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Trends and risk factors for mortality in elderly burns patients: A retrospective review

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ABSTRACT

Introduction: The elderly experience higher mortality rates and poorer outcomes compared to younger burn survivors with similar injuries.
Methods: This epidemiological study reviewed records of all admitted elderly burn patients collected from five burns facilities in Israel between 1997–2016. Collected data was limited to the population aged 20+, focused on the population aged 60+.
Results: Mortality rates for elderly patients increased with TBSA and increases with age. Regression analyses demonstrated a decrease in mortality of 2.9% ($p=0.013$) per 5 years, an overall decrease of 11.6% over the 20-year study period, with the decline more significant for older age groups. This decrease in mortality was much larger than that observed for all burns patients over this period. The most common cause of injury in the elderly population was fire, with mortality rate highest for this cause. There was no effect of gender on mortality rate. Mortality increased when smoke inhalation was present for TBSA<20%, with mortality unaffected by the presence of smoke inhalation for higher TBSA. The need for surgery correlates with high mortality rates.
Conclusion: This study identified key factors that impact mortality and demonstrated a large decrease in mortality in the elderly patients over the study period.

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1. Introduction

Globally burns is a public health issue, accounting for approximately 180000 deaths annually [1]. Moreover, it is well documented and accepted that elderly burn patients experience a higher mortality rate and poorer outcomes compared to younger burn patients with similar injuries [2]. The elderly population are at greater risk of experiencing a burn injury, which may be in part be related to impaired vision, and decreased coordination that impacts their mobility [3,4]. These impairments, as well as the fact that the elderly population are reported to tend to live alone with limited social support, further exacerbates their risk of a burn as well as the severity of the injury [5]. Furthermore, the elderly are also challenged with co-morbidities and decreased protective mechanisms. As a recent study identified, the elderly have substantially different responses to burns, including altered hypermetabolic, glycemic, lipidemic and inflammatory responses [6]. Elderly burn patients exhibit an increased mortality and morbidity rate as opposed to the younger adult population following a burn injury [3]. Age remains a strong predictor of in-patient mortality among those with burn injuries with survival affected up to two years after burn [3].

The proportion of those over 65 years is an ever-growing part of the population. According to data from the United States and Europe, forecasts maintain that by the year 2025, nearly a third of the western population will be over age 65 [7], leading to it being dubbed "the silver tsunami" [8]. The OECD defines the elderly population as those over the age of 65 [9]. Attempts to determine a threshold age associated with poor outcomes in the elderly after burn injury, it was found that there is not a distinct cutoff age that differentiates or predicts outcomes [10]. Instead, risk of death increases with increasing age across the cutoff of 65 years [10]. Various health systems worldwide are obliged to organize and carry out effective solutions to care for this aging population. The importance of this issue is demonstrated by the expanding body of literature on healthcare in the aging population. Focusing on burns among older people, there is a specific reference in literature to costs of treatment, predicted outcomes, and different premorbid situations that affect survival [11–13].

Reports have attempted to characterize the different variables that affect the mortality of the elderly burns population. These reports have found that Total Body Surface Area (TBSA), percentage full thickness surface area (FTSA%), number of co morbidities (with emphasis on chronic obstructive pulmonary disease, diabetes, heart disease, and sepsis), gender, smoke inhalation, an early need of intubation, and age, are factors that influence mortality [12,14–16]. In an attempt to identify positive prognostic indicators in burns in the elderly, a number of scoring systems have been developed to estimate mortality. One example is the Shock Index, which has unfortunately failed in predicting mortality in patients above age 60 [17]. Importantly, several reports have suggested that combining a number of models, for instance the APACHE III-j score, FTSA, Baux score and revised Baux score, more accurately assesses prognosis by minimizing the limitations of each individual model [18].

Another challenge in addition to prognosis is prolonged hospitalization among this older population [19]. This is of course in addition to the long and complex mental and psychological rehabilitation associated with a burn injury [20] which can continue long past discharge from hospital. With regard to life after hospitalization, a current study has shown that we lack the ability to assess the health-related quality of life (HRQoL) accurately [21].

Data formerly collected from the Sheba Israel National Burn Center show that approximately 15% of the population over 70 years old, who sustained burns greater than 20% TBSA to at least second degree survived. From the conclusions of this former study, and another which summarized the activity of the new burn unit in Israel, it appears than an effective burn center can improve survival rates [22,23]. This encouraging data joins a large literature review published in 2010, which found that the overall survival rate in the elderly population (with TBSA usually less than 24%) ranges from 61% to 87% [24]. Yet another study demonstrated that survival rates in the elderly population are better than commonly perceived, if they are admitted to a dedicated burn unit/center and undergo operations in a time sensitive manner [25]. However, a study published in 2015 reported that true mortality rates are underestimated, which may apply also to the elderly population [26]. This limits the ability to accurately assess prognosis in the elderly population.

There are diverse moral dilemmas when health professionals attend to the care of elderly burn patients, as well as significant challenges. There are challenges regarding prognosis estimation, the length and intensiveness of treatment, the need for long-term rehabilitation, and the question of whether the patients' quality of life would be dramatically reduced upon discharge from hospital.

The accepted policy maintains that nearly all patients, regardless of age, TBSA level, depth of burn, etc., should receive full medical attention. This universal policy has local variation due to the culture and nature of the local health system. Given the public nature of the health system, there is little motivation to restrict expensive and prolonged treatment that is considered the standard of care, providing a challenge for management of facilities. The development of pathways for the management of burn injury is a critical element in the treatment of severe burn injuries. As Greenwood [27] highlights, the development of pathways in major burn injuries often rely on personal experience and anecdote and describes the complexities encountered. Measures for assessing burn severity such as the revised Baux Score, The Belgian Outcome in Burn Injury (BOBI) Score and the Abbreviated Burn Severity Index (ABSI) are validated tools, however they do not fully account for burn patients with comorbidities [28] which have high prevalence amongst elderly burn patients.

In our study, we analyzed data collected from the years 1997 to 2016 from the 5 burn centers operating in Israel, with a focus on mortality in the elderly burn population. There was an emphasis on a number of parameters: duration of stay in hospitalization, need for surgery, nature of injury (TBSA, degree of burn, cause of injury, smoke inhalation), and gender differences.

2. Methods

In this retrospective, epidemiological cohort study, we reviewed records of all elderly burn patients who were admitted for at least one day at one of the five burn units in Israel between the years 1997-2016. The burn units are located in Hadassah, Sheba, Soroka, Rabin, and Rambam Medical Centers. The information was gathered through the National Israeli Trauma Registry (ITR), conducted by the Gertner Institute (The National Research Institute for The Study of Epidemiology and Health Policies), within the Sheba Medical Center. Focus was limited to the burn patient population aged 60 and over, to allow an assessment of subgroups of those with increased risk due to age. Data regarding risk factors, related to background information (gender, length of hospitalization, whether hospitalized in the ICU, need of surgery), and the nature of the injury (TBSA, degree of burn, cause of injury, smoke inhalation) was collected according to known risk factor identified in the burns literature and identified by burns clinicians.

Statistical analysis was performed using SAS software version 9.4 (SAS, Cary, NC). Statistical tests performed included Chi-square tests (and Fisher's exact test when sample size ≤ 5) for the variables; age, gender, cause of injury, ICU admission, need for surgery, presence of smoke inhalation and TBSA. Ordinary least-squares regression was used to assess the change in mortality over time. A p-value of less than 0.05 was considered statistically significant.

3. Results

For the period 1997–2016, 5395 isolated second or third degree burn patients in the age of 20+ were hospitalized, of whom 418 (7.7%) died. Of the records analyzed, n=798 (14.8%) were aged 60+ years. The demographic, nature of injury and hospitalization statistics for the 60+ group are presented in Table 1. The elderly population were stratified into three age groups: 60–69 years (n=371, 46.5%), 70–79 years (n=260, 32.6%), and 80+ years (n=167, 20.9%). The stratified statistics are presented in Table 2. Each main group was subsequently examined over increments of five years across the total span of 20 years. There were similar numbers of elderly patients in each 5-year block and no significant variations in patient characteristics.

3.1. *Mortality as a factor of age and gender*

The overall mortality rate of 22.7% (n=181) for the elderly was much higher than that of the general population ($p<0.001$), which is reported to be around 4% over a similar time-frame [26]. The data collected show that the mortality rates logically correlate to increasing age, with subgroup mortality rates of 12.7% (n=47), 27.3% (n=71) and 37.7% (n=63), respectively for the 60–69, 70–79, and 80+ subgroups ($p<0.001$). The mortality risk is more than doubled for the 70–79 group and tripled for the 80+ group compared to the 60–69 group. There were similar mortality rates by gender, with rates of 21.9% (n=99) for males and 23.7% (n=82) for females (p=0.634).

Table 1 – Counts and mortality for assessed variables with chi-squared test for mortality.

	Total n (%)	Died n (%)	χ^2	p
Gender				
Male	452 (56.6)	99 (21.9)	0.230	0.634
Female	346 (43.4)	82 (23.7)		
Age				
60-69	371 (46.5)	47 (12.7)	45.9	<0.001
70-79	260 (32.6)	71 (27.3)		
80+	167 (20.9)	63 (37.7)		
TBSA				
1-9%	422 (52.9)	16 (3.8)	378.6	<0.001
10-19%	156 (19.5)	27 (17.3)		
20-29%	50 (6.3)	22 (44.0)		
30-39%	40 (5.0)	21 (52.5)		
40-89%	87 (10.9)	74 (85.1)		
90-100%	21 (2.6)	21 (100.0)		
ICU admission				
Yes	185 (23.2)	112 (60.5)	195.6	<0.001
No	613 (76.8)	69 (11.3)		
Injury mechanism				
Fire/flame	356 (44.6)	146 (41.0)	130.9	<0.001
Boiling water	284 (35.6)	17 (6.0)		
Chemical	47 (5.9)	2 (4.3)		
Hot object	43 (5.4)	3 (7.0)		
Explosion	35 (4.4)	8 (22.9)		
Electrocution	9 (1.1)	0 (0.0)		
Surgery				
Yes	213 (26.7)	65 (30.5)	10.2	0.001
No	585 (73.3)	116 (19.8)		
Smoke inhalation				
Yes	49 (6.1)	31 (63.3)	49.0	<0.001
No	749 (93.9)	150 (20.0)		
Year of admission				
1997-2001	175 (21.9)	47 (26.9)	5.31	0.151
2002-2006	208 (26.1)	49 (23.6)		
2007-2011	195 (24.4)	46 (23.6)		
2012-2016	220 (27.6)	39 (17.7)		

3.2. *Decline in mortality 1997-2016*

The mortality incidence declined over the analysis period. Fig. 1 presents a regression analysis of mortality rate over time for the elderly. There is a moderate (r=0.55) negative relationship between mortality rate and admission year, with a significant decrease in the mortality rate of 2.9% per 5 years (p=0.013). The year of admission explains 30% of the variation in mortality for the elderly. Over the 20-year study period the mortality rate decreased by 11.6% for the elderly. The decrease in mortality is different for the age subgroups, with greater reductions in mortality for the older subgroups. The decrease in the mortality rates per 5 years were 1.8%, 2.3% and 5.9% respectively for the 60–69, 70–79, and 80+ subgroups. Over the 20-year study period the mortality rates decreased by 7.1%, 9.3% and 23.8% respectively for the 60–69, 70–79, and 80+ subgroups.

Table 2 – Age stratified counts and mortality for assessed variables with chi-squared test for age.

Age category	60–69 (n=371)		70–79 (n=260)		80+ (n=167)		p
	Total n (%)	Died n (%)	Total n (%)	Died n (%)	Total n (%)	Died n (%)	
Gender							
Male	241 (64.9)	25 (10.4)	130 (50.0)	39 (30.0)	81 (48.5)	35 (43.2)	<0.001
Female	130 (35.1)	22 (16.9)	130 (50.0)	32 (24.6)	86 (51.5)	28 (32.6)	0.03
TBSA							
1–9%	206 (55.5)	1 (0.5)	134 (51.5)	6 (4.5)	82 (49.1)	9 (11.0)	<0.001
10–19%	67 (18.1)	4 (6.0)	53 (20.4)	9 (17.0)	36 (21.6)	14 (38.9)	<0.001
20–29%	16 (4.3)	1 (6.3)	25 (9.6)	15 (60.0)	9 (5.4)	6 (66.7)	0.001
30–39%	17 (4.6)	4 (23.5)	10 (3.8)	8 (80.0)	13 (7.8)	9 (69.2)	0.006
40–89%	40 (10.8)	29 (72.5)	27 (10.4)	26 (96.3)	20 (12.0)	19 (95.0)	0.01
90–100%	8 (2.2)	8 (100.0)	7 (2.7)	7 (100.0)	6 (3.6)	6 (100.0)	N/A
ICU admission							
Yes	78 (21.0)	33 (42.3)	58 (22.3)	41 (70.7)	49 (29.3)	38 (77.6)	<0.001
No	293 (79.0)	14 (4.8)	202 (77.7)	30 (14.9)	118 (70.7)	25 (21.2)	<0.001
Injury mechanism							
Fire/flame	157 (42.3)	41 (26.1)	117 (45.0)	56 (47.9)	82 (49.1)	49 (59.8)	<0.001
Boiling water	115 (31.0)	2 (1.7)	106 (40.8)	9 (8.5)	63 (37.7)	6 (9.5)	0.04
Chemical	36 (9.7)	1 (2.8)	8 (3.1)	0 (0.0)	3 (1.8)	1 (33.3)	0.2
Hot object	21 (5.7)	0 (0.0)	15 (5.8)	2 (13.3)	7 (4.2)	1 (14.3)	0.2
Explosion	22 (5.9)	1 (4.5)	8 (3.1)	3 (37.5)	5 (3.0)	4 (80.0)	<0.001
Electrocution	8 (2.2)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.6)	0 (0.0)	N/A
Surgery							
Yes	86 (23.2)	19 (22.0)	76 (29.2)	24 (31.6)	51 (30.5)	22 (43.1)	0.03
No	285 (76.8)	28 (9.8)	184 (70.8)	47 (25.5)	116 (69.5)	41 (35.3)	<0.001
Smoke inhalation							
Yes	21 (5.7)	8 (38.1)	13 (5.0)	10 (76.9)	15 (9.0)	13 (86.7)	0.006
No	350 (94.3)	39 (11.1)	247 (95.0)	61 (41.5)	152 (91.0)	50 (32.9)	<0.001
Year of admission							
1997–2001	76 (20.5)	12 (15.8)	62 (23.8)	20 (32.3)	37 (22.2)	15 (40.5)	0.01
2002–2006	87 (23.5)	10 (11.5)	75 (28.8)	21 (28.0)	46 (27.5)	18 (39.1	<0.001
2007–2011	82 (22.1)	14 (17.1)	72 (27.7)	18 (25.0)	41 (24.6)	14 (34.1)	0.1
2012–2016	126 (34.0)	11 (8.7)	51 (19.6)	12 (23.5)	43 (25.7)	16 (37.2)	<0.001

3.3. *Injury cause*

It was found that there is a difference in the frequency of the injury causes ($p<0.001$). The two most common causes of injury for elderly burn patients are fire (n=356, 44.6%) and boiling water (n=284, 35.6%), with these two causes of injury accounting for more than 80% of all burns. For the subgroups the rate of the cause of fire was 42.3% (n=157), 45.0% (n=117), and 49.1% (n=82), in the age groups 60–69, 70–79, and 80+, respectively ($p=0.3$). The rate for boiling water was 31.0% (n=115), 40.8% (n=106), and 37.7% (n=63), in the age groups 60–69, 70–79, and 80+, respectively ($p=0.03$).

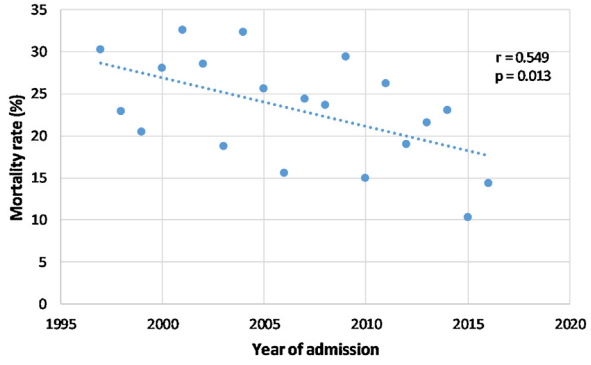

Fig. 1 – Relationship between mortality rate and year of admission.

3.4. *Mortality rate as a factor of cause of injury*

Our data show that there is a difference in mortality rates when the burns result from different causes ($p<0.001$). The mortality rates are highest, across all age groups, when the cause of injury was fire (41%, n=146) ($p<0.001$), where smoke inhalation is a factor. The next most life-threatening cause was explosion (22.8%, n=8) ($p=0.003$). Boiling water injuries, while having a high incidence, had a low mortality rate of 6.0% (n=17). Fig. 2 presents frequencies for each cause of injury, survival and mortality. Fig. 3 presents mortality rates for each cause of injury.

We found that smoke inhalation in addition to a burn injury is correlated with an increased mortality rate, for TBSA under

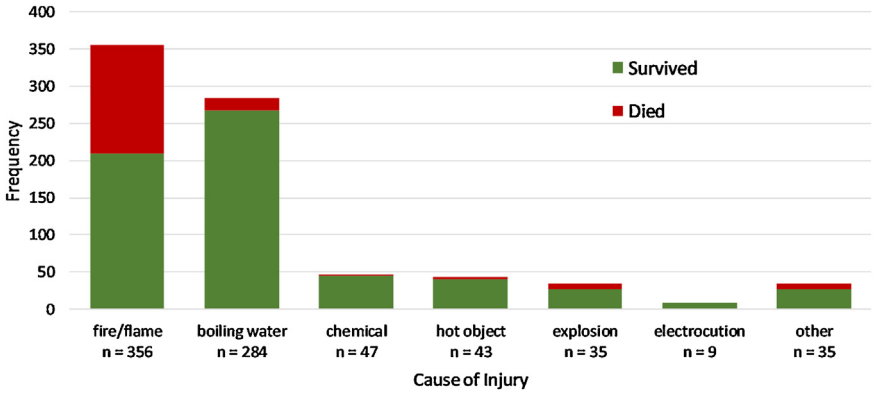

Fig. 2 – Frequency of survival and death according to cause of injury for elderly patients.

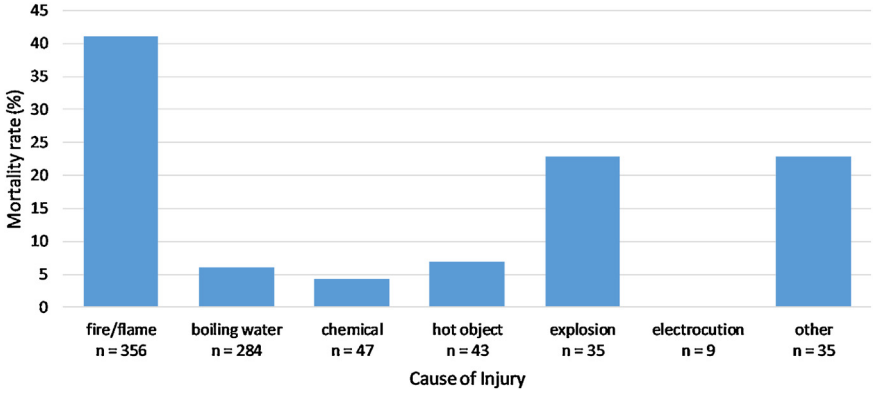

Fig. 3 – Mortality rate according to cause of injury for elderly patients.

20% across all age groups ($p<0.001$). Over the age of 70 years, with the presence of smoke inhalation and TBSA above 40%, the mortality rate was 100% (n=60).

3.5. *Admission to the regular ward and ICU*

The rate of ICU admission for elderly patients overall was 23.2% (n=185). The rate of admission to the ICU rises with patients' age, with admission rates of 21.0% (n=78), 22.3% (n=58), and 29.3% (n=49), for the age groups of 60–69, 70–79, and 80+, respectively, however this difference is not significant ($p=0.098$).

Moreover, our data indicate that any length of stay in the ICU, as opposed to admission and stay in a regular medical ward, indicates an increased mortality rate of 60.5% (n=112), compared to 11.2% (n=69) ($p<0.001$). The mortality rates for those admitted to ICU increase across the age subgroups with mortality rates of 42.3% (n=33), 70.7% (n=41), and 77.6% (n=38), for the age groups of 60–69, 70–79, and 80+, respectively ($p<0.001$). There was a corresponding increase in mortality for those not admitted to ICU across the age subgroups of 4.8% (n=14), 14.9% (n=30), and 21.2% (n=25) for the age groups of 60–69, 70–79, and 80+, respectively($p<0.001$).

The mortality rate with length of hospitalization is shown in Fig. 4. The highest mortality is for a length of stay of 1 day, after which there is a decline in rates, and generally similar mortality rates after 7 days.

3.6. *Need of surgery*

The need for surgery for elderly patients overall was 26.7% (n=213). This compares to 20% in the general population over a similar period [29]. The need for surgery is associated with high mortality rates, with 19.8% (n=116) mortality among elderly patients who did not undergo surgery and 30.5% (n=65) mortality for those who had surgery ($p=0.001$).

3.7. *Mortality as a factor of body surface and age*

Increased TBSA is a risk factor for mortality ($p<0.001$) (Fig. 5). It is apparent that the 60–69-year population has a lesser mortality rate in comparison to the other, older age groups. The most pronounced gap is seen in the 20–29% TBSA burn group, in which the mortality rate in the 60–69-year age group is only 6.3%, as opposed to 60%, and 66.7% in the 70–79 and 80+ year population, respectively ($p=0.001$). Importantly, the mortality rate of the 70–79-year-old population, with 40–89% burn, is 96.3%, which is significantly higher than the 72.5% mortality rate among the 60–69-year-old population ($p=0.02$). In lesser TBSA, the age group of 70–79 years shows lower mortality rates, 80% in TBSA of 30–39%, although it is not statistically significant ($p=0.2$). There are positive associations between TBSA and mortality across the age subgroups, and a positive associations between age and mortality in most TBSA subgroups.

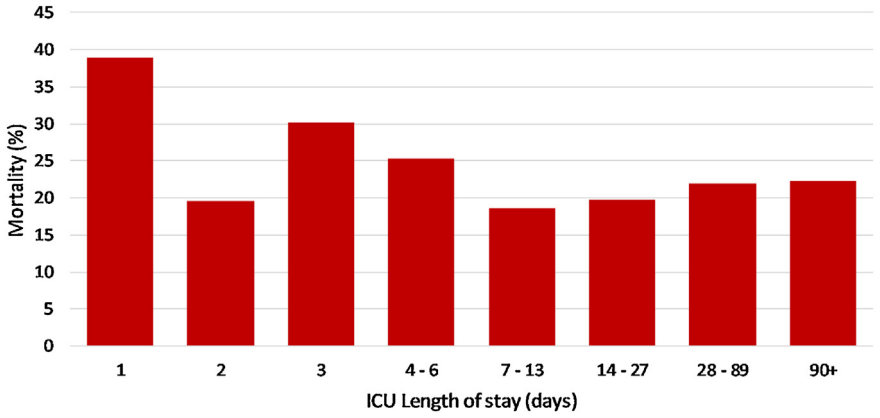

Fig. 4 – Mortality rate as a function of the number of days in hospitalization.

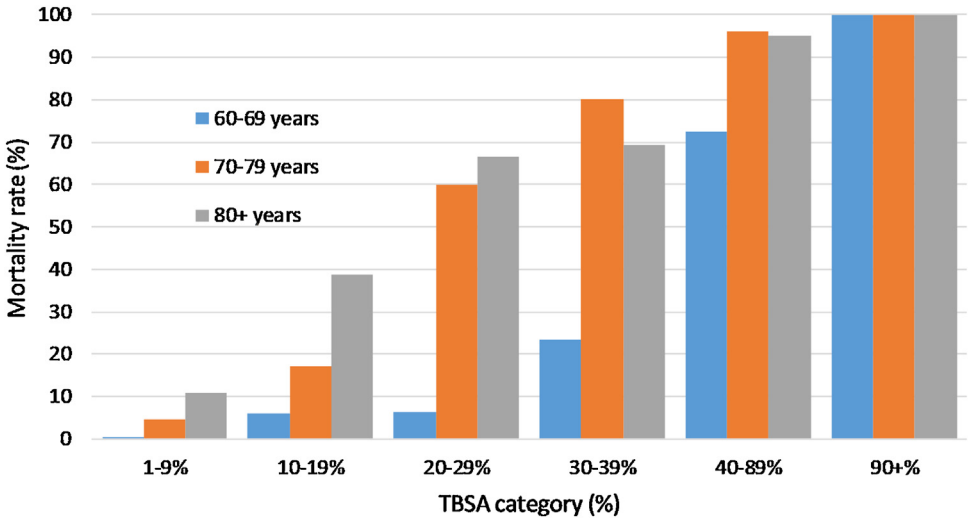

Fig. 5 – Mortality rate as a function of TBSA stratified by age.

4. Discussion

For the elderly, the risk factors for mortality follows the standard prognostic factors of age, TBSA, and inhalation injury, as well as cause of injury and need for surgery. The results also show the expected result that mortality in elderly burn patients increases with age. This concurs with former research that show that age plays a dramatic role in mortality rates [2,12,20,30], where increased comorbidities with age providing an important pathway for this negative prognostic factor [28].

The therapeutic and rehabilitative challenges regarding care for elderly burn patients pose weighty moral dilemmas. Past studies have attempted to set a standard for the need and method of care for elderly burn patients [12,28]. A review of the literature identified few studies that addressed medical protocols in the elderly population with the need to encompass issues as when only supportive care is best, or whether a patient would benefit from intensive care, with the goal to return elderly patients to the best quality of life possible.

Four aspects of the findings related to mortality were of importance when considering the care needs and vulnerabilities of elderly burn patients. Firstly, fire and flame were found to be the most common etiology for burns in our study population, being over 40%. This cause was also the most lethal, with mortality rates above 40%. The second was the subject of smoke inhalation, which constituted a major aspect of the fire/flame and explosion causes. It was found that when smoke inhalation was a part of the injury, for TBSA <20%, mortality rates increased significantly. For TBSA above 20%, mortality rates are no longer affected by smoke inhalation, and so for these TBSA percentages treatment should not be affected by the presence or absence of the smoke inhalation. The third element was the need for surgery, which also reduced survival rates significantly as it usually reflects the severity of the burn and other risks related to surgery risk overall. Finally, TBSA was a significant factor in mortality. It was evident in our study that when the TBSA ranges from 40%

to 89% there is a dramatic incline in mortality rates. Patients aged above ages 70 years with 40%–89% TBSA had higher mortality rates of greater than 95% compared to less than 80% mortality for those with TBSA of 30–40%. This mortality rate decreased even more when the TBSA was lower than 30%. It is important to note that the TBSA range that was investigated in this current study was very broad, for a sample that was relatively small. And so there exists the possibility that there was a significant variety in the survival rates also within the range of 40%–89%.

Past studies have shown that female patients have higher risk of mortality due to burn injuries [31,32], but in this study, mortality rates in the elderly seem to be equal between genders ($p=0.634$), and so this variable should not be a factor in establishing prognosis.

This study also found an overall decline in mortality rates in the population over time. Regression analyses showed a significant decrease of 2.9% per 5 years, with the decline being more significant with increasing age. This compares to much smaller decreases in mortality over a similar period for the general population [29]. Based on the results of this study, the reduction in mortality rate may have a number of explanations. Firstly, there has been an increase in the aggressive nature of treatment over this time period, mainly due to a changed attitude towards the management of older patients. Secondly, the treatment of co-morbidities for elderly patients has improved, and hence survival is less influenced by the presence of co-morbidities. Finally, the establishment of an intensive care burn unit in Israel, would likely have influenced treatment and patient outcomes. The results of this study indicate that improvements in facilities and burn care have most benefited the elderly burn patients, since the decrease in mortality rates over this time period is much larger for the elderly patients than for the general population. In addition, awareness of the particular needs of elderly burn patients has undergone significant developments over this time period. The decrease in mortality rates over this 20-year period, an almost halving of the rate at the start of the study period, demonstrates the capacity for improvements for this high-risk age group. The current high mortality in the elderly remains significantly higher than that for the general population, emphasizing improvements in burns care for the elderly may provide continued improvements for this high risk group.

By understanding the importance of these factors affecting mortality, health care professionals can better understand the vulnerabilities and hence care needs of these affected patients. This understanding brings with it some ethical dilemmas. To put this in perspective, according to our study, and the surrounding literature, when a patient experiences a TBSA burn of 40% or less, without any significant comorbidity or smoke inhalation, there is a fair and real chance of surviving the injury. For this reason, the patient, in these settings, should be given full active and intensive medical treatment. However, the overwhelming mortality rate in TBSA burns above 40% for patients over 70 raises the ethical issue when should we focus more on supportive care, which may ultimately reduce suffering.

The generalizability of this study to other Western countries is made difficult by the demographics of Israel. Former epidemiological studies in Israel, performed in the years 1997–2003 [33] and 2004–2010 [29], found that burn patients who were above the age of 60 years constitute only 3% of all patients over that period. Israel is considered a country with relatively low elderly population [34] compared to other Western countries, and therefore this may influence the conclusions. Taking these discrepancies into consideration would allow greater transfer of knowledge to other cultures.

4.1. *Limitations*

It is important to interpret the results of the study with an understanding of its limitations, as it was a retrospective study performed in one country. The samples used in this study were relatively small, and may be difficult to generalize to different countries. For example, in some western countries there may be different protocols regarding treatment of elderly patients with co-morbidities, resource availability, number and accessibility of burn units, and different health systems, public or private. It is also important to note that in this study the quality of life of the patients was not examined, and we plan to explore this subject in future studies.

5. Conclusion

With a rapidly aging global population fundamentally changing the focus of health care, it is more important than ever before to understand the health needs and vulnerabilities of this demographic. This study provided a comprehensive examination of burn injuries and their associated mortality specifically for the older ages groups 60 years+. Covering a period of 20 years we were able to identify several key factors that impact mortality in these older age groups. This study identifies a reduction in mortality rate over this period. This finding emphasizes improvement in the nature of treatment for the elderly with likely factors including; aggressive treatment options, improved co-morbidity management, and the establishment of specialized burns facilities. The study also raises strong ethical questions about the extent to which life-saving interventions should be offered when these may not alter mortality risk and may add further pain and discomfort to the burn patient. Quality of life and palliative care needs to be considered for some elderly patients, which warrants further investigation. The study demonstrates improvements for elderly burn patients with reduced mortality that will no doubt be further enhanced as burn care techniques and understanding are developed.

Conflict of interest

None.

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