

## Assessing Burn First Aid Knowledge, and Information Sources among Burn Caregivers in Rwanda

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### ABSTRACT

**INTRODUCTION:** Burn injuries are a major public health issue, especially in low- and middle-income countries (LMICs). This study assessed burn first-aid knowledge and information sources among caregivers at the University Teaching Hospital of Kigali, Rwanda (CHUK).

**METHODS:** A cross-sectional study involving 75 caregivers (next of kin) was conducted between October 2023 and April 2024. Data were collected using a structured questionnaire covering demographics, first aid knowledge, and sources of information. Knowledge was assessed using ten multiple-choice questions (scored from 0 to 10), classified as poor (<5), intermediate (5-7) and good (>7). Data analysis was performed using the JMP software.

**RESULTS:** The median age of the caregivers was 33 years (IQR: 27-43), with the majority being female (80%; n=60) and married (80%; n=60). Among the caregivers, 67%(n=50) had intermediate knowledge, 25%(n=19) had poor knowledge, and 8%(n=6) had good knowledge, with a mean score of 5.36 (SD: 1.6). Friends and family members were the primary sources of information (95%, n=71), whereas healthcare providers contributed minimally (8%, n=6). Misconceptions included the use of sugar and cooking oil for burns. Despite 93% (n = 70) lacking prior training, 96%(n=72) expressed willingness to learn, preferring books (69%, n=50) and classroom training (39%, n=28). Exploratory item level analyses showed better knowledge of fire escape strategies among rural caregivers (p=0.0292) and better blister management among females (p=0.0270), while primary composite analysis showed no significant demographic associations.

**CONCLUSION:** Significant gaps in burn first-aid knowledge among caregivers in CHUK were identified, highlighting the urgent need for educational interventions.

**Keywords:** Burn injuries, first aid knowledge, caregivers, educational interventions, University Teaching Hospital of Kigali.

### INTRODUCTION

Burn injuries pose a significant global public

health challenge, with an estimated 250,000 deaths occurring annually [1]. The burden of burn injuries falls disproportionately, with the majority

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of fatalities occurring in low-income and middle-income Countries [2]. In addition to the loss of life, burns result in long-term disabilities and disfigurement, hindering functional abilities and impeding socioeconomic prospects [3].

There is a high burn rate in Africa, where burn deaths exceed six per 100,000 people annually. Moreover, considering the substantial impact of burn injuries on children in the African region, with almost three times the incidence of burn deaths among children under five years of age, enhancing first-aid knowledge and practices among caregivers is imperative [2,4].

First-aid knowledge and beliefs play a crucial role in the initial management of burn injuries and significantly influence patient outcomes. However, studies have shown that misconceptions and gaps in accurate information regarding burn-first aid are prevalent among caregivers. In 2017, Chirongoma found that caregivers in Zimbabwe used incomplete or inadequate first aid measures, including traditional remedies [5]. In 2016, Alomar found that many caregivers in Saudi Arabia used nonscientific remedies and had inappropriate or no knowledge of the duration of cooling burns with water [6]. In 2023, Farzan conducted a systematic review and found that caregivers' knowledge of burn-first aid was moderate and positively correlated with educational level, first-aid training, and history of burns in children [7].

Overall, studies conducted in many other countries suggest that understanding first-aid knowledge, beliefs, and sources of information among caregivers of burn patients is vital for developing targeted educational interventions [4,6–9]. By identifying knowledge gaps and misconceptions, healthcare professionals can design educational programs tailored to caregivers' specific needs, promote effective first aid practices, and potentially reduce the severity and impact of burn injuries.

The University Teaching Hospital of Kigali (CHUK) is a tertiary healthcare facility in Rwanda that receives a large number of burn patients each year. However, no comprehensive study has been conducted to assess burn-first aid knowledge and information sources among caregivers, specifically in this hospital. Unlike community-based studies, a hospital-based caregiver population captures individuals who have already encountered severe or complicated burns requiring specialized care, providing insight into real world pre-hospital practices that directly influence clinical outcomes. Furthermore, understanding caregiver's

knowledge at the point of tertiary care enables the design of targeted, facility based educational interventions, such as caregiver counseling, discharge education, and referral level prevention strategies that can be integrated into burn care pathways at tertiary hospitals. Therefore, this cross-sectional study aimed to explore first-aid knowledge and information sources among caregivers of patients with burns at the Kigali University Teaching Hospital. Exploring these factors will provide valuable insights into current practices and identify areas for improvement.

## METHODS

### Study design and setting

This cross-sectional study was conducted at the University Teaching Hospital of Kigali, the largest national referral hospital in Rwanda, which houses the only dedicated burn unit in the country [10]. The eight-bed burn unit at this hospital during study period serves a significant portion of the country's burn patients. This study spanned six months, from October 2023 to April 2024, during which the hospital typically received an average of 12 new burn patient admissions monthly.

### Participants

All eligible caregivers, aged 18 years and above, who were responsible for admitted burn patients and willing to provide informed consent, were included. Exclusions were made for those who refused consent or were below 18 years of age.

### Data collection

Data were collected using a structured comprehensive questionnaire developed in the KoBoToolbox [12] based on similar research projects and local expert inputs. It covered three sections: demographic information, first-aid knowledge, sources of information, and interest in learning. The knowledge assessment section comprised ten multiple-choice questions on specific burn scenarios. Correct responses were scored as 1 and incorrect responses as 0, with total scores out of 10 categorized into poor knowledge (0-4), intermediate knowledge (5-7), and good knowledge (8-10).

Prior to the main data collection, the questionnaire was pilot tested among five caregivers of burn patients to assess clarity, comprehension, and applicability in the local context. Feedback from the pilot test resulted in minor wording and

formatting adjustments. Data from the pilot test were not included in the final analysis and were not previously published.

Data were collected by the principal investigator and two trained research assistants (a nurse from the burn unit and a resident in plastic surgery). Caregivers were approached immediately upon the patient's admission to the emergency department or within 24 hours of admission if immediate contact was not possible.

### Sample size and sampling strategy

This study employed a hospital-based cross-sectional design using a convenience sampling approach. All eligible caregivers of burn patients presenting to the emergency department or admitted to the burn unit in Kigali University Teaching Hospital (CHUK) during the study period were consecutively recruited until the end of the data collection period.

A formal population frame for caregivers of burn patients was not available and reliable prior estimates of the prevalence of adequate burn first-aid knowledge in this setting were lacking. Therefore, a formula-based sample size calculation was not applied. The final sample size of 75 caregivers reflects the number of eligible participants encountered and consented during the study period.

### Data analysis

Data were analyzed using JMP software version 17 [12]. Descriptive statistics were used to summarize demographic characteristics, knowledge levels, and practices. Inferential statistics were used to explore the associations between demographic factors and burn-first aid knowledge and practice.

#### Ethical considerations

Ethical approval was obtained from the CHUK Institutional Review Board (Ref: EC/CHUK/153/2023). The participants provided written informed consent in their local language and confidentiality was maintained throughout the study.

## RESULTS

### Demographic information and selected first aid agents

A total of 75 caregivers participated in the study, with a median age of 33 years (IQR: 27-43). The majority of the participants were female (80%,

$n=60$ ) and married (80%,  $n=60$ ). With regard to education, 52% ( $n=39$ ) had completed primary school, whereas 11% ( $n=8$ ) had attained university education. Most participants lived in rural areas (51%,  $n=38$ ) and were primarily employed (43%,  $n=32$ ), or engaged in farming (36%,  $n=27$ ). Interestingly, 25% ( $n=19$ ) of the patients' caretakers reported a history of previous burn injury in the family, whereas 75% ( $n=56$ ) had no such history. Participants reported a variety of immediate responses to burn injuries, with many using non-medical materials. Notably, sugar and cooking oil 40% ( $n=30$ ) were identified as the primary agents to use respectively, followed by 33% ( $n=25$ ), who selected the use of cool water. Among those who selected cool water, 64% ( $n=16$ ) chose still/running tap water, 20% ( $n=5$ ) chose running water without tap water, and 16% ( $n=4$ ) chose non-running water. Only 24% ( $n=6$ ) of the participants reported applying cool water for at least 20 minutes, whereas the majority (44%,  $n=11$ ) reported applying water for at least one minute (Table 1).

### First aid practices and knowledge

When asked about the use of cool water in cold weather as first aid, 39% ( $n=29$ ) indicated that they would use it as usual, whereas 61% ( $n=46$ ) would not. A significant majority (68%,  $n=51$ ) recognized the importance of preventing hypothermia by covering the patient post-burn, 27% ( $n=20$ ) did not see it as mandatory, and 5% ( $n=4$ ) were unsure.

Participants reported using various materials to cover burn patients: clean dressing 32% ( $n=24$ ), nothing 28% ( $n=21$ ), rabbit hair 24% ( $n=18$ ), clay 3% ( $n=2$ ), cooking oil 3% ( $n=2$ ), charcoal 4% ( $n=3$ ), human hair 1% ( $n=1$ ), and pharmacy dressing 4% ( $n=3$ ). Most participants (92%,  $n=69$ ) understood the necessity of removing clothes and other accessories sticking to the body post-burn, while 5% ( $n=4$ ) did not, and 3% ( $n=2$ ) were unsure.

Only 7% ( $n=5$ ) were aware of the "stop, drop, and roll" techniques for extinguishing flames, with 61% preferring to remove burning clothes directly if they caught fire. In the scenarios involving building fires, 73% ( $n=55$ ) indicated that they would run quickly to escape, whereas 17% ( $n=13$ ) would use a wet towel to cover the face and run. For fires in multi-story buildings, 44% ( $n=33$ ) preferred using stairs, whereas 39% ( $n=29$ ) chose lifts. When dealing with burn blisters, 81% ( $n=61$ ) understood that they should not break them unless they are already broken. Within the first 15 min of burn

**Table 1: Demographic information and selected first aid agents**

Variables	n	%
<b>Age (years)</b>		
Median, (IQR)		33 (27-43)
<b>Gender</b>		
Female	60	80
Male	15	20
<b>Marital status</b>		
Single	12	16
Married	60	80
Divorced	1	1
Widowed	2	3
<b>Level of education</b>		
No formal schooling	10	13
Primary school	39	52
Secondary school	16	21
TVET	2	3
University	8	11
<b>Location</b>		
Rural	38	51
Urban	37	49
<b>Occupation</b>		
Student	1	1
Employed	32	43
Unemployed	15	20
Farmer	27	36
<b>Any previous burn injury in the family</b>		
No	56	75
Yes	19	25
<b>Selected first aid agents as prioritized by caregivers</b>		
Sugar	30	40
Cooking oil	30	40
Cool water*	25	33
Honey	13	17
Elayo oil	11	14
Rabbit's hair	8	11
Other	16	23
Cow's oil	4	5
Nothing	4	5
Cow's pit	4	5
I do not know	2	3
<b>Type of water in case</b>		
Still/Running tap water*	16	64
Running water in case you don't have them; you can use non-running water	5	20
Non running water	4	16
<b>Duration of water application</b>		
I don't know	2	8
At least one minute	11	44
At least 5 minutes	3	12
At least 10 minutes	3	12
At least 20 minutes*	6	24

TVET: Technical and Vocational Education and Training; others include ash, salt, clay and human hair; IQR: Interquartile Range; \*: Correct answer for each question.

**Table 2: Burn first aid knowledge and practice**

Variables	n	%
<b>Would you use cold water in cold weather?</b>		
I can use cold water as usual*	29	39
I cannot use cold water	46	61
<b>Is it mandatory to prevent hypothermia/to cover the patient immediately post burn?</b>		
No	20	27
Yes*	51	68
No information/I don't know	4	5
<b>What would you use to cover burn patient immediately?</b>		
Clay	2	3
Clean dressing*	24	32
Rabbit's hair	18	24
Nothing	21	28
Charcoal	3	4
Human hair	1	1
Cooking oil	2	3
Dressings from pharmacy	3	4
<b>Is it necessary to remove clothes and other accessories sticking to the body post burn?</b>		
Yes*	69	92
No	4	5
No information/I don't know	2	3
<b>If your clothes catch fire, what can you do?</b>		
Remove clothes	46	61
Run	2	3
Stop, drop and roll over the ground*	5	7
Try to stop fire using water	17	23
Try to stop fire using hand	3	4
Other	2	3
<b>How to escape from building in fire?</b>		
Running as quick as possible*	55	73
Using wet towel covering face and run	13	17
Crawling on the floor with wet towel covering the face	4	5
Nothing	3	4
<b>How to escape from multiple floor building in fire?</b>		
Using stairs*	33	44
Using lift	29	39
Using window	9	12
Nothing	4	5
<b>If burn blisters, what should you ideally do?</b>		
Leave the blisters alone unless they break*	61	81
Break them only	8	13
Break them and apply petroleum jelly	4	5
Break blisters and put rabbits hair	9	12
Apply petroleum jelly without breaking them	1	1
<b>What could you do in the first 15 min when providing first aid to the burn patients?</b>		
Stopping the fire, dressing, covering and transfer to the hospital*	47	63
To consult traditional healer for small burn	5	7
Transferring as quick as possible to the nearest hospital and applying ice or cold clothes	22	29
Do nothing	1	1

\*: Correct answer for each question

incidents, 63% (n=47) would appropriately stop the fire, dress the wound, cover the patient, and then transfer them to a hospital (Table 2).

### Overall knowledge, source of information and interest in learning burn first aid

Overall, 67% of the participants had an intermediate level of understanding of burn first aid, 25% had poor knowledge, and 8% demonstrated good knowledge with a mean score of 5.36 (SD: 1.6).

The primary sources of information were friends and family members (95%, n=71), with minimal contribution from healthcare providers (8%, n=6). Training on burn first aid was notably lacking, with 93% (n=70) of the caregivers having no prior training. However, 96% (n=72) of participants expressed a desire to learn burn-first aid. The preferred methods included using books (69%, n=50), in-class or training sessions (39%, n=28), radio and/or television (22%, n=16), messages

**Table 3: Overall knowledge, source of information and interest of learning burn first aid**

Variables	n	(%)
<b>Overall knowledge (after sum up all true responses)</b>		
Poor (0-4)	19	25
Intermediate (5-7)	50	67
Good (8-10)	6	8
Marks out of 10 (Mean, SD)		(5.36, 1.6)
<b>Source of information given</b>		
Friends and family members	71	95
Healthcare providers	6	8
TV and Radio	1	3
<b>Did you have training on burn first aid before?</b>		
Yes	5	7
No	70	93
<b>If yes, where?</b>		
Radio and TV*	1	20
In training	4	80
<b>If yes, how long did you participate in training?</b>		
In the last year	4	80
In the last 5 years	1	20
<b>Do you wish to learn burn first aid?</b>		
Yes	72	96
No	3	4
<b>How do you wish to learn?</b>		
In the class or training	28	39
On Radio and/or TV*	16	22
Using a book	50	69
By message sent to phone	14	19
At hospital visit	8	11
Advertisement using posters or banners	4	6
Using social media	5	7
<b>Types of books</b>		
Given by healthcare providers	46	92
In the telephone as a mobile app	4	8

\*: Correct answer for each question; TV: Television; SD: Standard Deviation

**Table 4: Demographic factors associated with knowledge on burn first aid**

Variable	Knowledge item assessed	Findings (Direction of association)	p-value
Location	To escape building in fire	Participants from rural areas were more knowledgeable than urban peers	0.029*
	First aid material to use	Correct knowledge was reported only among urban participants	0.015*
Level of education	To escape from multiple building in fire	Those with secondary education were significantly more likely to respond incorrectly compared to other education levels	0.002*
gender	If burn has blisters	Females demonstrated significantly higher correct knowledge than males	0.027*
Marital status	If burn has blisters	Married participants were more knowledgeable than unmarried counterparts	0.013*

sent to phones (19%, n=14), hospital visits (11%, n=8), social media (7%, n=5), and advertisements via posters or banners (6%, n=4). The preferred type of book was provided by healthcare providers (92%, n=46), with a smaller percentage favoring a book on a mobile device application (8%, n=4) (Table 3).

In the exploratory item-level analyses, several statistically significant associations were identified for specific burn first-aid knowledge and practice items. Rural caregivers demonstrated better knowledge of appropriate escape strategies from building fires compared with urban caregivers ( $p=0.0292$ ). Female caregivers showed better knowledge in the management of burn blisters than males ( $p=0.0270$ ), while widowed and divorced caregivers demonstrated poorer knowledge of burn blisters management compared with other marital groups ( $p=0.0137$ ). Location was also significantly associated with knowledge of preferred first-aid materials, with urban caregivers showing greater awareness ( $p=0.0153$ ), and education level significantly influenced escape strategies from multistory buildings ( $p=0.0021$ ). These findings are exploratory in nature and were not adjusted for multiple comparisons, therefore, they should be interpreted cautiously as hypothesis generating rather than confirmatory (Table 4).

In contrast, the primary outcome analysis, based on the composite overall burn first aid knowledge score, revealed no statistically significant associations with demographic or socioeconomic characteristics, including age, sex, location, education level, occupation, marital status, and family history of burns (all  $p>0.05$ ). Effect size estimates indicated small and imprecise associations across variable: participants age <33

years (OR=0.73; 95% CI:0.30-2.38), and males and females showed comparable odds of poor knowledge (OR=1.09; 95% CI:0.30-3.94). Having a previous burn in the family was associated with higher odds of poor knowledge, although this association was not statistically significant (OR=2.14; 95% CI:0.69-6.62). Participants who had previously learned burn first aid demonstrated higher odds of improved knowledge compared with those who had not (OR=0.27; 95% CI: 0.01-5.15), though this difference did not reach statistical significance ( $p=0.081$ ). Notably, all participants classified as having poor overall knowledge expressed interest in learning burn first aid (Table 5).

## DISCUSSION

This study identified substantial gaps in burn first-aid knowledge among caregivers attending the University Teaching Hospital of Kigali, underscoring an urgent need for targeted educational interventions. Although many caregivers were aware that cool water should be used as first-aid for burns, the continued reliance on unproven remedies such as honey and cooking oil reflects persistent misconceptions. This pattern suggests that awareness alone may be insufficient and highlights the influence of informal information sources, emphasizing the need for standardized, evidence-based burn first-aid education tailored to caregivers in this setting.

These findings are consistent with reports from both hospital and community based studies worldwide, which document widespread deficiencies in burn first-aid knowledge and frequent use of traditional remedies [6,8,13–15]. While appropriate first-aid particularly early cooling with water has been shown to reduce burn severity and complications,

**Table 5: Independent Factors associated with level of knowledge**

	Level of knowledge		p-values	Effect size	95% CI
	Poor knowledge (n=19)	Improved (Intermediate and Good) knowledge (n=56)			
<b>Age category</b>			0.550		
<33yrs	8(42)	28(50)		0.73	0.25-2.08
≥33yrs	11(58)	28(50)		1.00	-
<b>Location</b>			0.739		
Rural	9(47)	29(52)		0.84	0.30-2.38
Urban	10(53)	27(48)		1.00	-
<b>Gender</b>			0.894		
Male	4(21)	11(20)		1.09	0.30-3.94
Female	15(79)	45(80)		1.00	-
<b>Level of education</b>			0.689		
No formal schooling	3(16)	7(13)		-	-
Primary school	11(58)	28(50)		-	-
Secondary school	4(21)	12(21)		-	-
University	1(5)	7(13)		-	-
TVET*	0(0)	2(4)		-	-
<b>Occupation</b>			0.284		
Student	1(5)	0(0)		-	-
Unemployed	4(21)	11(20)		-	-
Farmer	8(42)	19(34)		-	-
Employed	6(32)	26(46)		-	-
<b>Any previous burn in the family?</b>			0.193		
Yes	7(37)	12(21)		2.14	0.69-6.62
No	12(63)	44(79)		1.00	-
<b>Marital status</b>			0.765		
Single	3(16)	9(16)		-	-
Married	15(79)	45(80)		-	-
Widowed	1(5)	1(2)		-	-
Divorced	0(0)	1(2)		-	-
<b>Did you learn burn first aid?</b>			0.081		
Yes	0(0)	5(9)		0.27	0.01-5.15
No	19(100)	51(91)		1.00	-
<b>Do you have interest to learn burn first aid?</b>			0.180		
Yes	19(100)	53(95)		-	-
No	0(0)	3(5)		-	-

\*TVET: Technical and Vocational Education and Training

its adoption remains inconsistent. Olusegun et al. demonstrated improved clinical outcomes associated with immediate water cooling, yet only one third of caregivers in our study reported using this method [16]. This discrepancy suggests a gap between knowledge and practice, reinforcing the need for interventions that focus not only on

information delivery but also on behavior change. The observed differences in specific knowledge domains by location and sex warrant contextual interpretation. Rural caregivers demonstrated better knowledge in certain practical aspects, such as fire escape strategies, which may reflect greater exposure to open-fire cooking, less formal housing

structures, and frequent engagement with fire-related risks. Such routine exposure may foster experiential learning that compensates, to some extent, for limited formal education. In contrast, urban caregivers may rely more heavily on modern infrastructure and emergency services, potentially reducing firsthand engagement with fire hazards. These findings highlight how contextual exposure patterns can shape practical knowledge and should inform the design of location sensitive educational strategies.

The discrepancy between theoretical knowledge and practical application observed in our study mirrors findings from Saudi Arabia, where participants demonstrated awareness of recommended practices but failed to apply them appropriately in real life situations [17]. This reinforces the importance of incorporating hands on skills based training into burn first aid education programs, particularly in hospital catchment populations where caregivers may encounter burns both at home and in community settings.

Education level and prior first-aid training have been consistently associated with improved burn first-aid knowledge in previous studies [18]. In our cohort, the predominance of caregivers with primary level education and high proportion lacking prior first-aid training likely contributed to the overall low knowledge scores. While earlier studies have identified education as a major determinant, our findings suggest that contextual factors such as residence and gender may play a more prominent role in shaping specific knowledge domains. Differences in preferred learning modalities compared with studies conducted in other settings, such as Alomar's report highlighting social media as a preferred source [6] further emphasize the importance of adapting educational approaches to local preferences and access patterns.

A multifaceted educational approach combining traditional methods with appropriate digital strategies has been recommended to improve burn first aid knowledge [7]. In our setting, where caregivers expressed a preference for books and structured training sessions, integrating burn first-aid education into existing health education platforms and community outreach programs may be particularly effective. The low proportion of caregivers identifying healthcare providers as source of first aid information suggests a missed opportunity for health professionals to actively disseminate accurate and consistent guidance

during routine healthcare encounters.

Cultural beliefs play a significant role in shaping first-aid responses, as evidenced by the continued use of traditional remedies in this study. Educational interventions should therefore be culturally sensitive, acknowledging local practices while clearly addressing misconceptions that may compromise burn outcomes. Consistent with previous findings showing widespread knowledge gaps across different caregiver groups [14], our results indicate that burn first-aid education should not be limited to specific demographic subgroups but broadly implemented at both community and healthcare facility levels.

Future research should focus on evaluating the effectiveness of context specific educational interventions in improving both knowledge and practical application of burn first-aid. Longitudinal studies examining the impact of improved first-aid practices on burn severity and outcomes would be particularly valuable. Additionally, exploring barriers that limit healthcare providers' involvement in first-aid education could inform strategies to strengthen their role as trusted sources of evidence-based information.

This study is among the few to focus on burn first-aid knowledge among caregivers at the University Teaching Hospital of Kigali, thus offering valuable local insights. However, the use of a cross-sectional design with convenience sampling limits the generalizability of the findings to the wider community. The absence of a formal population frame and prior prevalence estimates precluded a formula-based sample size calculation, resulted to limited statistical power, as reflected by wide confidence intervals. Additionally, item level analyses were exploratory and not adjusted for multiple comparisons, warranting cautious interpretation. Self-reported data and the cross-sectional design further limit causal inference. Larger, community based and longitudinal studies are needed to confirm these findings and to evaluate the impact of targeted educational interventions.

## CONCLUSION

The critical gaps in burn first-aid knowledge among caregivers at the University Teaching Hospital of Kigali may have significant implications for patient outcomes. Addressing these gaps

through targeted, culturally sensitive educational interventions can enhance first aid practices and potentially reduce the severity and impact of burn injuries. The willingness of caregivers to learn, combined with deficiencies in current knowledge sources, provides a clear mandate for action by health care providers and policymakers. By improving first-aid knowledge, caregivers can be empowered to provide more effective initial care, thereby improving the prognosis and quality of life of burn patients in Rwanda and other similar settings.

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