

Landscape of Health Information Literacy among University Students in Four-Tier City in China: Prevalence, Disparities, and Urgent Needs

Yuan Meng¹, Jian Li², Xianlin Wu³, Jinyu Mo^{1,*}, Li Dong^{1,*}

¹*Library, Hubei University of Medicine, Shiyan, Hubei, China*

²*School of Basic Medical Sciences, Hubei University of Medicine, Shiyan, Hubei, China*

³*School of Public Health and Management, Hubei University of Medicine, Shiyan, Hubei, China*

**Corresponding Author*

Abstract: This study combines qualitative and quantitative research methods to examine the current state of Health Information Literacy (HIL) among university students in a fourth-tier city in China. Conducted in four universities within Shiyan City, the research employed a questionnaire survey (N=294) and semi-structured interviews based on Grounded Theory (N=35). Quantitative analysis of the questionnaire data assessed students' proficiency across different HIL dimensions (HIS > HIA > HIE > HIC > HIM > HK) and identified disparities across demographic groups (gender, degree level, grade). Qualitative analysis identified key barriers, including a superficial understanding of HIL concepts, and limitations in evaluation and search skills for health information, among others. Based on these findings, the study suggests enhancing public awareness, establishing collaborative educational frameworks involving libraries and health departments, adopting innovative teaching methods, and designing stratified curricula. The findings from the HIL landscape among university students in a fourth-tier city underscore a pressing need for targeted interventions in resource-constrained urban settings, while also unveiling challenges. This research provides a practical reference and rationale for academic libraries and health institutions regarding HIL improvement initiatives and educational programs.

Keywords: Health Information Literacy; University Students; Four-Tier Cities; Questionnaire; Grounded Theory

1. Introduction

1.1 Problem Statement

There have been numerous public health crises in recent years, ranging from common infectious diseases to global health crises, which have made the public pay greater attention to health information and health literacy. As a core component of health literacy, health information literacy plays an important role.

Students at universities, as active participants in the era of information, are highly educated, rapidly adapt to new knowledge, and have a significant impact on their families [1], so their health information literacy will affect public health in a significant way. Zhu & Tang pointed out that the promotion of health information literacy among university students is an important strategy to promote public health, as well as a new direction in medical library information services [2]. In light of this, the study of the university students' health information level, the identification of the challenges they face when using health information, and their education regarding their particular features have great practical significance. This study conducts both qualitative and quantitative research on four universities in Shiyan, a Four-tier City in China. It aims to identify the health information literacy level and related issues among university students, particularly in small and medium-sized cities, so as to offer a practical reference for enhancing their health information literacy education.

1.2 Research Questions

The authors conducted a questionnaire and semi-structured interviews to investigate the issues mentioned above by using the following research questions:

What is the current status of students' HIL levels?
What are their weaknesses in terms of HIL?

Is there a difference in the status quo of HIL in different groups of students?

What are the students' barriers regarding their HIL, and what suggestions for improvement?

2. Literature Review

2.1 Health Information Literacy

The concept of information literacy was first introduced by Zurkowski [3], referring to the ability to acquire information using a variety of tools and data sets to solve problems. In 1974, Simonds first proposed the term "health literacy", which was defined as the ability of individuals to maintain their health through the acquisition, analysis, evaluation and utilization of acquired resources [4]. Researchers such as Haruna and Hu [5], Huhta et al. [6] believe that health information literacy emerges from the integration of the two concepts of "health literacy" and "information literacy". In addition to being an important factor influencing health literacy, it is also a subdivision of information literacy.

2.2 Health Information Literacy Evaluation

For health information literacy measuring, some researchers focused on constructing the measure scale for patients. Davis et al. developed the REALM, which is mainly used to test the health information literacy level of patients in clinical practice [7]. Parker et al. developed TOFHLA to assess the level of health information literacy among hospital patients [8], which was revised in 1999 as the S-TOFHLA by Baker et al., making it more appropriate for clinical environments with a high level of time pressure [9]. REALM and TOFHLA have played an important foundation role in measuring HIL, lots of the HIL measuring tools that appear later are mostly adapted from these two, but their focus is primarily on clinical rapid assessments, which are not indicative of the real HIL level in general populations. Ivanitskaya et al. Developed RRSA based on the information literacy standard of higher education to evaluate university students' online information searching ability, health information evaluation ability [10], and self-evaluation of information literacy level. Wang et al. developed a health information literacy self-rating scale from five aspects and includes 29 items based on the definition of health information literacy which proposed by MLA [11]. For health information

literacy level, studies many focused on the HIL of specific groups. For university students, many researchers pointed out that their HIL is inadequate. As Haruna and Hu noted, university students possess weak health information skills for conducting online research through analysis [5].

To summarize, many studies have been conducted on the use of HIL measurement tools and the level of HIL among different groups. However, there have been few studies on this topic in recent years, especially regarding the level of HIL after the pandemic. The authors believe that despite the fact that sociocultural context must be fully taken into account in HIL measuring research, it is also necessary to understand the current situation of HIL from the users' perspective.

3. Methods

To study the HIL level of university students in Shiyan City from various aspects, the authors conducted their research in two parts: questionnaire and semi-structured interviews.

3.1 Questionnaire

3.1.1 Design overview

A questionnaire was designed based on previous studies, which is divided into two parts: the first part involves collecting demographic characteristics about university students, including gender, education level, grade, and subject. The second part focuses on investigating the HIL level among university students, which is based on previous studies such as [11] and [12], and combines them with the features of university students and Shiyan City to set the rating scale from six aspects with 28 measure questions: health information cognition (HIC), health information search (HIS), health knowledge (HK), health information evaluation (HIE), health information application (HIA), health information morality (HIM). A five-point Likert scale is used to indicate the respondents' views on the questions, with five possible answers: strongly agree, agree, neutral, disagree, and strongly disagree, each assigned a value from 1 to 5.

3.1.2 Data collection

The sampling framework encompasses all university students in Shiyan City, with full coverage of the four local universities, which include Hubei University of Medicine, Hubei University of Automotive Technology, Hanjiang

Normal University, and Hubei Industrial Polytechnic. The authors distributed 330 questionnaires online between July 2024—December 2024, and received 309 questionnaires back, of which 294 were valid. The validity rate, therefore, is 95.1%. In terms of the reliability test, Cronbach's alpha (α) for the questionnaire is 0.95, indicating excellent reliability.

3.1.3 Data analysis plan

After collecting the data, SPSS 27.0 was used to do the quantitative analysis. Statistical analysis includes testing the average score, median, mode, and standard deviations of the tested university students' HIL to research their current HIL level. In addition, the authors divided all the responses into three qualitative categories of health literacy according to their score: low (less than 60% of the full score, 0-84), medium (60%-80% of the full score, 85-112), high (higher than 80% of the full score, 113-140) and use Pearson chi-square

test [13] to investigate if there is a significant association between categorical variables.

3.2 Semi-Structured Interviews

3.2.1 Design overview

A semi-structured interviews on HIL of university students in Shiyan City were performed in this study. The outline of the interviews (Table 1) was mainly guided by the definition of HIL [14] and the 5 aspects of HIL [11], which includes the topics mainly focus on how they understand HIL and their Self-Rated of their own HIL? How do they retrieve and evaluate health information? What are the barriers to improving their HIL? The researchers engaged in comprehensive interviews with participants to explore their HIL current situation, and challenges faced in accessing health information. All interview sessions were audio-recorded for documentation purposes.

Table 1. Outline of Interview

Students	
Basic information	grade, gender, education, major, university
HIL level	Do you think health information is important? How do you evaluate your health information literacy?
	Do you pay attention to health-related information at the moment and take the initiative to look for health information?
	When you need health information, can you accurately and effectively obtain relevant health information?
	Can you distinguish which health information is correct and which is false?
Barriers and suggestions	What's your suggestions on improving your HIL?
Librarians	
Basic information	Age, gender, education, department, university
HIL level	What problems do you believe university students generally face in terms of health information literacy?
Suggestions	What's your suggestions on improving students' HIL?

3.2.2 Data collection

In each of the four universities which are mentioned above, 4-5 students and 4-5 librarians were chosen as random sampling, which in total 35 samples. The surveys were conducted in person. The investigation duration was restricted to a maximum of 20 minutes per participant.

3.2.3 Data analysis plan

The authors developed distinct interview outlines tailored for students and librarians from two aspects: HIL level and impact factors of HIL level, as detailed below. 4 samples in 35 were randomly reserved for saturation test. The content of the remaining 31 samples was coded and analyzed by Nvivo 15. Coding follows the process of open, axial, and selective coding based on Proceduralised Grounded Theory [15], which uses raw data from interviews, repeatedly

compares and codes to conceptualize the data, find out the university students' HIL problems, influence factors, suggestions etc. Then, saturation checks on coded data are conducted to ensure that the coding results have high reliability.

4. Findings

4.1 Questionnaire

4.1.1 Sample characteristics

In figure1, the dataset provides demographic and academic characteristics of a sample population (n=294), revealing a balanced gender distribution with males constituting 50.68% (n=149), and females 49.32% (n=145), indicating near parity (1.36% difference). Since universities have a greater proportion of

undergraduate students, the bachelor's degree students are dominant (70.07%, n=206). Students in Year3 (31.29%, n=92) are concentrated, followed by Year2 (24.15%, n=71), Year4 (21.43%, n=63), Year1 (12.25%, n=36), and fifth-year undergraduates (2.04%), along with postgraduates (8.84%, n=26).

Science (30.95%, n=91) and medicine (28.23%, n=83) make up 59.18% of subjects, whereas humanities/social sciences (15.99%, n=47), agriculture (9.52%, n=28), and other fields (15.31%, n=45) make up smaller subgroups. Thus, this dataset can be used for cross-sectional analyses of academic demographics.

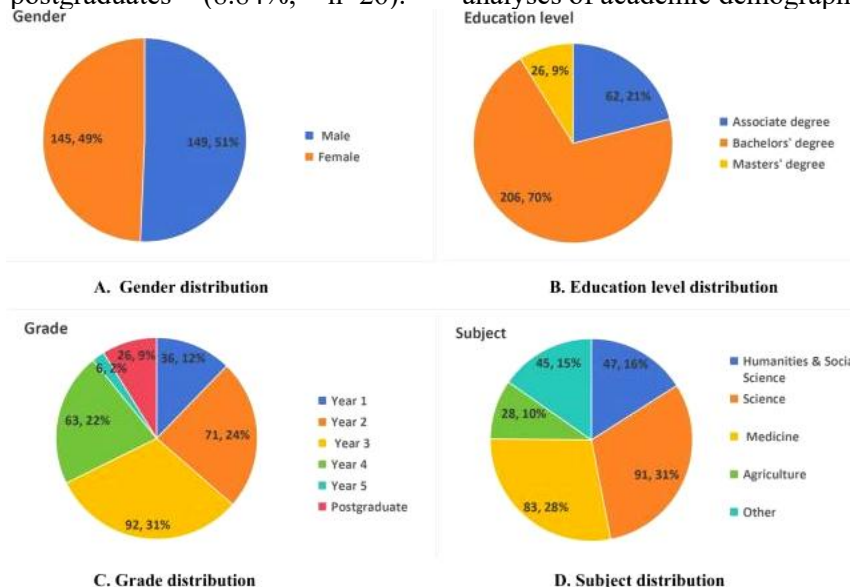


Figure 1. Sample Distribution of the Questionnaire

4.1.2 Data analysis

Table 2 shows the six information HIL dimensions from high to low based on the mean: HIS (M = 23.259) > HIA (M = 19.776) > HIE (M = 19.772) > HIC (M = 16.915) > HIM (M = 16.279) > HK (M = 16.245), where the mean and median of health information search are the highest, suggesting students performed best in terms of it. The mean and median of health information evaluation and health information application are close to each other, and concentrate around 20 points, indicating the relatively high levels of both variables. Health information cognition, health information

morality, and health knowledge have relatively low mean and median values, indicating that these variables are at an overall low level.

According to the data set, health information search exhibits the widest range of scores (6–30), indicating substantial variation (SD = 4.688, CV = 0.220), indicating that the ability to search health information varies significantly among individuals. In spite of its lower Mean, health information morality showed the tightest clustering of scores (SD = 2.326, CV = 0.13) and the most left-skewed distribution (skewness = -0.961), implying a concentration of higher scores and relative consistency in ethical literacy.

Table 2. HIL among University Students in Shiyan

Items	Sample Size	Maximum	Minimum	Mean	Std. Dev.	Median	Variance	Kurtosis	Skewness	CV
HIC	294	20	8	16.915	2.698	17	7.279	0.279	-0.816	0.16
HIS	294	30	6	23.259	4.688	23	21.981	-0.185	-0.323	0.202
HK	294	20	6	16.245	2.813	16	7.913	-0.303	-0.432	0.173
HIE	294	25	11	19.772	3.438	20	11.822	-0.682	-0.066	0.174
HIA	294	25	8	19.776	3.718	20	13.827	-0.06	-0.473	0.188
HIM	294	19	4	16.279	2.326	16	5.41	1.918	-0.961	0.143

Note: health information cognition (HIC), health information search (HIS), health knowledge (HK), health information evaluation (HIE), health information application (HIA), health information morality (HIM).

The study found that gender, educational level, grade and subject are all significantly associated with students' HIL level ($p < 0.001$) by Pearson chi-square test, as shown in Table 3. On the gender dimension, there were significant

differences between the sexes. In the high score segment, 78% of females (78/145) were represented, which is significantly higher than the proportion of men (63%, 70/149), and no females were represented in the low score

segment. On the education level dimension, associate degree students present the highest proportion (64.5%, 40/62) in the high score segment. Students with Bachelor's degrees have the lowest proportion (44%, 90/206) in the high score segment. A surprising finding in the low score segment is that the proportion increases with education level: Associate degree (1.6%, 1/62), Bachelor's degree (4.4%, 9/206), Master's degree (23.1%, 6/26). On the grade dimension,

the proportion of high scores of the freshmen was 69.4% (25/36), which is significantly higher than the other grades, in which Year 4 has the lowest proportion of high scores (38%, 24/63). On the subject dimension, there is a high proportion of high scores in Humanities & Social science (61.7%, 29/47) and Medicine (53%, 44/83), followed by Agriculture (42.9%, 12/28), Science (50%, 46/91), and Others (22.2%, 10/45).

Table 3. HIL Level in Each Dimension

Items		Low	Medium	High	Numbers	X ²	P
Gender	Male	46	35	39	149	17.61	0.000***
	Female	23	38	37	145		
Education level	Associate degree	1	21	40	62	25.683	0.000***
	Bachelors' degree	9	107	90	206		
	Masters' degree	6	9	11	26		
Grade	Year 1	1	10	25	36	29.675	0.001***
	Year 2	2	32	37	71		
	Year 3	2	49	41	92		
	Year 4	5	34	24	63		
	Year 5	0	3	3	6		
	Postgraduate	6	9	11	26		
Subject	Humanities & Social Science	2	16	29	47	27.564	0.001***
	Science	5	40	46	91		
	Medicine	1	38	44	83		
	Agriculture	5	11	12	28		
	Other	3	32	10	45		

Notes: ***p < 0.001; **p < 0.01 and *p < 0.05;

4.2 Semi-Structured Interviews

4.2.1 Data analysis

Following the collection of data, data analysis and coding were carried out. The qualitative data

was analyzed using the Proceduralised Grounded Theory [15] approach, which follows the coding process of open coding, axial coding, and selective coding. The identity and numbers of respondents are presented in Table 4.

Table 4. Identity and Numbers of Respondents

University	Librarian numbers	Students numbers				
		Year 1	Year 2	Year 3	Year 4	Total
Hubei University of Medicine	5	0	2	2	0	4
Hubei University of Automotive Technology	4	0	0	0	4	4
Hanjiang Normal University	4	1	1	2	1	5
Hubei Industrial Polytechnic	4	1	2	1	0	4

The raw data investigate the university students' HIL status quo in Shiyan. Upon reviewing the original textual data related to students' health information literacy, all viewpoints and statements regarding students' health information literacy abilities, problems and suggestions were subjected to open coding, resulting in 202 free nodes in the HIL status quo. On the basis of the free nodes (open coding), the students' HIL status quo was conceptualized in axial coding, refined, and various connections were established between conceptual categories. In the part of HIL status quo, the free nodes were categorized into 16 subnodes, then further

organized via selective coding based on categorical relationships, ultimately condensing into 6 categories. That are the status quo of students' self-evaluation of their HIL, their health information cognition, health information search, health information evaluation, health information application, the problems students and librarians found out on students' HIL, and suggestions to improve it.

After coding, the authors used the remaining 4 samples for saturation testing. In the saturation test, no new categories and characteristics were identified, and the results were satisfactory. The coding statistics list is shown in Table 5.

Table 5. University Students' HIL Status Quo

Selective coding	Axial coding	Open coding(examples)	Nodes numbers
Self evaluation	High	I think my HIL is good; I spent time improving it.	4
	Medium	I am able to handle health information well sometimes, but not always. It still needs to be improved.	8
	Low	In the past, I rarely looked into health information.	1
Health information cognition	Knowing conception	This is my first encounter with HIL. I am not familiar with its conception.	4
		Having worked in the field, I am aware of this concept.	3
		It might be related to information literacy or under the concept of health, but I am not sure.	8
	Importance of HIL	It's important to university students, or even everyone.	30
	Proactive attention	Since I am healthy, I would not pay attention to health information proactive.	2
		When I am interested in some topics, I pay attention to health information proactive.	6
	Proactive searching	I rarely search for health information proactive.	1
		Whenever there is an environmental reason, such as a pandemic, I search for health information proactively.	3
		I search for health information when I find health problems on my own.	11
		I usually search for health information proactively to understand my daily health status.	3
Health information search	APP	I use health apps on my phone, which can provide me some personalized and customized health plans and information pushes.	10
		I can access authority health information from health WeChat public platforms like NHC WeChat public platform.	3
		I use apps like TikTok and Rednote to access health information.	2
	Search engine	I use Baidu to search for health information; it's easy and convenient.	10
	Close associates	I ask my friends or family when I need health information.	3
	Doctors	I ask doctors in online hospitals.	3
Health information evaluation	Evaluation	I cannot tell if the health information is true or not because the information on the net is too general.	3
		I can evaluate health information well based on my own experience.	7
		In some cases, I can distinguish between false and true health information, especially when the information is exaggerated.	8
Health information application	Sharing	I usually share health information when I find it useful to myself or to those around me.	39
		I have never shared health information with others.	3
Problems	Low attention	Students only focus on information that interests them.	4
		There is a lack of awareness of health and HIL among students, even at universities.	4
	Ineffective retrieval strategies	They tend to use retrieval tools like Baidu, Tiktok which often provide non-authoritative information.	7
	Low evaluation ability	It is difficult for students to differentiate between true and fake health information.	12
Improvement	Individual	Improving my HIL through joining lectures, reading professional materials, etc.	14
	University	To improve students' HIL, the university needs to cooperate with family and health institutions.	3
		Universities need to set systematical HIL courses or training for students.	28
		Universities need to create more propaganda about the importance of HIL to students.	17
		Universities need to provide more various and professional health resources for students.	4

5. Discussion

In this mixed-methods study, the authors assessed health information literacy (HIL) among university students in the fourth-tier Chinese city Shiyang, revealing students' HIL status quo and the problems with their HIL. Four key findings need to be elaborated: (1) students' HIL level, (2) disparities across different groups, and (3) barriers and improvement suggestions identified through qualitative analysis.

5.1 Students' HIL Level

Students exhibited the highest proficiency in health information search but lower in health information cognition, health information morality, and health knowledge. These results differ from Ivanitskaya et al. [10] and Haruna and Hu [5], which indicated that students are weak at health information searching and evaluating. Additionally, the ability to search health information varies significantly between

individuals ($SD = 4.688$, $CV = 0.220$), indicating that a wide range of abilities exists. It means HIS may also be the capability that can be improved the most easily. HIM, on the other hand, demonstrated the lowest mean ($SD=2.33$, $CV=0.14$), suggesting that ethical awareness is uniformly underdeveloped. This echo with Wang et al.'s (2013) framework that positioned HIM as an advanced skill, and this result indicates that HIM requires additional attention in further education in order to enhance its performance.

5.2 Disparities across HIL Dimensions

Consistent with many researches, females outperformed males in high-HIL attainment (78% vs. 63%, $p<0.001$) [16-18]. That is consistent with the gender disparities in the previous research on health literacy [19]. However, the authors observed an inverse education-level effect: Master's students had the highest low-HIL proportion (23.1% vs. 1.6% in associate degrees). This suggests that advanced academic training may not organically improve HIL. Freshmen unexpectedly performed better than other grades, especially the Year4 (69.4% vs. 38% high-HIL, $p<0.001$), indicating higher grade students may pay less attention to HIL because of curriculum fatigue, and also there is a lack of systematic and sustainable training on HIL for students in universities. In addition, contrary to previous studies such as Ye and He's [20], in this study, students studying medicine did not demonstrate a noticeable advantage over those studying other subjects in terms of HIL. Thus, the high HIL of medical students is not an absolute, but also dependent on the level of medical education provided by cities and universities.

5.3 Barriers and Improvement Suggestions

5.3.1 Barriers

This qualitative analysis reveals some problems with students' HIL.

Compared with previous studies [5,10,18,20], this study provides further insight into the students' weaknesses with regard to health information cognition. It reveals a paradox in students' health information cognition: while most respondents acknowledge the importance of HIL to them, their understanding of HIL is shallow. Students and librarians generally understand HIL unclearly as "related to information literacy", or they are not familiar

with it. Moreover, students tend to pay attention to health information only when they encounter health troubles or pandemics, and they take health information as a crisis-response tool rather than an essential daily literacy. This finding is also consistent with the quantitative analysis of the questionnaire in this study, which found that health cognition scored lower on six dimensions. Additionally, HIL does not only receive low attention from students, but also from librarians as well as from universities, as some librarians also don't know the HIL, and none of the four universities held HIL education courses.

It is not surprising that students' barriers to search health information are related to their inability to select the proper retrieval tools and use advanced search skills, along with previous studies [10,5]. Many of them rely on search engines such as Baidu, apps such as Tiktok, or ask others for health information rather than searching professional databases for authoritative information. Additionally, some of them tend to passively receive personalized health information from health apps instead of actively seeking it out.

Limited health information evaluation ability has been found to be a common barrier by many studies [18,20], which is also proved in this study. It is difficult for students to distinguish between true and fake health information unless the information is exaggerated to a great extent.

5.3.2 Suggestions

By combining the suggestions from qualitative analysis and the problems this study identified, the authors propose the following suggestions in order to improve students' HIL:

Publicity and popularization of health information should be a priority for the government and community. It can contribute to the creation of a positive and healthy social environment as well as promote health literacy among the general public, including families, universities, and students. It can also contribute to the creation of the joint system necessary to improve HIL. Meanwhile, the popularization of health information may enhance public health knowledge in daily life and improve the ability to identify and evaluate misinformation.

The university library should increase its awareness of health information education and plan and establish a collaborative mechanism for joint constructions on health information education. A library-led health education team

could be built by collaborating with departments such as the Student Affairs Office School, Public Health, or health institutions, which can recruit experts and scholars from a wide range of disciplines, including medicine, public health, psychology, nutrition, education, etc. to improve the professionals and effectiveness of enhancing readers' health information literacy.

To improve student engagement and interest in health information literacy education, it is necessary to develop innovative teaching methods. In light of the rapid development of new technologies and the evolving needs of students, the future of HIL education should incorporate diverse approaches, explore new methods of education, such as using AR and VR to enhance visual presentation effects of health information and enhance fun and participation.

In order to prevent students from becoming less interested in health information in the upper grades, university libraries should provide comprehensive, hierarchical content development to organize health information literacy education in a planned and phased manner. University libraries should also refine their target audiences for health education in order to enhance the relevance of their services and to set up sustainable educational systems. In order to avoid focusing less on HIL with increasing of grades, libraries can segment their service recipients based on different learning stages, such as freshmen and graduates, sophomores, juniors and so forth, gradually deepening the education content from popularizing health knowledge to specialized and professional lectures, and providing multifaceted health education that is aligned with the subject matter and future job requirements. Moreover, since the HIL of females is higher than the HIL of males, a different level of educational content could be designed for them, and different topics could also be selected based on their psychological and physiological characteristics.

6. Conclusion

This study utilizes a questionnaire as quantitative research and a Grounded Theory-based semi-structured interview as qualitative research to investigate students' HIL in four universities in a four-tier city of Shiyang in China. At the HIL level, it finds out that they critically lack conceptual and ethical foundations: HIC, HK and HIM scored lowest. A

phenomenon unmatched in prior literature that specialized education may erode general health information literacy is found in this study. According to the qualitative analysis, problems with students' HIL like great weakness on health information cognition, low attention from universities, weak retrieval skills, Low health information evaluation ability have been found out. Thus, to achieve students' HIL improvement, government and health institutions should improve publicity and popularization of health information, and universities should construct multi-departments for joint health information education, innovate education methods, and provide comprehensive, hierarchical content for health information literacy education. These approaches help to understand the current state of university students' HIL, especially in four-tier cities, and provide a practical guide for improving it based on the problems identified. It also enhances the theoretical understanding of university students' HIL as well as the HIL services provided by universities. Despite this, there are still limitations to the research. For instance, samples are based on only one four-tier city, and some semi-interview questions are not detailed enough to get a deeper perspective on HIL. Further research could address these shortcomings explicitly.

Acknowledgments

This work was supported by 2024 Higher Education Research Project of the China Association of Higher Education, Grant/Award Number: 24BJ0406.

References

- [1] Stellefson M, Hanik B, Chaney B, Chaney D, Tennant B, Chavarria EA. eHealth Literacy Among College Students: A Systematic Review With Implications for eHealth Education. *J Med Internet Res* 2011;13:e102.
- [2] Zhu YL, Tang LG. Discussion on Health Information Literacy Education for College and University Students. *J Med Inform* 2013;34:93–5.
- [3] Zurkowski P. The Information Service environment relationships and priorities. *Relat Pap* 1974;5.
- [4] Simonds SK. Health Education as Social Policy. *Health Educ Monogr* 1974;2:1–10.
- [5] Haruna H, Hu X. International Trends in

- Designing Electronic Health Information Literacy for Health Sciences Students: A Systematic Review of the Literature. *J Acad Librariansh* 2018;44:300–12.
- [6] Huhta A-M, Hirvonen N, Huotari M-L. Concepts Related to Health Literacy in Online Information Environments: A Systematic Review with an Emphasis on Approach to Information. In: Kurbanoglu S, Boustany J, Špiranec S, Grassian E, Mizrachi D, Roy L, editors. *Inf. Lit. Workplace*, vol. 810, Cham: Springer International Publishing; 2018;460–9.
- [7] Davis TC, Long SW, Jackson RH, Mayeaux EJ, George RB, Murphy PW, Crouch MA. Rapid estimate of adult literacy in medicine: a shortened screening instrument. *Fam Med* 1993;25:391–5.
- [8] Parker RM, Baker DW, Williams MV, Nurss JR. The test of functional health literacy in adults: A new instrument for measuring patients' literacy skills. *J Gen Intern Med* 1995;10:537–41. <https://doi.org/10.1007/BF02640361>.
- [9] Baker DW, Williams MV, Parker RM, Gazmararian JA, Nurss J. Development of a brief test to measure functional health literacy. *Patient Educ Couns* 1999;38:33–42.
- [10] Ivanitskaya L, O'Boyle I, Casey AM. Health information literacy and competencies of information age students: results from the interactive online Research Readiness Self-Assessment (RRSA). *J Med Internet Res* 2006;8:e6.
- [11] Wang FZ, Luo AJ, Xie WZ, Hu DH. Development of health information literacy self-rating scale and its reliability and validity test. *China J Mod Med* 2013;23:89–93.
- [12] Fang Y. Research on the influencing factors of middle school students' health information literacy based on grounded theory. Thesis for Master's degree. Shandong Normal University, 2023.
- [13] Pearson K. On the Criterion that a Given System of Deviations from the Probable in the Case of a Correlated System of Variables is Such that it Can be Reasonably Supposed to have Arisen from Random Sampling. In: Kotz S, Johnson NL, editors. *Breakthr. Stat.*, New York, NY: Springer New York; 1992, p. 11–28.
- [14] Shipman JP, Kurtz-Rossi S, Funk CJ. The health information literacy research project. *J Med Libr Assoc JMLA* 2009;97:293–301.
- [15] Strauss AL. *Qualitative Analysis for Social Scientists*. Cambridge: Cambridge University Press; 1987.
- [16] Niemelä R, Ek S, Eriksson-Backa K, Huotari M-L. A Screening Tool for Assessing Everyday Health Information Literacy. *Libri* 2012;62.
- [17] Fu S, Chen X, Zheng H, Ou M. Understanding health information literacy of mHealth app users from digital wellbeing perspective: Evidence from regression analysis and fsQCA. *Libr Inf Sci Res* 2021;43:101108.
- [18] Yao J. Analysis of the health quality level and its influencing factors of college students in Shanxi Province. Thesis for Master's degree. Taiyuan University of Technology, 2023.
- [19] Sudhakar SK, Doshi DP, Nair G, Rao T. Investigating health literacy and sociodemographic factors in college students. *Sci Rep* 2025;15:20455.
- [20] Ye XJ, He JY. Investigation on the Health Information Literacy Level of College Students Based on EHIL Scale. *J Jiujiang Univ Sci Ed* 2020;35:7–11.