Global epidemiology of geriatric burns, capacities of care, and injury outcomes: Perspectives from the World Health Organization global burn registry

Abstract

Background: An increasing aging population alongside a potentially increasing injury risk emphasizes a critical need for evidence-based burn care regarding preventive and therapeutic strategies tailored to the unique needs of older adults. However, we note a critical gap in understanding geriatric burn trends on a global scale and the care capacity across settings. Thus, this study sought to ascertain the global trend of geriatric burns with a focus on patient demographics, injury characteristics, capacities of care, and injury outcomes.

Methods: A retrospective design focusing on older adults aged ≥ 60 years with burns recorded in the World Health Organization Global Burn Registry as of 31st May 2023 was employed. Descriptive statistics were employed to analyze the data.

Results: Of the 9277 records obtained from the Global Burn Registry, 849 participants (9.2%) were aged ≥ 60 years with the majority of these reported from the Eastern Mediterranean (EMRO) and Southeast Asia (SEARO) regions. More females than males were involved in burn injuries with the most common aetiological factor being flame. Most burns occurred in the home/ domestic setting with a seasonal variation (more injuries occurred in December and January). In terms of burn care capacity, the data suggest the availability of specialized services in most settings albeit the AFRO and SEARO regions still lacked the resources to offer specialized burn care. While most injured older adults were discharged home with no physical impairment (395, 46.5%), a substantial number died (250, 29.4%) during hospitalization, particularly in the African (AFRO) region and 111 (11.1%) left the

facility against medical advice with the majority from the SEARO region (88).

Conclusion: Burn injuries in older adults remain a public health issue. On the preventive aspect, the results demonstrate a need to intensify safety in the home or domestic setting, and during festive seasons. Therapeutically, the findings underscore a need to consider the inclusion of more specialist geriatric and palliative care services in the burn management process. Additionally, we identified a need to strengthen burn care capacity in the AFRO and SEARO regions.

Introduction

A burn is a common traumatic injury that usually affects the integument and occasionally deeper structures. Burn injuries remain a leading cause of morbidity and mortality [1]. Even after surviving the injury, burn survivors have been reported to have shorter lifespans compared to the general population [2]. The occurrence of the injury is not specific to any age group albeit older adults have been reported to be a high-risk group for being involved in burns [3]. The high-risk nature of older adults in relation to the occurrence of burn injuries may be due to their decreasing physical strength resulting from the aging process or underlying issues, an impaired protective mechanism (such as decreased sensitivity), poor vision, the existence of multiple co-morbidities, and decreased reaction time [3,4].

The aging process is associated with several physiological changes that result in reduced functional reserves and a diminished ability to adapt to the injury [5,6]. The relatively atrophic skin of older adults makes the resulting burns deeper [6]. The intensity and severity of the hypermetabolic and hyperdynamic alterations in response to the burn injury increase with age and may result in an exaggerated response in older persons even with minor burns [7]. The clinical management of older adults with burns, therefore, remains an ongoing issue with the potential for poor outcomes such as disabilities, worsening of underlying comorbid diseases, and death [8].

Despite the major advances in burn care in the areas of critical care, nutrition, early excision, and grafting, increasing age is still considered the most significant predictor of mortality after burns [9]. Additionally, increasing total burn surface area (TBSA) and presence of inhalational injury remain significant predictors of mortality following burns [10,11]. More recently, the number of underlying comorbidities has been identified as an independent predictor of

mortality following burns [12]. Although some studies have reported a reduction in mortality rates among older persons with burns [13,14], other studies emphasize that older persons with burns are still behind on mortality rates and other relevant outcomes when compared to younger persons with burns [15,16]. Other outcomes following burns such as surviving the injury but with varying degrees of disabilities and discharge against medical advice remain poorly articulated in existing burn care literature since only mortality has received significant attention [17]. In fact, the impact of age on discharge disposition remains poorly defined in the older burned adult group [18]. Put together, burns in older adults deserve further focus from the preventive and therapeutic points of view, particularly considering the exponential increase in the aging population across the globe and the potentially increasing risk for injuries [19].

Globally, the proportion of persons aged ≥ 60 years has increased from 9.2% in 1990 to 11.7% in 2013 and is projected to reach 21.1% (> 2 billion) by 2050 [20]. Although a significant step demonstrating longevity, the escalating aging population has several ramifications for health care services [3]. Indeed, more older persons residing in the communities may be living alone and may need to carry out activities such as cooking on their own with limited social support [21,22]. Older adults are disproportionately affected by chronic conditions, with approximately 77% have at least two, and 65% have four or more chronic illnesses [23–25]. Mental health issues including depression, and loneliness, are commonly reported among older adults [26,27]. Neurodegenerative conditions such as Alzheimer's disease or other dementia are increasingly prevalent among older adults which can increase the risk of a burn injury occurring [28,29]. Thus, within the domain of burn care, a consequence of global aging will potentially be a great need for specialised burn care services for older adults and an even greater emphasis on prevention [30].

Put together, a need to step up burn care prevention and therapeutic services, informed by evidence, is warranted to support an aging population and their families. This assertion notwithstanding, data regarding geriatric global burn trends remain inconsistent and are often deduced from single studies which do not offer a clear picture of this global issue. This creates a critical gap regarding our epidemiological understanding of geriatric burn trends globally, outcomes following the injury, and care capacity. To address this, the World Health Organization (WHO) developed and implemented the Global Burn Registry (GBR) as a unified platform to facilitate the collation of burn-related injuries worldwide [31]. Thus, to inform policy and clinical practice, this study sought to examine the GBR to ascertain the trend of burns among older adults with focus on patient demographics, injury characteristics, and treatment outcomes. As a secondary objective, the study sought to ascertain the care capacities across the WHO regions.

Materials and methods

Design

A retrospective design was employed focusing on older adults with burns recorded in the WHO GBR as of 31st May 2023. In this study, we define an older adult as a person aged ≥ 60 years which is congruent with existing definition in burn care literature [3,32,33]. We report this retrospective study according to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines [34].

Source of data: the global burn registry (GBR)

We obtained the data for this study from the WHO GBR database on 31st May 2023. The GBR is a validated minimum dataset and repository that seeks to provide an improved, standardised data collection system for burn injuries across the globe [35]. Though the GBR was officially

launched in 2017, collection of data had begun in some centers as of 2016 [36]. As at January 2022, twenty-nine centers from seventeen countries have contributed data to the registry [37]. Patient data are entered into the GBR by participating centers using a standardized, validated data collection tool. The validated data collection form utilised by participating health facilities was developed through the collaboration of experts from the WHO, International Society for Burn Injuries (ISBI), and Global Alliance for Clean Cookstoves [38].

Collected data include patient demographics, mechanism of the burn injury, reported contributing factors, treatment facility, and basic patient treatment process, and outcome of care [36,37]. The variables regarding resources captured under treatment facility and treatment process (capacity of care) based on the GBR are as follows: ownership (private or government ownership), setting (urban or rural), wound care capabilities (availability of advanced plastic and reconstructive surgery skills or the ability to perform excision and grafting of small/ moderate burns and simple contracture release), critical care (reliable or limited access), specialized treatment unit (availability of a specialized physical plant with dedicated personnel for the care of burn patients, ability to provide inpatient care but no specialized ward, or availability of a ward designated for burn patients), operating theater (reliable or limited access), blood transfusions (limited or full capability), specialist capabilities (availability of some specialist capacity such as physiotherapy or availability of specialist capacity in supportive areas such as nephrology), physiotherapy and rehabilitation capabilities (reliable or limited access), nutritional capabilities (availability of nasogastric tube and general nutritional supplementation or availability of sophisticated nutritional supplementation), computerization (small range of computers or wide range of computers and other IT equipment), annual burn admission, and internet connectivity (permanent or intermittent) [39]. Additional data captured by the GBR include arrival by either public or private transport, arrival by an ambulance, and

arrival from another health facility [39]. The variables captured under outcomes of care include: discharged home without physical impairment, discharged home with physical impairment, dead, and left against medical advice [39]. The GBR is continuously updated, and the uploaded data are stored on network servers located at WHO headquarters in Geneva, Switzerland [36]. The data set is available in public domain and can be accessed online [36]. For this study, the data were accessed via Global burn registry (who.int).

Analysis

The dataset for this study was downloaded on 31st May 2023 as an Excel file and inspected for completeness. We used the 'sort' function in Excel to identify and segregate all burn patients aged ≥ 60 years following which we moved their details to a new Microsoft Excel sheet. The Excel sheet containing data for only burn patients aged ≥ 60 years was exported to SPSS version 29. We employed descriptive statistics in the form of count and percentages to ascertain the patient demographics, burn injury risk factors, burn injury characteristics, outcomes (including death, discharge with disability, discharge without disability, and discharge against medical advice), and facility capabilities (access to critical care, an operating theater, nutrition services, physical therapy and rehabilitation services, blood transfusion, and internet connectivity). Measures of central tendency such as mean and standard deviation were employed for continuous variables where appropriate. To explore the data set more in-depth and ascertain the regional variations regarding the injury, outcomes, and care capacity, we employed cross-tabulations.

Results

A total of 9277 records were obtained from the Global Burn Registry. Of this number, 849 participants (9.2%) were aged ≥ 60 years and included in the current cohort study. The burn

injury dates entered in the registry ranged from 4th March 2018–27 th July 2022. The yearly trend indicates that more geriatric burns were recorded in the GBR in 2020 (n = 305) albeit this should be interpreted with caution as entries in 2018 commenced in March and entries for 2022 were up to July (see Fig. 1). The data also demonstrated that at least one entry was registered from a facility each day from March 2018 to July 2022. Though the registry covers all WHO regions (African, Region of the Americas, Eastern Mediterranean, European, Southeast Asia, and Western Pacific), data regarding burns among older adults were recorded for all the regions except the Western Pacific Region. This covered 13 countries as follows: Argentina (n = 6), Chile (n = 51), Estonia (n = 17), India (n = 104), Iran (n = 334), Kenya (n = 10), Mexico (n = 37), Nepal (n = 210), Nigeria (n = 18), Pakistan (n = 43), South Africa (n = 16), Sri Lanka (n = 1), and Tanzania (n = 2). All the reporting hospitals across the WHO regions are in urban areas except one in the AFRO region which is in the rural area. Regarding ownership of the participating hospitals, it emerged that all the facilities from the EMRO and EURO regions are government-owned, whereas more facilities in AFRO, AMRO, and SEARO are a blend of government and private ownership.

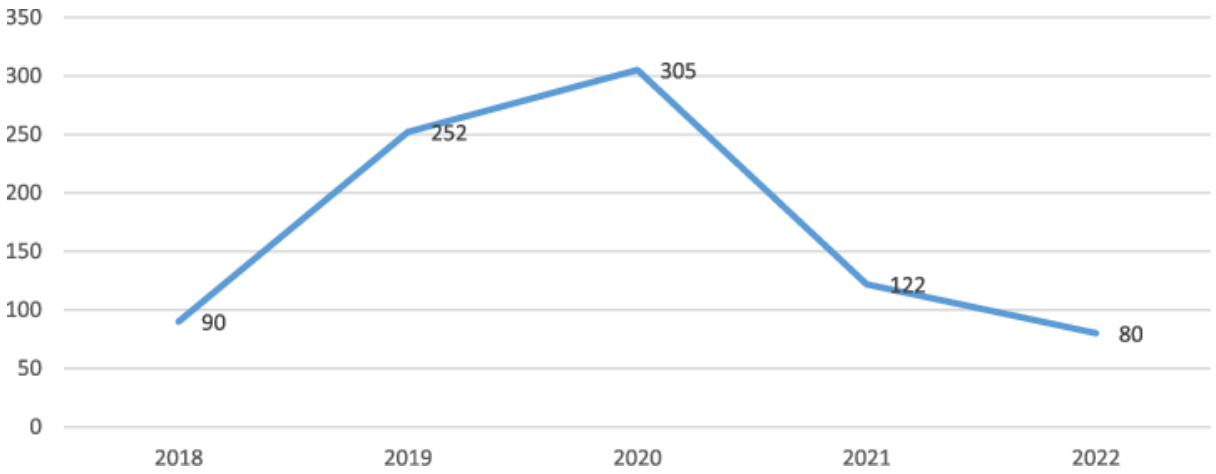

Fig. 1 – Yearly Distribution of Geriatric Burns Recorded in the GBR from 2018 to 2022.

Patient demographic characteristics

Table 1 presents a summary of the demographic characteristics of the patients included in this cohort study. As shown in Table 1, the cohort included more females (55.7%) than males (44.3%). Most of the older adults who sustained a burn injury were aged 60–69 years (52.7%) with a mean age of 66.5 years. Regarding the WHO region, it was observed that most entries were obtained from the Eastern Mediterranean (44.4%) and Southeast Asia Regions (37%). Additionally, most of the cases were recorded from upper middle-income settings (46.3%) based on the 2016 World Bank Income status.

Injury characteristics

As shown in Table 2, most of the burns were caused by flames (69.3%), followed by hot liquid, steam, or gas (18.7%). Across all WHO regions, flame burns remained the main aetiological factor implicated in the burn injuries ($p = < .001$). A moderate association was observed regarding the WHO region and cause of burns (Cramer's $V = .227$, $p = < .001$) (see Table 4). For the flame burns, the contributing factors include traditional biomass such as wood, charcoal, and dung (20.4%), natural gas (14%), kerosene (8.7%), and liquified petroleum gas (7.2%). Regarding the burn surface area, most of the affected persons were within the 5–20% range (61.2%). Up to 14.1% of the participants experienced inhalational injury. Concomitant injuries alongside the burns include chest trauma, eye trauma, long bone fracture, and spinal cord injury. All participants ($n = 849$) experienced burns to the head, neck, and aspects of the arms, hand, wrists, and legs. Most of the burns occurred within the domestic or household setting (62.4%). Though most of the participants did not report any contributing factors, some older adults reported the usage of alcohol and drugs, presence of dementia, epilepsy, physical, and psychiatric illnesses. Regarding the burn month, most of the burns were recorded in January (133, 15.7%) and December (132, 15.5%). The data also demonstrated that most geriatric burns occurred at noon (153, 18%) with fewer burns occurring in the early hours of the day, that is

from 1 am to 4 am. Regarding the days of the week, it was observed that most burns occurred on Fridays (151, 17.8%), followed by Saturdays (143, 16.8%), Thursdays (134, 15.8%), Mondays (113, 13.3%), Tuesday (107, 12.6%), Wednesdays (101, 11.9%), and Sunday (100, 11.8%). Following the injury occurrence, the average pre-hospital duration was computed as 25.06 h. Also, the mean hospital stay for older burn adults was computed as 14.4 days.

Care capacity across the WHO Regions

This section sought to examine the access to critical care, availability of an operating theater, nutrition services, physical therapy and rehabilitation services, blood transfusion, and internet connectivity across the included settings.

As shown in Table 3, most participants underwent surgery for their injury (52.9%) with most facilities having reliable access to an operating theater (94.8%). In terms of WHO regional variations, it was observed that all geriatric burn patients from AMRO, EMRO and EURO regions had reliable access to an operating theatre whereas up to 18 patients in AFRO and 26 in SEARO regions had limited access (see Table 5). Table 3 further indicates that most facilities also had reliable access to critical care for the burn patients (96%) with only a few facilities having limited access to this important component of burn care (4%). In terms of WHO regional variations, it was noted that up to 33 patients (71.7%) in the AFRO region had limited critical care capacity whereas all patients across AMRO, EMRO, and EURO had reliable access to critical care facility.

Additionally, most facilities reportedly have adequate nutritional support (66.4%), physiotherapy (89.6%), and a specialized facility with dedicated personnel (95.9%). It is worth highlighting the regional variations as well. As shown in Table 5, most geriatric burn patients

from the AFRO (27, 58.7%) and SEARO regions (211, 67%) had access to only nasogastric tubes and general nutritional supplements whereas all geriatric burn patients reported across the AMRO and EURO regions had access to sophisticated nutritional supplementation. Most of the included facilities were also reported to have specialist capability in supportive areas in addition to full specialist capability in all the following areas: physiotherapy, psychological support, nutrition, and surgical care (94.1%). For the regional variations regarding specialist capabilities, we observed that the AMRO, EURO and SEARO regions had specialist capacity in supportive areas. Regarding wound care, it was observed that most of the facilities have advanced plastic and reconstructive surgery skills (98.6%). In terms of the WHO regional variations, it was noted that except for the AFRO region, patients from the remaining regions had access to advanced plastic and reconstructive surgery services. Put together, though care capacity seems adequate in the AMRO, EURO, and EMRO whereas care capacity in the AFRO and SEARO regions is still limited and warrants further attention.

Treatment outcomes

Regarding treatment outcomes, most of the burned older adults were discharged home with no physical impairment (395, 46.5%) albeit a substantial proportion also died from the injury (250, 29.4%) and 111 (11.1%) also left the facility against medical advice. Crosstabulations as shown in Table 6 further highlight the variation in outcomes based on the WHO region. Comparatively, it was observed that more deaths following the injury occurred in the AFRO (21, 45.7%) and SEARO (106, 32.1%) regions. More geriatric burn patients were discharged home without disability in the EMRO (211, 56%) and EURO (13, 76.5%) regions. Table 6 further indicates that the SEARO region recorded more burned older adults leaving the facility against medical advice (88, 27.9%).

Discussion

With the increasing aging population across the globe, concerns exist regarding the increased risk of older adults suffering from burn injuries. Indeed, a consequence of global aging will potentially be an increased need for specialised burn care services for older adults and a significant focus on implementing preventive measures as far as practically possible [30]. Despite this concern, epidemiological studies examining the phenomenon of burns among older adults usually focus on single centers which makes it rather difficult to ascertain therapeutic and preventive measures across the globe. To resolve this gap, our study draws on the GBR to ascertain the demographics of older adults with burns, their injury characteristics, the burn care capacity across settings, and treatment outcomes. The study findings affirm that burns commonly occur in the home. Care capacity data suggests the availability of specialized services in most settings albeit AFRO and SEARO regions still lacked the resources to offer some specialized care. Though most older adults were discharged home with no physical impairment, a substantial number either died during hospitalization or left against medical advice.

Gender variation regarding the aetiology of burns has been reported in existing studies. Studies across both developed and developing settings have reported a preponderance of burns among older females than males [33,40–43]. This has been attributed to females' involvement in domestic activities such as cooking which predisposes them to burns [3]. More burn injuries occurring in the household setting observed in this study may offer credence to the preceding assertion. Thus, preventive measures should be emphasized in the homes or domestic settings. Ongoing education regarding fire safety, hot water usage, and liquified petroleum gas precautions in places such as the kitchen and bathroom must be increased and older adults who engage in domestic activities need to be particularly targeted. Smoke detectors, where possible,

should be installed in appropriate places in both domestic and industrial settings, particularly in developing countries to facilitate the prompt detection of fires. Underlying issues such as alcohol and drug usage which were also noted to contribute to the occurrence of burns in this study must be duly addressed. All educational strategies must be designed to suit local contexts.

Seasonal variation in the occurrence and intensity of burns is an ongoing area of inquiry in burn care literature with geographical variations. While some studies have reported peak occurrence of burns during the summer period [44,45], another study has reported peak occurrence during the spring season [46], and another during the winter season (December to February) [47]. Potentially, the increased occurrence of burns during the winter may be related to a need to keep warm using heaters, kettles, and stoves, or the Christmas and thanksgiving festivities at this period where people use candles and other inflammable materials. Education around this period to increase public awareness may help minimise the occurrence of burns.

Although burn cases were reported across all WHO regions except for the Western Pacific, it was observed that the availability of burn care resources in AFRO and SEARO regions are limited. AFRO and SEARO countries such as Kenya, Nepal and India fall within the low- and middle -in - come setting category which are already faced with several competing health interests and limited resources. In Africa a general lack of burn care equipment, limited access to procedures such as skin grafting, and limited human resource is present which adversely impact the quality of burn care service offered [48]. Similarly, in South East Asia, it has been reported that outcomes associated with burns are often poor due to resource limitations [49]. All these findings draw attention to strengthening burn care in these areas using locally available materials [50] and collaborating with burn care colleagues in other WHO regions to strengthen burn care capacity and availability of resources.

The occurrence of concomitant injuries alongside the burns, and presence of underlying comorbidities such as dementia, epilepsy, physical, and psychiatric illness affirm the need for specialized geriatric care. Previous studies have reported the presence of comorbidities such as diabetes and hypertension among older adults with burns [51–54]. These comorbidities can worsen and be worsened by the burn trauma [6,55], and lead to distressing symptoms in the burned older adult population [56–59]. Coupled with the limited physiological reserves associated with the aging process, hypermetabolic, and hyperdynamic states resulting from the burn injury, the clinical management is likely to be challenging if left within the domain of only burns care [60]. This finding may warrant the inclusion of other specialists/ services such as geriatric physicians and palliative care in the clinical management of burns among older adults. Additionally, it may highlight a great need for transitional support and a multi - disciplinary follow -up after discharge to facilitate holistic recovery [60 -63].

Although the study findings noted that most older adults with burns are discharged without physical impairments, the potential occurrence of psychosocial issues needs attention. The WHO GBR database does not capture the occurrence of psychosocial issues during or after hospitalization, which may be a significant limitation of the database, considering that psychosocial issues such as post -traumatic stress dis - order, depression, and anxiety abound in the burn patient population. Findings from this study highlight the availability of rehabilitative support, although returning to use them remains an ongoing challenge. Most burn survivors have been reported not to return to use available services due to fi - nancial constraints, time constraints, and long travel dis - tances particularly in AFRO and SEARO regions [64,65]. A significant number of older adults from the SEARO region left the healthcare facilities against medical advice which raises concerns regarding how they can be supported. Innovative

approaches (such as homebased wound care or rehabilitative support) to burns management must be considered where practically possible [66]. Also, to facilitate ongoing support, burn care services need to consider an active approach to follow -up on burn survivors such as through the use mobile health applications (mHealth) for patients and their families, particularly as recent studies have reported the usefulness of mHealth applications among community -dwelling older adults [67–69].

To the authors' best knowledge, this is the first study to employ the GBR to examine trend of geriatric burns. However, we note some limitations. The GBR is still evolving, and participation in it is entirely voluntary. As such, data obtained so far does not feature all burn units or healthcare facilities across all countries. Additionally, though the WHO GBR offers a standardized global platform for data regarding burn injuries, treatment, and outcomes, it is not universal. Clinical information in the GBR regarding the injury (such as burn depth), treatment (such as specific burn surgeries), and hospital course are not captured in the database. Also, the GBR does not capture data relating to the occurrence of psychosocial issues emerging from the injury during or after hospitalization; and does not offer in-depth information regarding unique contextual characteristics of the included settings. Thus, the findings should be interpreted in relation to background contextual information of the included settings. The limitations notwithstanding, the findings offer a global lens to the epidemiology, outcomes of geriatric burn care, and availability of burns management resources which can inform further public health and clinical efforts.

Conclusion

Burn injuries occur in older adult population and the demographics noted in this study affirm a need to intensify safety in the home or domestic setting. Although specialized services are

available across most settings, we note a need to consider the inclusion of geriatric and palliative care professionals to improve patient outcomes. Moreso, we find a critical need to strengthen burn care capacity in the AFRO and SEARO regions.

CRediT authorship contribution statement

Jonathan Bayuo: Conceptualization, Methodology, Software, Data Curation, Writing Anita Eseenam Agbeko.: Data curation, Writing- Original draft preparation. Arkers Kwan Ching Wong: Methodology, Data Curation, Investigation, Supervision, Writing- Reviewing and Editing. Frances Kam Yuet Wong: Supervision, Methodology, Writing- Reviewing and Editing: Elisha Oduro Baafi: Methodology, Software, Data Curation, Writing- Reviewing and Editing.: Prince Kyei Baffour: Methodology, Writing- Reviewing and Editing, Data curation.: Hser Eh Naw: Methodology, Writing- Reviewing and Editing, Data curation.: Pius Agbenorku: Supervision, Methodology, Writing- Reviewing and Editing.

Declaration of Competing Interest

All authors declare no conflict of interests.

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Appendix

Table. 1 – Patient Demographics.

	n	%
Gender		
Male	376	44.3
Female	473	55.7
Age (years)		
60–69	447	52.7
70–79	261	30.7
80–89	119	14
90–99	22	2.6
WHO Regions		
African Region (AFRO)	46	5.4
Region of the Americas (AMRO)	94	11.1
Eastern Mediterranean (EMRO)	377	44.4
European Region (EURO)	17	2
Southeast Asia Region (SEARO)	315	37
Western Pacific (WPRO)	0	0
World Bank Income Region		
High Income (OECD)	68	8
Upper middle income	393	46.3
Lower middle income	388	45.7

Table. 2 – Injury Characteristics.

	n	%
Cause of burn		
Chemical	13	1.5
Electrical	21	2.5
Flame	588	69.3
Hot liquid, steam, or gas	159	18.7
Hot surface	54	6.4
Inhalation	1	1
Radiation	2	0.2
Others	11	1.3
Burn surface area (%)		
5–20	520	61.2
21–40	185	21.8
41–60	78	9.2
61–80	43	5.1
81–100	23	2.7
Smoke inhalation		
Yes	120	14.1
No	729	85.9
Associated injuries		
Chest trauma	4	0.5
Eye trauma	5	0.6
Long bone fracture	5	0.6
Spinal cord injury	1	0.1
None	834	98.2
Affected areas		
Head and neck	849	100
Trunk	504	59.4
Perineum or genitals	11	1.3
No trunk affected.	334	39.3
Arm	849	100
Hand and wrists	849	100
Legs	849	100
Setting of the burn injury		
Household	530	62.4
Occupational	43	5.1
Public	49	5.8
Contributing factors		
Alcohol	38	4.5
Dementia	7	0.8
Drug	95	11.2
Epilepsy	16	1.9
Physical or mental disability	24	2.8
Psychiatric illness	10	1.2
Other	60	7.1
None	599	70.6
Condition on discharge from facility		
Dead	250	29.4
Discharged home with physical impairment.	68	8
Discharged home without physical	395	46.5
impairment.	111	11.1
Left against medical advice.	18	2.1
Transferred to another facility.	7	0.8
Unknown		

Table. 3 – Care capacity.

	n	%
Surgery during hospital stay		
Yes	449	52.9
No	400	47.1
Blood transfusions		
Full capacity	611	72
Limited capacity	238	28
Computerization		
A small number of computers	304	35.8
Wide range of computers and other IT equipment	544	64.1
No computers	1	0.1
Critical care		
Limited availability for burn patients	34	4
Reliable access for burn patients	815	96
Internet connectivity		
Intermittent	232	27.3
No	1	1
Permanent	616	72.6
Nutritional capabilities		
Health facility has the ability to provide sophisticated nutritional supplementation.	564	66.4
Nasogastric tubes and general nutritional supplements available	285	33.6
Operating theater		
Limited access	44	5.2
Reliable access	805	94.8
Physiotherapy and rehabilitation capabilities		
Limited access for burn patients	57	6.7
Reliable access	761	89.6
Some physiotherapy staff available but on a very infrequent basis	31	3.7
Specialist capabilities		
Some specialist capability in any of the following areas: physiotherapy, psychological support, nutrition, and surgical care	50	5.9
Specialist capability in supportive areas (such as nephrology and cardiology) in addition to full specialist capability in all of the following areas: physiotherapy, psychological support, nutrition, and surgical care	799	94.1
Specialized treatment unit		
A specialized physical plant with dedicated personnel exists for the care of burn patients.	814	95.9
A ward or an area of a ward is designated for burn patients.	24	2.8
Health facility is able to provide inpatient care, but no specialized ward area or ward exists for burn patients	11	1.3
Wound care capabilities		
Ability to perform excision and grafting of small or moderate burns and simple contracture release.	12	1.4
Advanced plastic and reconstructive surgery skills are available.	837	98.6

Table. 4 – WHO Regional Variations Regarding Cause of Burns.

		WHO Regions										Total	
		AFRO		AMRO		EMRO		EURO		SEARO			
		N	%	N	%	N	%	N	%	N	%	N	%
Cause of burn	Chemical	2	4.3%	6	6.4%	3	0.8%	0	0.0%	2	0.6%	13	1.5%
	Electrical	1	2.2%	4	4.3%	6	1.6%	1	5.9%	9	2.9%	21	2.5%
	Flame	34	73.9%	50	53.2%	213	56.5%	7	41.2%	284	90.2%	588	69.3%
	Hot liquid, steam or gas	6	13.0%	23	24.5%	108	28.6%	6	35.3%	16	5.1%	159	18.7%
	Hot surface	0	0.0%	6	6.4%	42	11.1%	3	17.6%	3	1.0%	54	6.4%
	Inhalation	0	0.0%	1	1.1%	0	0.0%	0	0.0%	0	0.0%	1	0.1%
	Other	3	6.5%	3	3.2%	4	1.1%	0	0.0%	1	0.3%	11	1.3%
	Radiation	0	0.0%	1	1.1%	1	0.3%	0	0.0%	0	0.0%	2	0.2%
Total		46	100.0%	94	100.0%	377	100.0%	17	100.0%	315	100.0%	849	100.0%

Table. 5 – WHO Regional Variations Regarding Care Capacity.

		WHO Regions										Total	
		AFRO		AMRO		EMRO		EURO		SEARO			
		N	%	N	%	N	%	N	%	N	%	N	%
Blood transfusions	Full capability	18	39.1%	94	100.0%	377	100.0%	17	100.0%	105	33.3%	611	72.0%
	Limited capability	28	60.9%	0	0.0%	0	0.0%	0	0.0%	210	66.7%	238	28.0%
Total		46	100.0%	94	100.0%	377	100.0%	17	100.0%	315	100.0%	849	100.0%

		WHO Regions										Total	
		AFRO		AMRO		EMRO		EURO		SEARO			
		N	%	N	%	N	%	N	%	N	%	N	%
Critical care	Limited availability for burn patients	33	71.7%	0	0.0%	0	0.0%	0	0.0%	1	0.3%	34	4.0%
	Reliable access for burn patients	13	28.3%	94	100.0%	377	100.0%	17	100.0%	314	99.7%	815	96.0%
Total		46	100.0%	94	100.0%	377	100.0%	17	100.0%	315	100.0%	849	100.0%

		WHO Regions										Total	
		AFRO		AMRO		EMRO		EURO		SEARO			
		N	%	N	%	N	%	N	%	N	%	N	%
Wound care capabilities	Ability to perform excision and grafting of small or moderate burns and simple contracture release	12	26.1%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	12	1.4%
	Advanced plastic and reconstructive surgery skills available	34	73.9%	94	100.0%	377	100.0%	17	100.0%	315	100.0%	837	98.6%
Total		46	100.0%	94	100.0%	377	100.0%	17	100.0%	315	100.0%	849	100.0%

		WHO Regions										Total	
		AFRO		AMRO		EMRO		EURO		SEARO			
		N	%	N	%	N	%	N	%	N	%	N	%
Operating theatre	Limited access to general operating theatre space for burn patients	18	39.1%	0	0.0%	0	0.0%	0	0.0%	26	8.3%	44	5.2%
	Reliable access to operating theatre space for burn patients	28	60.9%	94	100.0%	377	100.0%	17	100.0%	289	91.7%	805	94.8%
Total		46	100.0%	94	100.0%	377	100.0%	17	100.0%	315	100.0%	849	100.0%

		WHO Regions										Total	
		AFRO		AMRO		EMRO		EURO		SEARO			
		N	%	N	%	N	%	N	%	N	%	N	%
Nutritional capabilities	Health facility has the ability to provide sophisticated nutritional supplementation	19	41.3%	94	100.0%	330	87.5%	17	100.0%	104	33.0%	564	66.4%
	Nasogastric tubes and general nutritional supplements available	27	58.7%	0	0.0%	47	12.5%	0	0.0%	211	67.0%	285	33.6%
Total		46	100.0%	94	100.0%	377	100.0%	17	100.0%	315	100.0%	849	100.0%

		WHO Regions										Total	
		AFRO		AMRO		EMRO		EURO		SEARO			
		N	%	N	%	N	%	N	%	N	%	N	%
Internet connectivity	Intermittent	22	47.8%	0	0.0%	0	0.0%	0	0.0%	210	66.7%	232	27.3%
	No	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1	0.3%	1	0.1%
	Permanent	24	52.2%	94	100.0%	377	100.0%	17	100.0%	104	33.0%	616	72.6%
Total		46	100.0%	94	100.0%	377	100.0%	17	100.0%	315	100.0%	849	100.0%

		WHO Regions										Total	
		AFRO		AMRO		EMRO		EURO		SEARO			
		N	%	N	%	N	%	N	%	N	%	N	%
Physiotherapy and rehabilitation capabilities	Limited access for burn patients	26	56.5%	0	0.0%	14	3.7%	17	100.0%	0	0.0%	57	6.7%
	Reliable access for burn patients	20	43.5%	94	100.0%	332	88.1%	0	0.0%	315	100.0%	761	89.6%
	Some physiotherapy staff available but on a very infrequent basis	0	0.0%	0	0.0%	31	8.2%	0	0.0%	0	0.0%	31	3.7%
Total		46	100.0%	94	100.0%	377	100.0%	17	100.0%	315	100.0%	849	100.0%

		WHO Regions										Total	
		AFRO		AMRO		EMRO		EURO		SEARO			
		N	%	N	%	N	%	N	%	N	%	N	%
Specialist capabilities	Some specialist capability in any of the following areas: physiotherapy, psychological support, nutrition, and surgical care	19	41.3%	0	0.0%	31	8.2%	0	0.0%	0	0.0%	50	5.9%
	Specialist capability in supportive areas (e.g. nephrology/ cardiology), in addition to full specialist capability in all of the following areas: physiotherapy, psychological support, nutrition, and surgical care.	27	58.7%	94	100.0%	346	91.8%	17	100.0%	315	100.0%	799	94.1%
Total		46	100.0%	94	100.0%	377	100.0%	17	100.0%	315	100.0%	849	100.0%

		WHO Regions										Total	
		AFRO		AMRO		EMRO		EURO		SEARO			
		N	%	N	%	N	%	N	%	N	%	N	%
Specialized treatment unit	A specialized physical plant with dedicated personnel exists for the care of burn patients	11	23.9%	94	100.0%	377	100.0%	17	100.0%	315	100.0%	814	95.9%
	A ward or an area of a ward is designated for burn patients	24	52.2%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	24	2.8%
	Health facility is able to provide inpatient care but no specialized ward area or ward exists for burn patients	11	23.9%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	11	1.3%
Total		46	100.0%	94	100.0%	377	100.0%	17	100.0%	315	100.0%	849	100.0%

Table. 6 – WHO Regional Variations Regarding Injury Outcomes.

		WHO Regions										Total	
		AFRO		AMRO		EMRO		EURO		SEARO			
	N		%	N	%	N	%	N	%	N	%	N	%
Condition on discharge from facility	Dead	21	45.7%	21	22.3%	106	28.1%	1	5.9%	101	32.1%	250	29.4%
	Discharged home with physical impairment	1	2.2%	20	21.3%	33	8.8%	0	0.0%	14	4.4%	68	8.0%
	Discharged home without physical impairment	16	34.8%	48	51.1%	211	56.0%	13	76.5%	107	34.0%	395	46.5%
	Left against medical advice	2	4.3%	0	0.0%	21	5.6%	0	0.0%	88	27.9%	111	13.1%
	Transferred to another facility	2	4.3%	4	4.3%	5	1.3%	3	17.6%	4	1.3%	18	2.1%
	Unknown	4	8.7%	1	1.1%	1	0.3%	0	0.0%	1	0.3%	7	0.8%
Total		46	100.0%	94	100.0%	377	100.0%	17	100.0%	315	100.0%	849	100.0%