, examining children's health literacy primarily through parents and caregivers rather than engaging directly with children (23–25). This limitation is particularly evident in Iran, where multi-stakeholder approaches integrating children's, perspectives remain underutilized (26).

Third, understanding of how determinants interconnect within cultural contexts is incomplete

While studies have identified various individual determinants, how these factors interact within specific cultural frameworks to influence health literacy development remains unclear. Contemporary scholarship recognizes that participatory methodologies can transform children from passive subjects to active partners in understanding health literacy determinants, yet such approaches remain underexplored (27–29).

Study Purpose

The purpose of this study is to investigate the multifaceted determinants influencing health literacy development among Iranian children aged 9-12 years using a multi-stakeholder approach. Responding to the identified research gaps—limited empirical evidence from non-Western contexts, methodological limitations privileging adult perspectives, and incomplete understanding of determinant interactions within cultural frameworks—this research adopts a comprehensive perspective incorporating insights from children, mothers (as primary caregivers), and educators.

This approach directly addresses existing limitations by centering children's voices while capturing perspectives of key adults in their lives, yielding culturally grounded understandings of how various determinants influence health literacy development. Iran represents a particularly important case study given its unique socio-cultural context and documented challenges Iranian students face with health literacy. The findings will provide critical insights for policymakers, educators, and health professionals seeking to develop culturally appropriate, evidence-based

approaches to enhancing childhood health literacy through targeted interventions addressing key determinants.

Materials and Methods

Study Design

This exploratory qualitative study employed conventional content analysis following Graneheim and Lundman's(30) methodology.

Setting and Context

The study was conducted between February 2023 and May 2024 in Isfahan Province, Iran, encompassing urban and rural communities to capture diverse socio-economic and cultural contexts. Isfahan Province was selected as the study setting because it represents a comprehensive microcosm of contemporary Iranian society across multiple dimensions critical to health literacy development. First, the province encompasses significant socioeconomic diversity, ranging from affluent urban districts to economically disadvantaged rural communities, reflecting the full spectrum of Iran's economic stratification. Second, Isfahan contains varied educational infrastructures including well-resourced private schools, government public schools, and rural educational facilities, mirroring the educational landscape found throughout Iran. Third, the province maintains both traditional cultural practices and modern lifestyle adaptations, representing the cultural transitions occurring across Iranian society. Finally, Isfahan's demographic composition includes families from various regional backgrounds who have migrated for economic opportunities, creating a representative sample of Iran's diverse cultural heritage. This comprehensive representativeness, combined with practical accessibility for sustained fieldwork, makes findings from Isfahan transferable to other Iranian contexts with similar socio-cultural characteristics.

Participants and Sampling

Twenty-one participants were purposively selected using maximum variation sampling to ensure diverse perspectives across stakeholder groups and demographic characteristics. Students were recruited from private and public schools across diverse economic areas to capture socioeconomic variation. The sample comprised 14 children aged 9-12 years, 3 mothers as primary caregivers, and 4 elementary school teachers/health educators **(Table 1).** Data saturation

was achieved when no new codes emerged from the analysis of interview data across all participants, indicating that the phenomenon had been comprehensively explored This multi-stakeholder approach recognizes that health literacy development occurs within complex ecological systems involving multiple influential actors (31).

Inclusion and Exclusion Criteria

Inclusion Criteria

Children: Participants included children aged 9–12 years enrolled in public and private elementary schools who demonstrated clear verbal communication abilities. All child participants provided verbal assent, with written informed consent obtained from their parents or legal guardians.

Mothers/Primary Caregivers: Primary caregivers were defined as mothers of children aged 9–12 years who met the following inclusion criteria: (1) had been residing with the child continuously for a minimum of two years to ensure adequate familiarity with the child's health experiences and behaviors; (2) had at least one child enrolled in either public or private elementary school; and (3) served as the primary decision-maker for health-related matters within the household. Mothers were specifically targeted for recruitment given their predominant role in pediatric health-related decision-making within the Iranian sociocultural context and their intimate knowledge of their children's daily health behaviors and experiences.

Educators: Educational professionals included currently active elementary school teachers and health educators with a minimum of two years' experience working with the target age demographic (9–12 years).

Exclusion Criteria

Children with diagnosed cognitive, developmental, or communication disorders that could significantly impair their ability to engage in meaningful conversation or comprehend interview questions were excluded from participation. Cognitive and developmental disorders were identified through comprehensive school records review and teacher consultation. Excluded conditions included intellectual disabilities, severe attention deficit disorders, autism spectrum

disorders with significant communication impairments, and any diagnosed condition affecting comprehension or verbal expression as documented in the child's educational records.

Data Collection

Semi-structured, in-depth interviews served as the primary data collection method, yielding 760 minutes of audio-recorded material. The data collection approach integrated multiple stakeholder perspectives—children, mothers, and educators—to reflect the ecological complexity of health literacy development and center children's authentic voices in the research process. This multi-perspective approach aligns with contemporary frameworks that view health literacy as a socially constructed phenomenon influenced by environmental and contextual factors (32,33). Separate interview guides were developed for children, mothers, and educators, incorporating developmentally appropriate language for child participants and culturally sensitive content tailored to the Iranian context. The flexible interview structure allowed probing and clarification, facilitating rich insights into health literacy determinants across multiple domains.

Participatory Question Development Process

Prior to formal data collection, collaborative question development sessions were conducted in children's classrooms with teachers present. These visits enabled researcher engagement with children within their familiar educational environment, fostering comfort and openness. Children, supported by teachers, provided feedback on question clarity, preferred questioning styles, relevant topics, and suggestions to enhance interview engagement. Based on their input, interview guides were revised to ensure developmental appropriateness and alignment with children's lived experiences. This process was consistent with recommendations for involving children in research tool co-design to enhance relevance, accessibility, and ethical integrity of child-centered qualitative research (33,34).

Child-Friendly Interview Techniques

Interviews with children employed narrative and conversational strategies rather than rigid question-answer formats, following best practices for child-centered qualitative research. Techniques included story-based questioning ("Tell me the story of your typical day..."), visual

aids such as simple drawings, scenario-based prompts ("Imagine if..."), think-aloud techniques, and activity integration allowing children to draw during interviews to reduce performance pressure. These methods align with recommendations for creating developmentally appropriate research environments respecting children's communicative preferences and agency.

The age range of 9–12 was selected due to both theoretical and empirical support. In Piagetian terms, children at this stage (concrete operational) begin to develop logical reasoning, which allows them to better reflect on and articulate their experiences. Empirical studies support including children in this age group, demonstrating their ability to engage meaningfully in qualitative interviews when facilitated through developmentally appropriate methods (19,32,35)

Interview Settings and Implementation

To support children's autonomy and comfort, participants chose interview locations from approved environments including familiar classroom spaces, school library areas, outdoor school settings, or their homes. Children could invite trusted peers to accompany them during interviews, acknowledging environmental and social factors influencing authentic research participation (36,37). Companion presence helped reduce anxiety and mitigate adult-child power imbalances while centering the child as primary informant (33).

Interviews were conducted in Persian by a trained qualitative researcher in supportive, participant-chosen environments. Light refreshments were offered during sessions, and small age-appropriate tokens of appreciation were provided upon completion. All interviews were audio-recorded with informed consent and subsequently transcribed verbatim.

.***Sample interview questions included:***

Children:

"Can you tell me the story of your typical day, starting from when you wake up?"

"If you could teach other kids about staying healthy, what would you want them to know?"

"Show me or tell me about a time when you had to make a decision about your health."

"Imagine you come home from school today, and there are many changes in your house. You're surprised and you say, 'What happened? Why is my family paying so much attention to health today?' What changes might have happened in your home?"

Mothers:

"What are your child's health-related habits?"

"Imagine you visit your child's school today and observe numerous significant changes. You are pleasantly surprised and remark, 'All these changes to prioritize our children's health are truly commendable.' Please describe those changes."

Educators:

How do environmental factors (air quality, school facilities) affect health literacy?

Can you tell me about any health-related rules or practices in your school?

Interview durations ranged from 20-30 minutes for children (flexible based on engagement) and 40-60 minutes for adults.

Data Analysis

Data were analyzed using inductive content analysis, guided by the methodology proposed by Graneheim and Lundman (30), and supported by MAXQDA 2022 qualitative data analysis software. The analytic process began with immersion through repeated readings of the transcripts to achieve familiarity with the data. Subsequently, meaning units were identified and condensed while preserving their core content. These condensed units were then assigned open codes using descriptive labels. Codes sharing similar features were grouped into sub-categories, which were further abstracted into themes representing broader conceptual patterns.

To ensure analytic rigor and credibility, a second coder independently analyzed 20% of the transcripts. Any discrepancies in coding or interpretation were discussed and resolved through collaborative consensus.

Trustworthiness and Rigor

To ensure methodological rigor, we implemented the following specific steps following Lincoln and Guba's four criteria(38):

• ***Credibility:*** We conducted prolonged engagement with the data through multiple readings and analysis sessions. Peer debriefing sessions were held with experienced qualitative researchers to discuss findings and interpretations. We employed triangulation by collecting data from three different stakeholder groups (children, mothers, and educators) to provide multiple perspectives on the phenomenon.

• ***Transferability:*** We provided thick descriptions of the research context, including detailed participant characteristics and interview settings. Rich quotes and comprehensive descriptions of findings were presented to enable readers to assess the applicability of results to similar contexts.

• ***Dependability:*** We maintained a comprehensive audit trail documenting all methodological decisions, including interview guides, coding procedures, analytical steps, and participatory modifications made during the study. All data collection and analysis procedures were systematically recorded.

• ***Confirmability:*** We practiced researcher reflexivity by documenting personal assumptions and potential biases throughout the research process. Independent coding was performed by a second researcher on 20% of transcripts, with discrepancies resolved through discussion. We maintained transparency about all participatory adaptations made during the study.

Ethical Considerations

Ethical approval was granted by Shahid Sadoughi University of Medical Sciences Ethics Committee (IR.SSU.SPH.REC.1401.131). Written informed consent was obtained from adult participants, with verbal assent secured from children after parental consent and age-appropriate explanation of their enhanced role in question development. When children chose companions, additional consent was obtained from accompanying friends' parents. Participant appreciation measures were reviewed and approved by the ethics committee as appropriate

tokens of gratitude rather than undue inducements. Confidentiality was maintained through transcript anonymization and secure data storage. Additional protocols addressed child participants' specific needs through developmentally appropriate methods, flexible environments, ongoing assent processes, and support mechanisms including trusted companion presence.

Table 1. Demographic Information of Participants in Determinants of 9-12-Year-Old Iranian Children's Health Literacy

Participants	Code	Age	Grade/ Education	Gender(M/F)	Job	Years of related work
Children	C01	12	6th	F	Student	-
	C02	10	4th	F	Student	-
	C03	9	4th	F	Student	-
	C04	11	5th	F	Student	-
	C05	11	5th	F	Student	-
	C06	12	6th	M	Student	-
	C07	10	4th	M	Student	
	C08	12	6th	M	Student	-
	C09	12	6th	M	Student	-
	C10	11	5th	M	Student	-
	C11	10	5th	M	Student	-
	C12	9	4th	F	Student	-
	C13	11	5th	M	Student	-
	C14	11	5th	F	Student	-
Mothers	M01	52	Undergraduate	F	Housewife	-
	M02	40	Bachelor's degree	F	Housewife	-
	M03	36	Diploma	F	Housewife	-
Elementary school Educators	T01	33	Psychology	M	Teacher	5
	T02	34	physical education	F	Teacher	10
	T03	35	Health education	F	Health educator	13
	T04	38	Health education	M	Health educator	15

Results

Conventional content analysis of 1,077 codes derived from children, mothers, and educators revealed four overarching categories comprising 15 sub-categories **(Table 2).** These categories represent the comprehensive and multilayered determinants of health literacy among Iranian children aged 9–12 years, highlighting the complex, interrelated nature of influences shaping children's health literacy development.

Category I: Child-Level Determinants

Individual capacities, cognitive abilities, and personal characteristics emerged as foundational elements influencing the development of health literacy. This category comprises three sub-categories reflecting children's intrinsic capabilities and evolving health literacy competencies.

Health Knowledge and Understanding

Children exhibited varying levels health knowledge, from basic factual information to complex conceptual understandings related to health promotion and disease prevention. This sub-category captured children's cognitive engagement with health topics, including their ability to articulate reasoning behind health behaviors and demonstrate health literacy through informed decision-making.

"For breakfast, instead of sweet tea and things like that, which can cause anemia, I eat Ardeh (sesame paste) and dates. This is the best food. The sweetness of the dates won't make us fat." (C14)

Teachers emphasized the importance of developing reasoning skills alongside factual knowledge for health literacy development: "This means that if an incident occurs at home and parents don't *have access to a phone or aren't fully conscious, the child must know a number to call emergency services—be it an ambulance or the fire department."* (T02)

Mental and Emotional Well-being

Psychological and emotional states significantly influenced children's capacity to access, understand, and apply health information effectively. Children demonstrated understanding of emotional health as integral to overall well-being, with one child explaining:

"Certainly, when my child is emotionally supported by their friends, they pursue their health-related questions with greater enthusiasm and self-confidence, and in addition to that, they also help the school with health education activities"(M 01)

"In the book ' Hedyeha ' I'm learning that when it's prayer time, we should do ablution (wudu), wear clean clothes, and smell good. Every time I pray, it gives me a good feeling and this makes me more interested in hygiene, health, and cleanliness". (C03)

This sub-category revealed children's holistic conceptualization of health extending beyond physical dimensions to encompass emotional regulation, social competence, and psychological resilience as they relate to health literacy development.

Health Skills and Self-Management

Practical capabilities to translate health knowledge into actionable behaviors and self-advocacy skills emerged as distinct components of health literacy. This sub-category captured children's developing abilities to independently access health information, make health decisions, and manage personal health behaviors.

"I'm used to waking up by myself around 8 AM. Then I exercise, and after that, I use my phone for a bit, like, maybe half an hour in the morning." (C07)

Category II: Family and Home Environment Determinants

The immediate family context emerged as a critical determinant encompassing family health literacy levels, parental practices, and household dynamics. This category includes three sub-categories reflecting familial ecological influences on children's health literacy development.

Family Health Literacy and Awareness

Parental health knowledge and family health literacy levels emerged as influential factors in children's health literacy acquisition, affecting how children access, interpret, and apply health information. Families with higher health literacy created environments that promoted children's health information-seeking behaviors and critical evaluation skills.

" When I ask my mom about health questions, she gives me good answers that help me understand health topics better than just reading books!" (C10).

Maternal Roles and Practices

Mothers emerged as central figures in children's health literacy development, functioning as primary health information mediators and modeling health information-seeking behaviors. Children identified their mothers as primary sources of health guidance and demonstrated reliance on maternal interpretation of health information.

"Because some parents don't really care much about these kinds of things. And whatever the health teacher says, kids might think it's not true... because their parents are their role models" (C09).

Children's narratives revealed that mothers served as accessible resources for health-related inquiries with testimonies such as *"I ask my mother about health questions"* (C05) and *"When I have questions about what to eat, I ask my mom"* (C08). Specific maternal practices substantially influenced their health literacy development, including caring for sick family members, planning nutritious meals, responding to children's health inquiries, establishing household eating guidelines, and involving children in health-related domestic activities

Family Structure and Dynamics

Family composition, relationships, and emotional atmosphere emerged as factors affecting children's capacity to engage with health information and develop health literacy skills. Family stability created optimal conditions for health information sharing and learning, while family disruption affected children's ability to access and process health information.

"Kids who have stable families with good relationships participate more in health-related discussions, are more persistent, and sometimes even help us, but those who have family stress are usually passive learner". (T03)

"When my parents are fighting a lot, I don't feel comfortable asking them health questions anymore..." (C05)

Category III: Educational and Institutional Determinants

The formal education system—including school environments, curricular content, and educator competencies—emerged as a major determinant of health literacy development through structured health information provision and skill development.

School Environment and Policies

Both physical and administrative aspects of the school environment played critical roles in shaping children's access to health information and opportunities to develop health literacy skills. School policies either facilitated or hindered health information access and health literacy skill application.

"Every few months, we have a healthy breakfast get-together at school. And every day, if any of us brings an unhealthy snack, our principal takes it away!" (C10).

Curriculum and Learning Content

Formal health literacy content integrated into school curricula formed an important component of systematic health information delivery and health literacy skill development. Analysis revealed the scope and limitations of current curriculum implementation in developing children's health literacy competencies.

"In this year's science book, in the 'Our Body' section, we learned about proper sitting posture and the effects of not using sunglasses on sunny days and snowy days and such things." (C07)

However, curricular limitations affected comprehensive health literacy development: *" when girls see the anatomical models we use during the 'Our Body' lessons in science class, some of them ask questions about where babies are located in the body, and then the teacher tries to quickly move past these questions... We have legal restrictions for classroom discussions.... The child doesn't receive answers from parents either and searches the internet each time, which creates even more questions for them."* (T01)

Teaching Methodologies

Pedagogical approaches significantly determined health information delivery effectiveness and children's health literacy skill development. Children demonstrated preferences for interactive,

experiential learning methods over traditional didactic approaches that enhanced their ability to understand and apply health information.

"One day, our teacher said there's a lot of trash on our schoolyard floor... So, for the past two or three days, I've been helping to pick up the trash, and it makes me feel really good!" (C12)

Educator Competence

Teacher knowledge, skills, and effectiveness as health literacy facilitators emerged as critical determinants directly impacting health information quality and children's health literacy skill acquisition.

"My teacher always tells us to wash our hands, and she explains why it's important." (C04)

Children also demonstrated peer health literacy facilitation capabilities: *"Yeah, some other guys, like those in our class, when they read books, they put their heads down on the desk. That can hurt their eyes and neck, so I tell them to stop."* (C07)

Category IV: Socio-Cultural and Systemic Determinants

Broader societal structures, encompassing economic conditions, cultural norms, media environments, and policy frameworks, formed the overarching context influencing children's access to health information and development of health literacy skills.

Economic Status

Financial circumstances significantly impacted families' capacity to access health information resources, quality health education materials, and technology needed for health literacy development.

“A father who has a good income can provide better facilities for his kids, gets them a good laptop, buys books to increase their knowledge, enrolls them in various classes, and this raises the scope of the children's knowledge and practice regarding anything that helps their health” (T02)

"Schools that are in more well-off areas can provide more facilities for kids' learning, and this gives us the chance to have more comprehensive programs for health literacy along with hands-on learning experiences." (M02)

Cultural and Religious Context

Societal beliefs, traditions, and religious values significantly influenced health information acceptability, health communication patterns, and the application of health literacy skills within Iranian cultural contexts. Cultural factors sometimes created barriers to accessing certain types of health information or applying health literacy skills.

: *"For example... a family said, 'Don't write this on her card, especially for my daughter. In small towns, we don't want to put a blemish on my daughter's record so that later they say she's diabetic.'"* (T02)

Information Environment

The broader information ecosystem significantly influenced how children and families accessed, evaluated, and applied health information, with digital sources creating both opportunities and challenges for health literacy development.

"Sometimes I search on Google about why I feel tired, but sometimes I don't know if the answer is real or not." (C11).

Policy and Governance

Systemic governmental factors, health policies, and inter-organizational coordination created the structural framework influencing health literacy resource allocation, program implementation, and children's access to comprehensive health information.

"If policymakers support health literacy programs, we can provide comprehensive education for kids that raises their understanding of the concept of health."(T03)

"Cooperation between health centers and schools can help us easily access useful information about health. For example, a while ago a specialist from the health center came to school and gave training about lice. It was really helpful for me."(M03)

Environmental Quality

Physical environmental conditions significantly impacted children's opportunities to apply health literacy skills and access health-promoting resources, representing an important systemic determinant influencing health literacy development.

"The health teacher really recommends that we do physical activity, go for walks, do group exercises with our classmates. But when the air is polluted…… we turn a blind eye to the things we've learned." (C12)

"... environmental problems limit our ability to have outdoors health education program, reducing childrens practical health literacy experiences" (T04)

Table 2. Comprehensive Determinants of Iranian Children's Health Literacy

Categories	Subcategories	Codes (Children = C, Mothers = M, Teachers = T)
Child-Level determinants	Health Knowledge & Understanding	Nutrition knowledge (C), Puberty knowledge (C), Traffic laws awareness (C), Self-care practices (C), Awareness of one's rights (C)
	Mental & Emotional Well-being	Not being depressed (C), Healthy communication (C), Resilience (C), Prayer (C, M), Self-control (C)
	Health Skills & Self-Management	Problem-solving (C), Saying 'no' (C), Planning (C), Media literacy (C), Seeking medical attention (C), Academic performance (C)
Family & Home Environment Determinants	Family Health Literacy & Awareness	Low family health literacy (T), Improving family HL (M), Attention to parental HL (T)
	Maternal Role & Practices	Parents as info sources (C), Mother's role in decisions (C), Cooking with family (C), Family role modeling (M), Social media control by mother (M)
	Family Structure & Dynamics	Family support (C), Family disputes (C), Parental separation (C), Sibling influence (M), Family rules shaping child behavior (M)
	School Environment & Policies	School breakfast programs (C),

Educational & Institutional determinants		Health ambassador (C), Counselor role (C), Hygiene checks (C), Milk distribution (C)
	Curriculum & Learning Content	Health topics in textbooks (T), Religious content (C), Science and hygiene integration (T), Age-appropriate curriculum (T)
	Teaching & Learning Methodologies	Museums, games, poems, body model (C), Repetition (C), Children teach parents (C), Simple language in teaching (T)
	Educator Competence	Teachers as info sources (C), Teacher training (M, T), Health instructors (T), Teacher-family collaboration (M)
Socio-Cultural & Systemic determinants	Economic Status	Economic status impacts mood, nutrition, access to education and materials (M)
	Cultural & Religious Context	Performing prayer (C), Hedieh-ha book verses (C), Using fruits/vegetables as gifts (C), Cultural norms overriding science (T)
	Information Environment	Trusting search pages (C), Virtual misinformation (T), Family media practices (M), Shared phone use (M), Learning from TV/parents (M)
	Policy & Governance	Policymaker support (T), Legal support (T), Coordination between family and school (M, T), Social participation (M)
	Environmental Quality	Pollution and mental health (C, M), Environmental degradation impact on health (T), Rural food quality (M)

This framework integrates the insights from children (C), Mothers (M), and elementary school teachers/health educators (T), with a deliberate focus on amplifying the unique voice and experiences of children in shaping their health literacy in Iran

Discussion

This exploratory qualitative study provides comprehensive insights into the multifaceted determinants influencing health literacy development among Iranian children aged 9-12 years. Through multi-stakeholder perspectives that prioritized children's authentic voices alongside mothers and educators, this research reveals the complex, interconnected nature of factors shaping health literacy acquisition within culturally diverse contexts. The four major determinant categories with 15 sub-categories illuminate how health literacy develops through dynamic

interactions between child-level capacities, family environments, educational institutions, and socio-cultural systems **(Figure 1).**

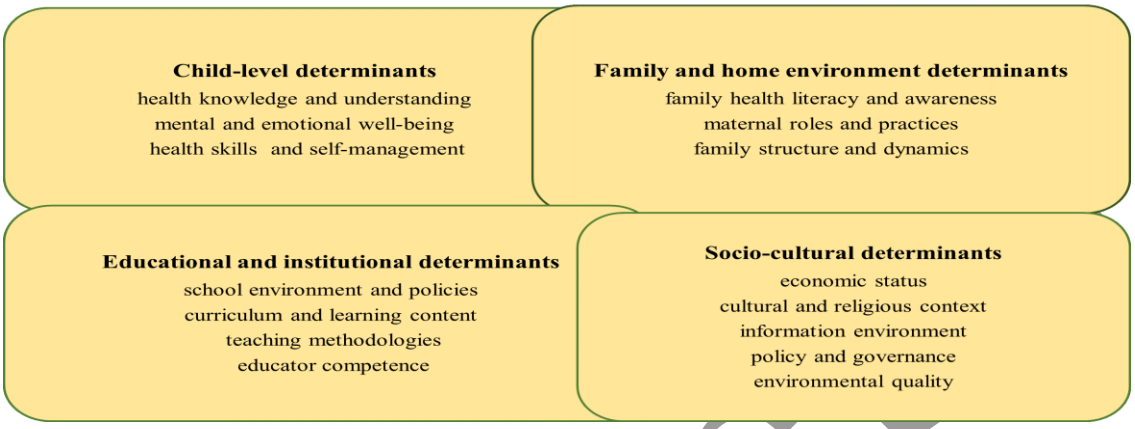

Figure 1. Determinants of Iranian 9–12-year-old Children's Health Literacy

Socioecological Architecture of Health Literacy Determinants

The structure of determinants identified in this study builds upon Bronfenbrenner's ecological systems theory, which conceptualizes human development as shaped by interactions between individuals and their layered environments (39,40). According to this theory, child development occurs through complex interactions between individuals and their surrounding environmental systems, with children positioned as active participants rather than passive recipients. Child-level determinants operate within the microsystem through direct interactions with immediate environments, while family and educational factors reflect mesosystem connections between different microsystems. Socio-cultural and systemic determinants encompass broader exosystem and macrosystem influences that indirectly shape development.

This ecological perspective finds strong empirical support in recent meta-ethnographic findings that demonstrate how children actively seek, process, and act upon health information within their socio-cultural contexts (22,41). These studies validate the ecological approach by showing that children's health literacy development is influenced by the same cognitive, psychological, and environmental factors operating across Bronfenbrenner's nested systems, confirming that health literacy emerges through dynamic interactions between children and their multilayered environments.

Child-Level Determinants: Holistic Health Understanding

The identification of mental and emotional well-being as a core determinant represents a significant contribution extending beyond predominantly cognitive-focused health literacy models. Children articulated holistic conceptualizations encompassing physical, psychological, and social dimensions: This emotional integration supports recent calls for multidimensional pediatric health literacy frameworks (9,42,43).

The concrete operational stage of cognitive development (typically ages 7–11) represents a critical window during which children acquire enhanced logical reasoning, perspective-taking abilities, and increased capacity for reflective thought (44). Our findings suggest this developmental phase provides optimal conditions for fostering comprehensive health literacy, as children demonstrate both cognitive readiness and emotional awareness necessary for integrated health understanding.

Children's self-management capabilities emerged as distinct from knowledge alone, reflecting their capacity to translate health understanding into actionable behaviors. This finding supports contemporary approaches emphasizing health literacy as an active process rather than passive knowledge acquisition (43,45).

Family and Home Environment: Social Learning Foundations

The family environment emerged as a foundational determinant, confirming Social Cognitive Theory's emphasis on observational learning and reciprocal determinism (46). Children's internalization of parental behaviors extended beyond simple imitation to encompass deeper value transmission about health priorities and decision-making processes.

Maternal roles as primary health decision-makers and information intermediaries proved particularly influential within Iranian family structures. This finding highlights the importance of family-centered interventions recognizing cultural patterns of health decision-making (47,48)

Our findings corroborate international research demonstrating that positive parent-child communication about health significantly impacts children's health and wellbeing (49). This aligns with health literacy research showing parental factors as key predictors of children's health literacy development (50). Within the Iranian context, collectivistic cultural values and extended family involvement create distinct relational dynamics where health-related decisions often involve multiple family actors, requiring children to navigate complex social interactions and shared decision-making processes.

Educational and Institutional Determinants: Formal and Informal Learning

The educational environment emerged as a crucial setting where formal health education intersects with peer relationships and institutional policies. Our findings validate Bronfenbrenner's Ecological Systems Theory (39), particularly mesosystem interactions between home and school environments. Children's descriptions revealed innovative peer-based approaches to health promotion demonstrating how institutional practices can create supportive peer networks for health literacy development.

Children frequently expressed preference for experiential learning approaches, favoring interactive and participatory methods over traditional didactic instruction. This finding reinforces the relevance of constructivist pedagogical frameworks emphasizing active engagement and learner-centered experiences. It aligns with evidence from studies highlighting the effectiveness of school-based health literacy interventions incorporating interactive, skills-based, and collaborative learning strategies(51–53).

Educator competence emerged as a critical determinant directly influencing health education quality and effectiveness. Children demonstrated effective teaching as characterized by educators who not only conveyed health information but also explained reasoning behind recommendations, fostering deeper understanding and critical thinking. This finding supports existing calls for enhanced teacher training in health literacy pedagogy (54,55).

Socio-Cultural and Systemic Determinants: Structural Influences

Macro-level influences reflect how structural factors create fundamental conditions for health literacy development. Economic constraints emerged as particularly significant, directly impacting families' ability to apply health knowledge: Children demonstrated clear awareness of economic barriers to healthy choices. This provides concrete evidence of how socioeconomic factors constrain health literacy application, supporting health equity models emphasizing structural determinants (4,56) .

Cultural and religious values emerged as active mediators rather than background factors in health literacy development. Children demonstrated sophistication in navigating between traditional practices and contemporary health information, though cultural stigma sometimes created barriers to health literacy application.

Digital health literacy presented both opportunities and challenges, with children expressing uncertainty about information quality despite technological comfort. These observations support the eHealth literacy framework proposed by Norman and Skinner, which emphasizes the importance of evaluating online health information critically (57–59).

Environmental quality emerged as an important systemic determinant often overlooked in health literacy research: This finding contributes to growing recognition of environmental factors in health literacy development (60).

Methodological Contributions: Amplifying Children's Voices

This study's multi-stakeholder approach enhanced traditional qualitative methodologies by prioritizing children's authentic perspectives. This methodological innovation demonstrated children's sophisticated comprehension of health determinants, frequently identifying systemic factors that adults overlook. The approach aligns with contemporary calls for participatory research methodologies that recognize children as valuable contributors rather than passive research subjects (31,61).

Implications for Theory, Practice, and Policy

Theoretical Implications

Findings suggest that pediatric health literacy models require explicit integration of emotional well-being, cultural values, and structural constraints as fundamental components. The study contributes to accumulating evidence supporting ecological approaches to children's health literacy, emphasizing the complex interplay between individual, relational, institutional, and societal factors (62–64).

Practice and Policy Implications

These findings underscore the necessity for multi-level, culturally responsive interventions that address identified determinants while engaging children as active participants. Healthcare providers and educators should implement family-centered approaches targeting maternal determinants, acknowledging mothers' influential roles in health decision-making within Iranian contexts. Coordinated efforts between healthcare systems, educational institutions, and families are essential for modifying environmental determinants and establishing supportive conditions for health literacy development.

Study Limitations and Strengths: Longitudinal studies tracking health literacy development through adolescence would illuminate developmental trajectories and critical transition points. Cross-cultural comparative studies could identify universal versus culture-specific factors, while measurement development research should create culturally valid, developmentally appropriate assessment tools. This study's multi-stakeholder approach and culturally contextualized methodology represent significant strengths; however, geographic focus on Isfahan Province may limit transferability, and the absence of fathers' perspectives constitutes a notable limitation.

Conclusion

This study identified four interconnected determinants—child-level, family, educational, and socio-cultural/systemic—that shape health literacy among Iranian children aged 9–12. Children demonstrated active engagement with health knowledge, applying it through self-care routines, peer teaching, and emotional self-regulation. Family influences, particularly maternal roles and household communication, were central to shaping health understanding. At school, the

effectiveness of health education was shaped by pedagogy, policy, and teacher competence. Structural factors such as economic conditions, environmental barriers, and cultural norms directly impacted children's ability to access and interpret health information. These findings highlight the need for health literacy initiatives that are ecologically grounded, culturally responsive, and that recognize children not as passive recipients but as active participants. Effective strategies must engage families, schools, and broader systems in coordinated efforts to promote equitable health literacy development.

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Ethics approval and consent to participate: This research adhered to the ethical principles outlined in the Declaration of Helsinki for studies involving human subjects. The study involved analysis of social experiences through participant interviews, with no procedures conducted on human tissues. Informed consent was obtained from all participants prior to conducting interviews. For child participants, both informed consent and parental permission were obtained, along with approval from school officials. This study received ethical approval from the Ethics Committee of Shahid Sadoughi University of Medical Sciences (ethical code: IR.SSU.SPH.REC.1401.131).

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