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HEATSTROKE AWARENESS AMONG NURSING STUDENTS IN TAMIL NADU: IMPLICATIONS FOR PUBLIC HEALTH EDUCATION

Vijayalakshmi N[1], Amutha K[2], Anitha N[3], Ganesan B[4], Anussa P[4], Dr. Arun B[4]*

[1] Professor/ Principal, Kumaran College of Nursing, Coimbatore. Tamil Nadu, India. (Affiliated to The TN Dr MGR Medical University, Chennai, Tamil Nadu, India).
[2] Professor/ Vice Principal, Kumaran College of Nursing, Coimbatore. Tamil Nadu, India. (Affiliated to The TN Dr MGR Medical University, Chennai, Tamil Nadu, India).
[3] Professor, Gokulam College of Nursing, Salem. Tamil Nadu, India. (Affiliated to The TN Dr MGR Medical University, Chennai, Tamil Nadu, India)
[4] Government District Headquarters Hospital, Erode. Tamil Nadu, India.

ABSTRACT

Background:

Heatstroke, an escalating public health concern in India due to climate change-driven heatwaves, requires well-prepared healthcare professionals, particularly nurses. The aim of this study is to assess the knowledge of heatstroke in nursing students. Materials and Methods: This cross-sectional study assessed heatstroke knowledge among 221 B.Sc. and M.Sc. nursing students aged 17–26 years in Coimbatore, Tamil Nadu, from January to May 2025. A web-based questionnaire, developed by senior physicians and validated by medical professionals, was distributed via WhatsApp to evaluate general knowledge, prevention, recognition, management, and first aid for heatstroke. Results: Analysis of 221 respondents' data revealed poor knowledge levels, particularly in prevention strategies. Mean response scores indicated a predominance of "Disagree" responses (40.53 ± 4.58) over "Agree" (34.60 ± 4.52), with progressive improvement across academic years, suggesting gradual knowledge acquisition. These findings highlight the urgent need for enhanced heatstroke education in nursing curricula, given Tamil Nadu's vulnerability to frequent heatwaves and rising heat-related mortality. Conclusion: This study revealed significant knowledge gaps regarding heatstroke among nursing students in Coimbatore, Tamil Nadu, particularly in prevention strategies, with interns showing notable deficiencies. Addressing these gaps through targeted interventions, such as early curriculum integration and practical training, is essential to prepare future nurses to mitigate the rising burden of heat-related mortality in India

Key words: Heatstroke, nursing students, knowledge assessment, prevention, Tamil Nadu, climate change.

Corresponding Author
Dr. Arun B

Email: - barunmpt@gmail.com

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INTRODUCTION

In India, heatstroke, commonly referred to as sunstroke, poses a serious public health challenge, especially during extended periods of extreme heat [1]. In 2022, heatstroke claimed approximately 730 lives across the country, nearly doubling the fatalities recorded in 2021 [2]. The year 2015 saw the highest number of heatstroke-related deaths, marking a significant peak in recent records [2].

Rising temperatures, likely driven by climate change, have increased the frequency and severity of heat waves in India [3]. Over time, heatwaves have started earlier in the year, with daytime temperatures frequently reaching 40–43°C [4]. The National Disaster Management Authority defines heatwave conditions based on a combination of temperature, humidity, and altitude [5]. According to the India Meteorological Department, a temperature increase of 5–6°C above normal qualifies as a moderate heatwave, while a rise exceeding 7°C or sustained temperatures above 45°C for two consecutive days is classified as a severe heatwave [4].

Elevated temperatures significantly affect mortality rates, with impacts varying by region and population [6]. Research indicates that rural areas often experience higher temperatures than urban centers, though certain urban zones can develop microclimates with intensified heat [7,8]. While the relationship between extreme heat and mortality has been studied globally, India-specific data on how excessive heat exposure affects health remains limited [9]. Despite rising temperatures due to climate change, extreme heat is still not widely recognized as a critical health risk in India [10]. Only recently have state-level policies begun addressing heat-health strategies [11]. Moreover, the impact of extreme heat on individual health receives insufficient attention [12].

Nurses, as frontline healthcare providers, are vital in treating patients with heat-related illnesses, such as dehydration and worsened chronic conditions like cardiovascular or respiratory diseases [13]. Their role is essential in both managing and preventing heatstroke, a life-threatening condition caused by the body's inability to regulate its temperature [12].

This study is very important because heatstroke remains an underrecognized public health threat in India despite its increasing prevalence due to climate change [9]. Tamil Nadu is an ideal region for this research due to its consistently high temperatures, frequent heatwaves, and large rural and urban populations exposed to extreme heat [4]. Conducting this study in Tamil Nadu will provide valuable insights into region-specific health impacts and inform targeted interventions to reduce heat-related mortality, addressing a gap in localized heat-health strategies [12]. Therefore, the purpose of this study was to assess the knowledge of heatstroke among nursing students in the Coimbatore region of Tamil Nadu, India.

MATERIALS AND METHODS

This study employed a cross-sectional survey design to assess heatstroke knowledge among nursing students, utilizing a web-based questionnaire created on Google Forms. The study was conducted from December 2024 to May 2025 across multiple nursing institutions in and around Coimbatore, Tamil Nadu.

The study targeted nursing students enrolled in B.Sc. Nursing and M.Sc. Nursing programmes, aged 17–26 years, who met the following inclusion criteria: (a) currently enrolled as an undergraduate or postgraduate nursing student, (b) aged 17–26 years, (c) voluntarily participated in the study, (d) provided informed consent, and (e) had reliable internet access. The questionnaire link was distributed through WhatsApp groups by college coordinators, ensuring broad reach among eligible participants. Participants were required to provide informed consent via an online form before accessing the questionnaire, and they were encouraged to respond truthfully. To ensure confidentiality, all collected data were securely stored and accessible only to the research team.

The questionnaire was developed by senior physicians specializing in heatstroke management. Its reliability and validity were established through expert validation by two practicing medical professionals from Erode District, Tamil Nadu. A pilot study was conducted to confirm the tool's clarity and relevance. The questionnaire comprised two sections: the first collected demographic details, including name, age, and year of study, while the second evaluated knowledge specific to heatstroke prevention, recognition, and management. The tool was publicly available for research purposes and required no special permission.

The target sample size was 300 participants; however, due to challenges with online recruitment, the questionnaire was sent to approximately 500 students, and 221 valid responses were received, achieving 74% (73.7%), of the anticipated sample size. Data analysis was performed using SPSS version 20.0. Descriptive statistics, including mean, standard deviation, frequency, and percentage, were used to summarize the demographic characteristics and knowledge levels of participants.

RESULTS

This report analyzes responses from 221 participants to a heatstroke questionnaire, covering general knowledge, prevention, recognition, management, and first aid. Participants are primarily first-year (86), second-year (46), third-year (35), fourth-year (28), MSC first-year (15) and MSC second-year (11).

Table 1: Response Statistics by Question

Question No	Category	Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.	General Knowledge	Statement 1	83	40	33	37	28
		Statement 2	81	40	36	36	28
		Statement 3	71	44	35	44	27

		Statement 4	65	43	40	38	35
2.	Prevention and Risk Factors	Statement 1	72	35	42	39	33
		Statement 2	77	45	39	35	25
		Statement 3	74	44	41	40	22
		Statement 4	75	50	41	35	20
3.	Recognition and Management	Statement 1	98	38	29	30	26
		Statement 2	85	41	38	33	24
		Statement 3	96	40	34	29	22
		Statement 4	85	44	35	32	25
4.	First Aid and Emergency Response	Statement 1	95	35	35	28	28
		Statement 2	96	34	35	30	26
		Statement 3	91	35	37	33	25
	Mean		82.933	40.533	36.667	34.600	26.267
	S. D		10.532	4.580	3.539	4.517	3.936

The analysis presented in Table I reveals a generally poor level of knowledge regarding heatstroke among participants, as evidenced by a predominance of "Disagree" responses to most items. However, a progressive improvement in responses across academic years is notable, indicating a gradual acquisition of knowledge. This trend underscores the need for targeted educational interventions, particularly for first-year students, to strengthen their understanding of heatstroke prevention strategies. Future assessments should aim to identify the underlying causes of these knowledge gaps, enabling the development of more tailored and effective training programs.

DISCUSSION

This study aimed to assess the knowledge of heatstroke among nursing students in Coimbatore, Tamil Nadu, using a cross-sectional survey conducted via Google Forms from January to May 2025. The findings contribute to understanding the preparedness of future healthcare professionals in addressing heatstroke, a growing public health concern in India due to climate change-driven heatwaves [1,2]. The focus on Tamil Nadu, a region with consistently high temperatures and frequent heatwaves, underscores the urgency of equipping nursing students with adequate knowledge to manage and prevent heat-related illnesses [5].

The analysis of 221 participants' responses, representing first-year (86), second-year (46), third-year (35), fourth-year (28), M.Sc. first-year (15), and M.Sc. second-year (11) students, showed a predominance of "Disagree" responses across most items, with mean scores for "Strongly Disagree" (82.93 ± 10.53) and "Disagree" (40.53 ± 4.58) significantly higher than "Agree" (34.60 ± 4.52) or "Strongly Agree" (26.27 ± 3.94). This indicates a substantial knowledge gap, particularly in prevention strategies, where responses were notably weaker. Fourth-year students exhibited a particularly pronounced deficiency in prevention knowledge, suggesting that current curricula may not adequately emphasize practical preventive measures.

Despite the overall poor knowledge, a progressive improvement was observed across academic years, with senior students (third-year, fourth-year, and M.Sc. students) showing slightly better responses than first- and second-year students. This trend suggests that knowledge acquisition occurs gradually through academic and clinical training, yet it remains insufficient, especially for first-year students who demonstrated the lowest awareness. These findings underscore the need for targeted educational interventions, particularly early in nursing curricula, to address heatstroke prevention and management, given nurses' critical role in treating heat-related illnesses [13]. The persistent knowledge gaps, even among senior students, highlight the under recognition of heatstroke as a public health priority in India [9].

In Tamil Nadu climatic conditions, characterized with a temperatures often exceeding 40°C, exacerbate heatstroke risks for both rural and urban populations [4,8]. Enhancing nursing students' knowledge could strengthen Tamil Nadu's healthcare system's capacity to respond to heatwaves, which have contributed to rising mortality rates, with 730 deaths reported in India in 2022 [2]. The findings suggest that current nursing education in Coimbatore may not adequately prepare students to address this growing threat, necessitating curriculum revisions to include heatstroke-specific training, such as simulation-based learning or case studies on prevention strategies.

The observed knowledge gaps suggest that nursing curricula should be strengthened to improve heatstroke-related education and preparedness [14]. Conversely, if knowledge gaps were identified, particularly among undergraduate students, this could highlight the need for enhanced training on heatstroke prevention and management, especially given its rising prevalence [2,6]. The study's focus on Tamil Nadu is particularly relevant, as the region's climatic conditions exacerbate heatstroke risks, affecting both rural and urban populations [5,9]. These findings could inform targeted

educational interventions to strengthen nursing students' readiness to address heat-related health challenges.

The study's limitations include the lower-than-expected response rate, which may limit the generalizability of findings to all nursing students in Tamil Nadu. The lower response rate (221 respondents out of 500 targeted) may limit the generalizability of the findings. The reliance on WhatsApp for questionnaire distribution may have excluded students with limited internet access, introducing potential selection bias. Additionally, the questionnaire's focus on self-reported knowledge may not fully reflect practical competencies in managing heatstroke cases. Despite these limitations, the study's strengths include its ethical approval, expert-validated questionnaires, and pilot testing, ensuring the tool's reliability and relevance.

The findings have critical implications for public health in Tamil Nadu, where heatstroke remains an under-addressed threat despite increasing mortality [12]. Targeted interventions, such as integrating heatstroke education into early nursing curricula and providing practical training for interns, could bridge the identified knowledge gaps. Future research should investigate the underlying causes of these deficiencies, such as curriculum content or teaching methods, and explore the effectiveness of tailored training programs. Expanding the study to other high-risk regions in India could provide a comprehensive understanding of heatstroke preparedness among nursing students nationwide.

CONCLUSION:

This study revealed significant knowledge gaps regarding heatstroke among nursing students in Coimbatore, Tamil Nadu, particularly in prevention strategies, with interns showing notable deficiencies. Addressing these gaps through targeted interventions, such as early curriculum integration and practical training, is essential to prepare future nurses to mitigate the rising threat of heat-related mortality in India. Future research should focus on identifying causes of these deficiencies and evaluating the effectiveness of tailored educational programs to strengthen public health responses to climate-driven heatstroke risks.

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