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Knowledge, Attitude and Practice of Kurdistan University of Medical Sciences Students regarding the Frostbite in 2023

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ABSTRACT

Background: Educational environments can be vulnerable during cold waves due to high population density, age diversity, and potential structural limitations. Frostbite is one of the important health risks associated with extreme cold exposure. This study aimed to assess the knowledge, attitudes, and practices of students at Kurdistan University of Medical Sciences regarding frostbite.

Methods: This cross-sectional descriptive study was conducted in 2023 among students of Kurdistan University of Medical Sciences. A total of 320 students were selected using an appropriate sample size calculation method. Data were collected using a researcher-developed questionnaire consisting of four sections: demographic characteristics, knowledge, attitude, and practice related to frostbite. The collected data were analyzed using SPSS version 24, applying descriptive statistics as well as inferential statistical tests, including independent t-tests and one-way analysis of variance (ANOVA).

Results: The mean age of the students was 21.57 ± 6.84, andthe Mean ± SD scores of knowledge, attitude, and practice were 12.14 ± 3.16, 10.09 ± 5.34, and 10.61 ± 5.97, respectively. Low levels of knowledge, attitude, and practice were observed in 40.95%, 43.61%, and 39.65% of the students. Independent t-test and one-way ANOVA showed no statistically significant association between knowledge, attitude, and practice scores and demographic variables ($p > 0.05$). The main sources of information about frostbite among students were television and radio, followed by the Internet.

Conclusion: The findings of this study indicate that the level of knowledge, attitudes, and practices of students regarding frostbite is not satisfactory. Given the important role of medical students as potential frontline supporters during emergencies such as cold waves, improving their awareness and preparedness is essential. Therefore, integrating comprehensive educational programs on frostbite prevention and management into medical training is strongly recommended

Keywords: Knowledge, Attitude, Practice, Students, frostbite

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Introduction

Frostbite is a cold-induced injury that occurs when skin and underlying tissues are exposed to freezing temperatures. The formation of ice crystals within tissues reduces blood circulation and leads to cellular damage. The body parts most commonly affected include the fingers, toes, nose, ears, and cheeks (Sheridan, Goverman, & Walker, 2022). Clinical manifestations of frostbite include numbness or loss of sensation in the affected area, pale or waxy skin discoloration, and in more severe cases, blistering and swelling. If the affected tissues are not promptly rewarmed and exposure to cold continues, deeper tissue layers may be damaged, potentially resulting in tissue necrosis, and in severe cases, amputation of the affected digits (Pugh, 1966; Rogers et al., 2022).

Despite being traditionally associated with rural and mountainous regions, cold-related injuries—including frostbite and hypothermia—are increasingly observed in urban settings and even in warmer climates. Factors such as homelessness and engagement in outdoor activities contribute to this trend. In the United States alone, an estimated 689 hypothermia-related deaths occur annually, with nearly half affecting individuals over 65 years of age; men are reported to have a 2.5-fold higher mortality rate than women (Endorf & Nygaard, 2022; Oshiro et al., 2022; Rathjen, Shahbodaghi, & Brown, 2019). Educational institutions may be particularly vulnerable during cold waves due to high population density, mixed age groups, and potential structural limitations. Moreover, large numbers of students often reside in dormitories away from their families. When well-managed, such residential environments can support academic performance; however, inadequate heating or preparedness may place students at heightened risk during extreme cold events (Nourmoradi, Haghighat, Karimi, & Mazloomi, 2017).

For medical students, the need for sufficient knowledge about frostbite is especially critical. As future healthcare providers expected to respond effectively in emergencies, they must be familiar with the signs, symptoms, risk factors, prevention strategies, and treatment approaches for frostbite. Adequate knowledge helps ensure timely recognition and appropriate first-aid measures, such as rewarming techniques, provision of warm fluids, and use of protective equipment (Zafren, 2017). Beyond knowledge, a positive and responsible attitude toward frostbite management is essential, enabling students to offer proper clinical care, psychological support, and appropriate referral when necessary. Competent practical skills are equally vital, including the ability to assess patients, initiate emergency stabilization, and apply frostbite-specific medical interventions (Kustina, 2021).

The knowledge, attitude, and practice (KAP) of medical students regarding frostbite can directly influence patient outcomes, particularly during cold-related emergencies. Despite the importance of this topic, a review of national and international databases revealed no prior research assessing KAP related to frostbite among medical students in Iran. Therefore, this study was designed to evaluate the level of knowledge, attitude, and practice of students at Kurdistan University of Medical Sciences regarding frostbite

Methods

This descriptive cross-sectional study was conducted among students of Kurdistan University of Medical Sciences in 2023. The sample size was calculated using the formula for estimating a proportion: $n = Z^2 P(1-P) / d^2$

Considering a 95% confidence level (Z = 1.96), an expected proportion (P) derived from similar studies (Kustina, 2021) ,and a precision level of d = 0.05, the final sample size was estimated to be 320 participants. A stratified random sampling method proportional to the size of each faculty was applied. First, the total number of students in each faculty was identified. Then, the sample size allocated to each faculty was determined proportionally to its student population. Finally, participants were randomly selected from each faculty using student identification numbers. After obtaining informed

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consent and explaining the objectives of the study, the questionnaires were distributed among the selected students while ensuring confidentiality of the collected information. The average time required to complete each questionnaire was approximately 20 minutes.

$$n = \frac{z^2 p(1-p)}{d^2}$$

Research Tool

Research Tool Information was collected using a researcher-developed questionnaire designed based on a review of scientific texts, relevant articles, and expert opinions. Content validity was confirmed through evaluation by 10 professors and experts. Reliability was assessed using Cronbach's alpha on a pilot sample of 20 students, producing an acceptable value of 0.91. The questionnaire consisted of four parts: demographic characteristics, knowledge, attitude, and practice. The knowledge section included 20 multiple-choice items (true/false/I don't know). Correct answers were scored as 2, "I don't know" as 1, and incorrect answers as 0, resulting in a total possible score range of 0–40. To avoid ambiguity and ensure interpretability, knowledge levels were classified into three groups using equal-interval categorization: poor (0–13), moderate (14–26), and good (27–40). The attitude section consisted of ten items scored on a five-point Likert scale (strongly agree to strongly disagree), with scores assigned from 0 to 4. The total attitude score therefore ranged from 0–40. Similar to the knowledge section, attitude levels were categorized using equal-interval groupings: poor (0–13), average (14–26), and good (27–40). The practice section also contained ten items rated on a five-point Likert scale (0–4), producing a total score range of 0–40. Practice levels were classified using the same rationale and equal-interval approach: poor (0–13), average (14–26), and good (27–40).

Statistical data analysis

Upon completion of data collection, the data were entered into SPSS version 24 for analysis. Descriptive statistics were used to summarize the data. Inferential statistical tests, including the independent t-test and one-way analysis of variance (ANOVA), were applied to compare the mean scores of knowledge, attitude, and practice across demographic variables such as gender, age group, faculty, level of education, income status, and marital status. A significance level of 0.05 was considered.

Results

The mean age of the participants was 21.57 ± 6.84. Among the 320 students included in the study, 183 were aged 21–24, 177 were male, 72 were enrolled in the medical program, and 171 were undergraduate students. In terms of socioeconomic status, 198 participants reported their family income as moderately sufficient to meet living expenses. The majority of students were unmarried (n = 216). The demographic characteristics of the participants are summarized in Table 1. No statistically significant associations were observed between the mean scores of the dependent variables and any of the demographic characteristics (P > 0.05) (Table 1).

Table 1. Mean and standard deviation of knowledge, attitude, and practice of students based on demographic characteristics

Demographic	n (%)	Knowledge (Mean ± SD)	Attitude (Mean ± SD)	Practice (Mean ± SD)	P-value (K)	P-value (A)	P-value (P)
Gender							
Man	177 (55.31)	12.34±3.69	10.41 ± 5.37	10.90 ± 5.35	0.360	0.170	0.230
Woman	143 (44.69)	12.07±3.45	10.60 ± 5.33	10.22 ± 5.04			
Age(year)							
<21	51 (15.93)	12.50±3.61	10.05 ± 5.31	10.44 ± 5.15			
21-24	183 (57.18)	12.34±3.33	10.41 ± 5.07	10.39 ± 5.81	0.180	0.160	0.270
>24	86 (26.87)	12.98±3.04	10.98 ± 5.64	10.55 ± 5.77			

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Table 1. Mean and standard deviation of knowledge, attitude, and practice of students based on demographic characteristics

Demographic	n (%)	Knowledge (Mean ± SD)	Attitude (Mean ± SD)	Practice (Mean ± SD)	P-value (K)	P-value (A)	P-value (P)
Faculty							
Medicine	62 (19.37%	12.24 ± 3.34	10.67 ± 5.07	10.34 ± 5.67			
Paramedical	59 (18.43%)	12.74 ± 3.61	10.66 ± 5.94	10.06 ± 5.28			
Dentistry	56 (17.50%)	12.69 ± 3.98	10.25 ± 5.57	10.94 ± 5.19	0.670	0.310	0.620
Health	72 (22.50%)	12.54 ± 3.67	10.12 ± 5.94	10.52 ± 5.07			
Nursing and midwifery	71 (22.18%)	12.63 ± 3.44	10.95 ± 5.84	10.67 ± 5.64			
Grade							
Bachelor's degree	171 (53.43%)	12.20 ± 3.34	10.67 ± 5.07	10.34 ± 5.67			
Master's degree	90 (28.12%)	12.57 ± 3.25	10.58 ± 5.67	10.61 ± 5.55	0.200	0.370	0.310
PhD	59 (18.43%)	12.91 ± 3.67	10.94 ± 5.19	10.95 ± 5.06			
Income							
High	53 (16.56%)	12.66 ± 3.23	10.34 ± 5.22	10.11 ± 5.04			
Middle	198 (61.87%)	12.14 ± 3.16	10.11 ± 5.19	10.04 ± 5.44	0.190	0.560	0.320
Low	69 (21.56%)	12.09 ± 3.54	10.17 ± 5.07	10.10 ± 5.16			
Marital status P							
Single	216 (67.50%)	12.04 ± 3.39	10.02 ± 5.24	10.35 ± 5.66	0.210	0.140	0.350
Married	104 (32.50%)	12.11 ± 3.56	10.11 ± 5.44	10.98 ± 5.65			

Independent Samples T-Test
**ANOVA

The results showed that the mean ± standard deviation of the knowledge, attitude, and practice scores were 12.14 ± 3.16, 10.09 ± 5.34, and 10.61 ± 5.97, respectively. Additionally, 40.95% of the students had low knowledge, 43.61% had a low attitude, and 39.65% demonstrated poor practice regarding frostbite (Table 2).

Table 2. Average scores for knowledge, attitude, and practice of the students under study

Variable	Frequency (number)	Score range	Mean ± SD	Score status (percentage)		
				Good	Medium	Weak
Knowledge	320	0-40	12.14±3.16	26.43	32.62	40.95
Attitude	320	0-40	10.09±5.34	29.54	26.85	43.61
Practice	320	0-40	10.61±5.97	28.7	31.65	39.65

Table 3 shows that the main sources of students' knowledge about frostbite were television and radio, followed closely by the Internet (Table 3).

Table 3. The primary sources of information for students on frostbite

n (%)	Sources
86 (26.87%)	TV and radio
82 (25.62%)	Internet
70 (21.87%)	Professors and courses
42(13.12%)	Book and magazine
40 (12.50%)	Friends and family
320 (100%)	Total

Discussion

In recent years, climate-related hazards, including extreme cold conditions, have increasingly affected daily life and public health. Universities and student populations may be particularly vulnerable during cold spells because of communal living conditions and high population density in dormitories. Therefore, the present study aimed to assess the knowledge, attitude, and practice of students at Kurdistan University of Medical Sciences regarding frostbite.

The findings of this study showed that the mean knowledge score of students was 12.14±3.16, and

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approximately 40.95% of participants had a low level of knowledge about frostbite. This finding is consistent with the results reported by Ireland (Ireland et al., 2006), (Franks & Moore, 2021), and Eman (Mohammed, El-Mouty, & Ameen, 2022), who also identified insufficient awareness regarding cold-related health risks among students and the general population. However, the findings differ from those reported by Khan (Khan, 2020), Wang (Wang et al., 2022), and Marzban (Marzban et al., 2019), who found higher levels of knowledge in their study populations. Differences in geographical conditions, educational programs, and exposure to public health information may explain these inconsistencies. Inadequate knowledge about cold-related hazards may reduce individuals' ability to recognize early symptoms of frostbite and adopt preventive behaviors, thereby increasing vulnerability during periods of extreme cold.

Insufficient knowledge about cold conditions may lead to several health and safety consequences. In the present study, a considerable proportion of students demonstrated low levels of knowledge and preventive practices regarding frostbite. Inadequate knowledge and inappropriate attitudes toward cold exposure may reduce individuals' ability to recognize early symptoms and adopt appropriate preventive measures. Such conditions can increase the risk of cold-related health problems, including frostbite and respiratory infections such as influenza. University dormitories may represent particularly vulnerable environments during cold periods because of high population density, continuous use of facilities, and shared living conditions. If students lack sufficient awareness and preparedness to deal with cold exposure, the likelihood of adverse health outcomes may increase. Furthermore, the absence of adequate awareness among students and staff regarding preventive measures and emergency responses during cold waves can potentially lead to disruptions in students' daily activities and academic performance. Therefore, improving students' knowledge and awareness about cold exposure and frostbite prevention is essential to promote appropriate attitudes and safer behaviors in cold environments (Gulášová et al., 2013; Higuchi et al., 2014).

Regarding attitude, the mean score was 10.09±5.34, and about 43.61% of students demonstrated a moderate attitude toward frostbite prevention. These findings are in line with those reported by Eman (12) and Wang (14) but contradicted the results of Khan (Khan, 2020) and Marzban (Marzban et al., 2019). Attitude plays an important role in shaping preventive behaviors. Students living in dormitories may underestimate the risks associated with cold exposure or may not prioritize preventive actions such as appropriate clothing, maintaining adequate indoor heating, or seeking timely medical attention. Improving awareness about the seriousness of frostbite and its potential health consequences can positively influence attitudes and motivate students to adopt safer behaviors (Tanaka & Tokudome, 1991; Zhang et al., 2019).

The results also indicated that the mean practice score was 10.61±5.97, and 39.65% of students had a low level of preventive practice. This finding is consistent with studies conducted by Eman (Mohammed et al., 2022) and Marzban (Marzban et al., 2019) , but it differs from the results reported by Koirala (Koirala, Wolpin, & Peterson, 2018) and Wang (Wang et al., 2022). Inadequate preventive practices may increase the likelihood of cold-related illnesses among students. Such conditions can negatively affect students' health and academic performance by causing fatigue, reduced concentration, and absence from classes. Therefore, strengthening preventive behaviors and promoting practical skills for dealing with cold conditions are essential to reduce potential health risks among university students (Gallaher, Fleming, Berger, & Sewell, 1992).

The present study also found that television and radio were the main sources of information about frostbite among students, followed by the Internet. This finding is consistent with studies conducted by Wang (Wang et al., 2022) and Marzban

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(Marzban et al., 2019). Mass media can play an important role in disseminating timely and accurate information about cold weather risks, preventive measures, and emergency recommendations, especially during extreme weather events (Deng et al., 2022; FARHANG, SAMADI, HASHI, & DANA, 2021). Utilizing these communication channels for educational campaigns may improve students' awareness and preparedness regarding cold-related hazards.

One of the limitations of this study was the use of a self-reported questionnaire, which may introduce response bias and affect the accuracy of the data. In addition, the descriptive design of the study limits the ability to determine causal relationships. Furthermore, the findings cannot be generalized to all university students in the country. Future studies are recommended to evaluate the effectiveness of educational interventions aimed at improving students' knowledge, attitudes, and preventive practices regarding frostbite.

Conclusion

The findings of this study indicate that a considerable proportion of students at Kurdistan University of Medical Sciences have insufficient knowledge and suboptimal attitudes and practices regarding frostbite prevention. Given that students living in dormitories may be more vulnerable to cold-related hazards due to shared living conditions and environmental factors, improving their awareness and preparedness is essential. Educational interventions, awareness campaigns, and the use of mass media and digital platforms could play an important role in increasing students' knowledge and promoting appropriate preventive behaviors. University authorities and health policymakers should consider implementing targeted educational programs and preventive strategies to enhance students' readiness for cold-related risks. Strengthening students' knowledge and attitudes may ultimately lead to improved preventive practices and reduce the potential health consequences associated with frostbite.

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Conflict of Interest

The authors declared no conflict of interest in the current study.

Ethical considerations

Participants in the study were instructed not to disclose their identities on the questionnaires, ensuring all questionnaires were gathered in one location for statistical analysis while upholding confidentiality. The research followed all principles outlined in the Declaration of Helsinki.

Code of ethics

IR.MUK.REC.1402.181.

Authors' contributions

Conceptualization was conducted by P.E. and A.M.; methodology was developed by Sh.M. and A.Kh.; data collection and original draft preparation were carried out by P.E. and S.M.; and supervision, data analysis, and manuscript editing were performed by A.M. and Sh.M. All authors reviewed and approved the final manuscript and take full responsibility for addressing any questions related to the article.

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