

Survey on High School Students' Mastery of First Aid Knowledge, Training Attitudes, and Needs

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Abstract: *Objective:* To understand high school students' mastery of first aid knowledge and their needs for first aid training, analyze the influencing factors of their mastery of first aid knowledge, and provide a reference basis for targeted first aid training for high school students. *Methods:* A total of 930 high school students from three high schools in Nanchong City, Sichuan Province, were selected as the research subjects using the convenience sampling method. A self-made questionnaire was used for the survey. SPSS 25.0 software was employed for data description and analysis. *Results:* The average score for high school students' mastery of first aid knowledge was (12.23 ± 4.39) , with a pass rate of 29.5%. There were significant differences in the correct response rates for each question (4.62% to 92.80%). 92.9% of high school students expressed willingness to participate in first aid training. Multivariate logistic regression analysis revealed that participation in first aid training (not participating in training: $OR = 2.524$, $95\%CI = 1.858-3.428$) was an influencing factor for high school students' mastery of first aid knowledge. *Conclusion:* High school students have insufficient mastery of first aid knowledge, and the correct response rates need to be improved. It is essential to enhance the popularization of first aid knowledge among high school students and implement diversified training formats and courses.

Keywords: First aid knowledge; First aid training; High school students; Influencing factors

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1. Introduction

First aid ability is a fundamental survival skill that the public must possess. In emergency situations such as sudden illnesses and accidental injuries, timely and effective first aid measures can significantly reduce the disability and mortality rates. The "Healthy China 2030 Plan" explicitly proposes the strategic theme of "co-construction and sharing, health for all," with improving the health literacy of the entire population as a core objective ^[1].

First aid knowledge and skills, serving as the "critical line of defense" for safeguarding lives, constitute a vital component of health literacy, and the extent of their dissemination directly determines the effectiveness of interventions during the pre-hospital emergency waiting period ^[2]. Surveys indicate that the penetration rate of

first aid knowledge in China is less than 1%, significantly lower than that in developed countries. For instance, in Germany, the penetration rate of first aid knowledge among the public reaches as high as 80%, while in France, it stands at 40%^[3]. This discrepancy often leads to a lack of effective interventions during the critical rescue window in most emergency scenarios.

As the future backbone of society, the cultivation of first aid capabilities among adolescents holds profound significance for enhancing the overall first aid proficiency of society^[4]. Data reveals that approximately 1.2 million adolescents worldwide die annually from accidental events such as trauma and drowning, with 40% of these deaths being preventable through timely first aid. In the Netherlands, children as young as 10 are required to learn and master basic first aid skills and knowledge, and in Japan, the penetration rate of first aid knowledge among high school students reaches 92%^[3,5].

Currently, domestic research on the dissemination of first aid knowledge predominantly focuses on college students or adult populations, with relatively less attention given to high school students. Therefore, this study conducted an online survey from February to March 2025, aiming to understand the mastery of first aid knowledge, attitudes, and needs towards first aid training among high school students in Nanchong City, Sichuan Province, and to analyze the influencing factors affecting their grasp of first aid knowledge. The findings aim to provide a reference basis for formulating scientific first aid training strategies for high school students.

2. Subjects and methods

2.1. Subjects

From February to March 2025, a convenience sampling method was employed to select 930 high school students from three high schools in Nanchong City, Sichuan Province, as the research subjects. Among them, there were 484 males (52.04%) and 446 females (47.96%); 299 freshmen (32.15%), 273 sophomores (29.35%), and 358 juniors (38.50%); 132 students from rural areas (14.19%), 102 from towns (10.97%), and 696 from urban areas (74.84%); 131 students with family members engaged in the medical industry (14.09%) and 799 without (85.91%); 482 students who had participated in first aid training (51.83%) and 448 who had not (48.17%).

2.2. Methodology

2.2.1. Survey instruments

A self-developed questionnaire was employed, the main contents of which included:

- (1) General information: This section encompassed gender, grade level, residential location, whether any family members were engaged in the medical field, participation in first aid knowledge training, and the primary reasons for non-participation in such training;
- (2) Mastery of first aid knowledge: This section comprised 25 questions divided into four parts: basic first aid knowledge (4 multiple-choice questions), cardiopulmonary resuscitation (CPR) knowledge (6 multiple-choice questions), trauma first aid knowledge (10 multiple-choice questions), and first aid knowledge for common accidental injuries (5 multiple-choice questions). The overall Cronbach's α coefficient for this section of the questionnaire was 0.79, indicating good reliability. Each question was worth 1 point for a correct answer, with no points awarded for incorrect answers or "I don't know" responses. The minimum score was 0, and the maximum was 25. In this study, a passing score was defined as a total score of 15 or above;

- (3) Demand and attitudes toward first aid training: This section explored the necessity for high school students to acquire basic first aid knowledge and skills, their interest in first aid knowledge and skills training, willingness to participate in school-sponsored first aid training, reasons for willingness to participate in first aid training, confidence in mastering first aid content, attitudes toward learning through first aid training, and the types of out-of-hospital first aid knowledge and skills they wished to learn.

2.2.2. Survey methods and quality control

This study utilized a self-designed questionnaire, which was constructed and distributed via the Wenjuanxing platform, generating QR codes for distribution. Trained investigators distributed the QR codes of the questionnaire to class groups, and students completed and submitted the questionnaire by scanning the code. Control measures were implemented in the electronic questionnaire: all questions were set as mandatory, preventing submission if any were left unanswered; each WeChat account was limited to completing only one questionnaire, avoiding duplicate responses and missing items. After the survey, the researcher reviewed all data and excluded responses with excessively short completion times. A total of 934 questionnaires were collected, with 4 excluded due to excessively short completion times (less than 60 seconds). Ultimately, 930 valid questionnaires were collected, yielding a valid response rate of 99.57%.

2.2.3. Statistical analysis

Data were screened and exported using the Wenjuanxing software, and statistical analysis was performed using SPSS 25.0 software. Quantitative data conforming to a normal distribution were described statistically using the mean $\pm$ standard deviation (SD), while qualitative data were described using frequency and percentage (%). Univariate analysis was conducted using independent sample t-tests and one-way analysis of variance. Factors influencing the mastery of first aid knowledge were analyzed using multivariate logistic regression. A *P*-value of less than 0.05 was considered statistically significant.

3. Results

3.1. Mastery of first aid knowledge among high school students

The lowest score for first aid knowledge was 0 points, and the highest score was 24 points, with an average score of (12.23 ± 4.39) points (see **Table 1**).

Table 1. Scores for first aid knowledge among high school students

Domain	Number of items	Highest score	Lowest score	Mean $\pm$ SD
First aid basics	4	4	0	2.89 ± 0.87
Cardiopulmonary resuscitation (CPR) knowledge	6	6	0	2.42 ± 1.60
Trauma first aid knowledge	10	10	0	5.23 ± 2.34
Emergency management of accidental injuries	5	5	0	1.68 ± 0.99
Total score	25	24	0	12.23 ± 4.39

Only 274 high school students scored 15 points or above, resulting in a pass rate of 29.5%. The accuracy rates for each question are shown in **Table 2**.

Table 2. Accuracy rates for first aid knowledge among high school students

Questions		Correct responses	Accuracy (%)
First aid basics	What is the universal emergency number in China?	817	87.85%
	When calling emergency services for a patient, which information is NOT essential to provide?	863	92.80%
	What is the first step when encountering a patient requiring emergency assistance outside hospital?	368	39.57%
	How to check if a patient is conscious?	641	68.92%
CPR knowledge	Where is the correct hand position for chest compressions in adults?	692	74.41%
	What is the compression-to-ventilation ratio during CPR?	229	24.62%
	What is the recommended chest compression rate?	251	26.99%
	What is the appropriate chest compression depth for adults?	244	26.24%
	Which statement about AED usage is correct?	281	30.22%
	What are the correct first aid measures for adult choking victims?	553	59.46%
Trauma first aid	What is the most direct, rapid, effective and safe method to stop most external bleeding?	276	29.68%
	Which item should NOT be used as a tourniquet when professional tourniquets are unavailable?	843	90.65%
	What is the maximum continuous duration for applying a tourniquet?	99	10.65%
	Which statement about wound dressing principles is incorrect?	349	37.53%
	Which is NOT a symptom of limb fracture?	693	74.52%
	Which action is inappropriate when providing first aid to fracture victims?	432	46.45%
	Which action is incorrect when splinting fracture victims?	552	59.35%
	What is the correct transport method for suspected spinal injury victims?	491	52.80%
	What is the appropriate on-site treatment method for specific injuries?	515	55.38%
	What is the correct approach for ankle sprain?	618	66.45%
Accidental injury management	What are the correct emergency measures for burn victims?	394	42.37%
	What are the correct emergency measures for heat stroke victims?	760	81.72%
	What are the correct first aid measures for drowning victims?	43	4.62%
	Which first aid measure is incorrect after a dog bite?	115	12.37%
	Which on-site measure is inappropriate after a traffic accident?	255	27.42%

3.2. Univariate analysis of mastery of first aid knowledge among high school students

Univariate analysis revealed statistically significant differences in the mastery of first aid knowledge among high school students based on gender, grade level, family residence, and participation in first aid training ($P < 0.05$), as shown in **Table 3**.

Table 3. Comparison of mastery of first aid knowledge among high school students with different characteristics in Nanchong City (mean $\pm$ SD, points)

Basic information	n	Percentage (%)	Score	t/F	P-value
Gender				-3.063	0.002*
Male	484	52.04	11.81 $\pm$ 4.56		
Female	446	47.96	12.69 $\pm$ 4.17		
Grade				12.904	< 0.001**
Grade 10	299	32.15	11.48 $\pm$ 4.37		
Grade 11	273	29.35	13.29 $\pm$ 4.35		
Grade 12	358	38.49	12.05 $\pm$ 4.30		
Residence				3.385	0.034*
Rural	132	14.19	11.39 $\pm$ 4.33		
Town	102	10.97	11.95 $\pm$ 4.86		
Urban	696	74.84	12.43 $\pm$ 4.32		
Family member in healthcare?				1.887	0.059
Yes	131	14.09	12.90 $\pm$ 4.12		
No	799	85.91	12.12 $\pm$ 4.43		
First aid training?				9.096	< 0.001**
Yes	482	51.83	13.44 $\pm$ 4.08		
No	448	48.17	10.92 $\pm$ 4.35		

Note: * $P < 0.05$, ** $P < 0.01$.

3.3. Multivariate analysis of mastery of first aid knowledge among high school students

A multivariate logistic regression analysis was conducted using the pass/fail status of the first aid knowledge questionnaire score as the dependent variable and four factors: gender, grade level, family residence, and participation in first aid training, as independent variables. The variable settings and assignments are shown in Table 4.

Table 4. Logistic regression coding and assignment

Code	Variable	Value assignment
Y	Questionnaire score	Pass = 0; Fail = 1
X1	Gender	Male = 1; Female = 2
X2	Grade	Grade 10 = 1; Grade 11 = 2; Grade 12 = 3
X3	Family residence	Rural = 1; Town = 2; Urban = 3
X4	First aid training received	Yes = 1; No = 2

The results showed that, using students who had received first aid training as a control group, students who had not received training had a higher probability of failing in first aid knowledge, with an odds ratio (OR) of 2.524 (95% confidence interval [CI] = 1.858 to 3.428), as shown in Table 5.

Table 5. Multifactorial logistic regression analysis of high school students' mastery of first aid knowledge

Aspects	β	S.E.	Wald χ^2	P-value	OR	95% CI
Gender						
Male ^a	-	-	-	-	-	-
Female	-0.133	0.149	0.797	0.372	0.876	0.654–1.172
Grade						
Grade10 ^a	-	-	-	-	-	-
Grade11	-0.151	0.188	0.645	0.422	0.860	0.595–1.243
Grade12	-0.520	0.179	8.442	0.004**	0.594	0.418–0.844
Residence						
Rural ^a	-	-	-	-	-	-
Town	0.245	0.234	1.096	0.295	1.278	0.807–2.023
Urban	-0.228	0.231	0.979	0.323	0.796	0.506–1.251
First aid training						
Yes ^a	-	-	-	-	-	-
No	0.926	0.156	35.134	< 0.001**	2.524	1.858–3.428

Note: a served as the reference group. * $P < 0.05$, ** $P < 0.01$.

3.4. Attitudes and needs of high school students toward first aid training

Among the surveyed high school students, 97.4% believed it was necessary to acquire first aid knowledge and skills, 82.4% expressed interest in first aid training, and 92.9% were willing to participate in such training, as shown in **Table 6**.

Table 6. Attitudes of high school students toward first aid training

Survey item	Options	Frequency	Percentage (%)
Necessity of mastering first aid knowledge and skills	Necessary	906	97.4
	Neutral	20	2.2
	Unnecessary	4	0.4
Interest in first aid training	Interested	766	82.4
	Neutral	145	15.6
	Not interested	19	2.0
Willingness to participate in first aid training	Willing	864	92.9
	Neutral	61	6.6
	Unwilling	5	0.5

In the survey of first aid knowledge needs, cardiopulmonary resuscitation (CPR), emergency bleeding control for trauma, wound bandaging, and fracture immobilization were identified as areas of high demand, as shown in **Table 7**.

Table 7 Needs of high school students for first aid training

First Aid Training Need	Frequency	Percentage (%)
Cardiopulmonary resuscitation (CPR)	779	90.16
Emergency bleeding control	721	83.45
Wound dressing	691	79.98
Fracture immobilization	589	68.17
Patient transport	518	59.95
On-site drowning rescue	648	75.00
Heat stroke management	687	79.51
Burn and scald management	621	71.88
Airway obstruction by foreign bodies	650	75.23
Out-of-hospital care for common emergencies	570	65.97

4. Discussion

4.1. Low level of mastery of first aid knowledge among high school students

This survey revealed that only 29.5% of high school students in Nanchong City, Sichuan Province, achieved a passing score in first aid knowledge, indicating a less-than-ideal level of knowledge acquisition.

Among the questions, only four had a correct response rate exceeding 80%: “What is the universal emergency phone number in China?”, “When calling an emergency number for an injured person, which of the following does not need to be clarified?”, “In the absence of a professional tourniquet, what cannot be used for bleeding control on-site?”, and “What are the correct on-site emergency first aid measures for heatstroke?”. The high correct response rates for these questions may be attributed to their common occurrence in daily life.

However, when it came to questions involving specific procedures or anatomical locations, the correct response rates were lower, such as on-site rescue measures for drowning victims (4.62%), rescue measures after a dog bite (12.37%), the maximum duration for tourniquet application (10.65%), and the frequency (26.99%) and depth (26.24%) of CPR, suggesting a lack of systematic and standardized first aid training among high school students^[4]. Such results may be related to the insufficient emphasis placed on popularizing first aid knowledge by families, schools, and society.

In the future, on the one hand, the normalized popularization of first aid education and training should be strengthened. On the other hand, first aid education courses should be incorporated into schools to enhance students’ safety awareness and first aid capabilities, and cultivate their abilities to urgently avoid risks and provide self-rescue and mutual rescue in emergencies^[6,7].

4.2. Factors influencing high school students’ scores in first aid knowledge

In the analysis of factors influencing high school students’ scores in first aid knowledge, whether they have participated in first aid training ($P < 0.05$) is a factor affecting their pass rate in first aid knowledge^[7,8]. High school students who have participated in first aid training generally possess more solid theoretical knowledge and practical skills in first aid, demonstrating higher levels of first aid knowledge and skills^[9,10]. This is the most direct and significant influencing factor. Meanwhile, studies have shown that trained students are more willing

to perform first aid operations in emergencies ^[10], indicating the significance of conducting systematic first aid training for high school students.

Gender, grade, and family residence do not affect high school students' pass rate in first aid knowledge. This result is consistent with the survey findings of He, possibly because education at the high school stage is primarily academically focused, and first aid education is not offered as a required course ^[11]. The extent of first aid knowledge popularization is far from sufficient, leading to generally low scores in first aid knowledge among high school students with different characteristics.

4.3. High school students' attitudes and needs towards first aid training

In the survey on attitudes towards first aid training, 97.4% of college students believed that learning first aid knowledge is necessary, 82.4% of high school students were interested in first aid training, and 92.9% of high school students were willing to participate in pre-hospital first aid training. These survey results indicate that the vast majority of students have a high level of interest and demand for first aid knowledge and are highly willing to participate in first aid training ^[4,7,12,13]. They believe that learning first aid knowledge is very necessary, reflecting the enhanced first aid awareness among contemporary high school students.

Among them, high school students showed a higher preference for learning pre-hospital first aid knowledge such as cardiopulmonary resuscitation (90.16%), emergency hemostasis for trauma (83.45%), wound dressing (79.98%), and fracture immobilization (68.17%). These pieces of knowledge are related to some common emergencies encountered in daily life and are also essential first aid skills that the public should master ^[2].

5. Conclusion

In summary, the overall level of first aid knowledge among high school students in three secondary schools in Nanchong City, Sichuan Province, is relatively low, and whether they have received first aid training is an influencing factor on their mastery of first aid knowledge. It is recommended that first aid training be incorporated into the normalized campus education system in the future, enabling first aid knowledge to become an essential life skill for teenagers and ultimately achieving an upgrade in public health concepts from “emergency response” to “proactive prevention.” This study still has certain limitations in its implementation: the convenience sampling method was used, with the sample primarily derived from high school students in Nanchong City, Sichuan Province, failing to cover groups from different regions and socioeconomic levels. This resulted in limited sample representativeness. Additionally, data were mainly obtained through self-administered questionnaires, which may be subject to the subjective perceptions and recall biases of the respondents, potentially leading to inaccuracies in some data. Subsequent studies could adopt stratified cluster sampling methods and optimize data collection methods to further confirm the results.

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Disclosure statement

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