



Survey on the current status of self-immolation attempts in Akita Prefecture: A cross-sectional survey

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ABSTRACT

Objective: Given the up to 70% fatality rate of self-immolation, with tragic consequences for survivors, proposals have been made for a global task force to prevent self-immolation. However, little research has recently been conducted on the actual situation of patients who attempt self-immolation in Japan. The current study aimed to investigate the actual situation of patients who attempt self-immolation in Akita Prefecture.

Result: Within Akita Prefecture, 13 individuals had attempted self-immolation in the past 5 years, with a predominance of a history of psychiatric disorders (46%). The following three novel findings were also revealed. First, patients with low a prognostic burn index tended to commit arson, while those with a high prognostic burn index tended to self-immolate. Second, patients attempting suicide tended to have a higher incidence of carbon monoxide poisoning. Third, those whose clothes caught on fire tended to have more severe burns, regardless of whether suicide was attempted.

Conclusion: Self-immolation tends to be serious, and prevention is imperative. In Akita Prefecture, the percentage of patients with a history of psychiatric disorders may be higher than commonly believed, and a more detailed understanding of the mental state of self-immolation is necessary in the future to develop effective prevention measures.

1. Introduction

Self-immolation has a fatality rate of up to 70%, with tragic consequences for the survivors [1]. Some studies have also shown that self-immolation is an apparent independent predictor of high mortality regardless of burn severity [2,3]. As such, proposals for a global task force have been established to prevent self-immolation in 2019 [4]. Japan has a suicide mortality rate of 18.5/100,000, which ranks seventh in the World Health Organization's country-by-country report [5], with self-immolation rates accounting for approximately 1% of the total number. Nonetheless, a limited number of surveys have been conducted on the actual situation of patients attempting self-immolation in Japan over recent years [6,7]. The current study sought to survey the actual situation of patients attempting self-immolation in Akita Prefecture.

2. Material and methods

2.1. Study design

This study was a cross-sectional questionnaire survey.

2.2. Study setting and population

We surveyed patients transported to the emergency room for burns in Akita Prefecture from January 1, 2015, to December 31, 2019, using data from patient care reports stored at each of the 13 fire departments in Akita Prefecture. Reports on 155 patients were included after duplicate reports, reports with missing data, and reports of burns without flame were excluded (Fig. 1). The questionnaire obtained data regarding age, gender, burn information (cause, method, location, time, history), total body surface area (TBSA), burn index (BI), prognostic burn index

Abbreviations: BI, burn index; CMP, carbon monoxide poisoning; PBI, prognostic burn index; TBSA, total body surface area.

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(PBI), presence of airway burns or carbon monoxide poisoning (CMP), route of transport, and destination hospitals. The depth and area of burns were also determined using data from the destination hospital to ensure accuracy. CMP was defined as carboxyhemoglobin levels higher than 5% or a high oxygen flow treatment in accordance with CMP. Of the cases of attempted suicides, those cases in which patients set themselves on fire were defined as self-immolation, and those in which they set other things on fire for suicidal purposes were defined as arson.

2.3. Ethics committee approval

This study was approved by the ethics committee of the Akita Medical Association (approval number: 34).

2.4. Statistical analysis

All analyses were conducted using R4.0.2 (CRAN), with $p = 0.05$ indicating statistical significance. Descriptive statistics were used to explain the sample characteristics. The Mann–Whitney U test was applied to examine injury severity in the suicide and non-suicide group, while Fisher’s exact test was applied to examine the method and severity of injury in the suicide group, the presence of airway burns, and CMP in the suicide and non-suicide groups.

3. Theory/calculation

The Burn Registry of the Japanese Society for the Study of Burns is a comprehensive collection of data regarding patients suffering burns throughout Japan. In principle, however, only facilities certified as specializing in burn treatment are registered. Therefore, this registry does not include patients with mild-to-moderate burn injuries or those who died of burns at an acute-care hospital that did not specialize in burn treatment. Akita Prefecture has a population of approximately 950,000 and has had the highest suicide mortality rate in Japan for majority of the past 20 years. We believe that a detailed survey and analysis of the actual situation of patients in this prefecture who attempt self-immolation will enable us to propose more practical preventive actions.

4. Results

All fire departments answered the questionnaire. Table 1 shows the characteristics of the patients.

Of the patients, 13 had attempted suicide (the suicide group) and 142 patients, including 14 who were burned, had not (the non-suicide group; Fig. 1).

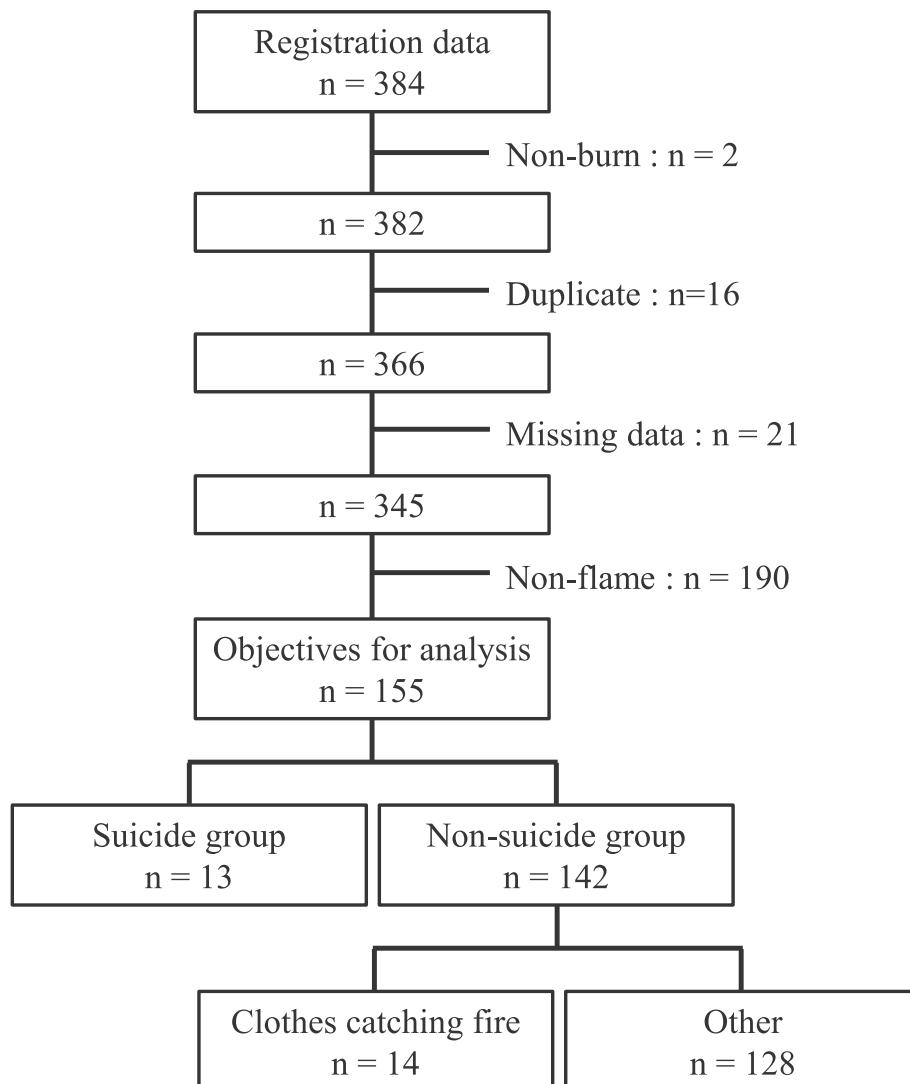


Fig. 1. Flowchart review.

Table 1
Characteristics.

	Suicide group (n = 13)			Non-suicide group (n = 142)		
	median	IQR	range	median	IQR	range
Age (y.o)	52	27	33–78	66	29.8	11–95
TBSA(%)	14	80	0–100	1	7.8	0–100
BI	9	76	0–100	0.5	4.2	0–100
PBI	68.25	80	33–167	69.5	34	11–170
Sex	male	8		male	91	
	female	5		female	51	
Cause of burn	Self-immolation	7		Clothes catching fire	14	
	Arson	6		Other	128	
Year	2015	3		2015	38	
	2016	0		2016	20	
	2017	4		2017	28	
	2018	2		2018	17	
	2019	4		2019	39	
Month	Jan.–Mar.	5		Jan.–Mar.	38	
	Apr.–Jun.	3		Apr.–Jun.	38	
	Jul.–Sep.	3		Jul.–Sep.	32	
	Oct.–Dec.	2		Oct.–Dec.	34	
Time	6–17	6		6–17	80	
	18–5	7		18–5	62	
History of suicide	+/-	3/10				
Airway burn	+/-	8/5		+/-	49/93	
CMP	+/-	7/6		+/-	22/120	
Alcoholism	+/-/NA	1/7/5		+/-/NA	1/101/40	
Psychosis	+/-/NA	6/4/3		+/-/NA	14/80/48	

Abbreviations: BI, burn index; CMP, carbon monoxide poisoning; IQR, interquartile range; PBI, prognostic burn index; NA, not available; TBSA, total body surface area.

4.1. Patients

A total of 13 suicide attempts (8 males, 5 females) was identified, with an average of 2.6 per year (Fig. 2). Patients had a median age of 52.0 (33–78) years, with no seasonally skewed month and no patients in May, November, or December (Fig. 3). In terms of age, only males were present in the age group of 60–79 years, and males accounted for 75% patients aged over 50 years (Fig. 4).

4.2. Suicide method

Suicides were attempted through either burning (seven patients) or

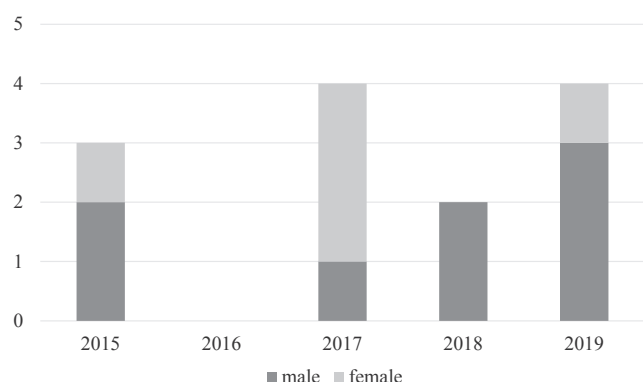


Fig. 2. Changes in the number of burn patients over a 5-year period.

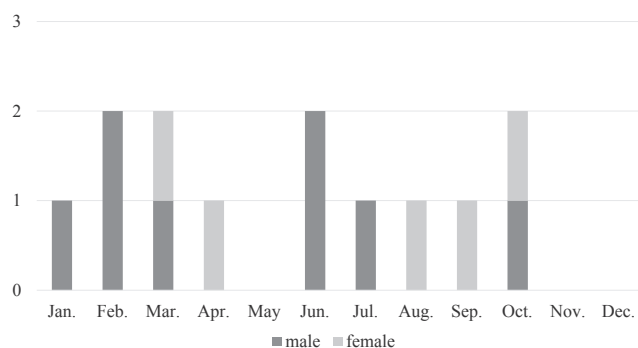


Fig. 3. Number of burn patients by month.

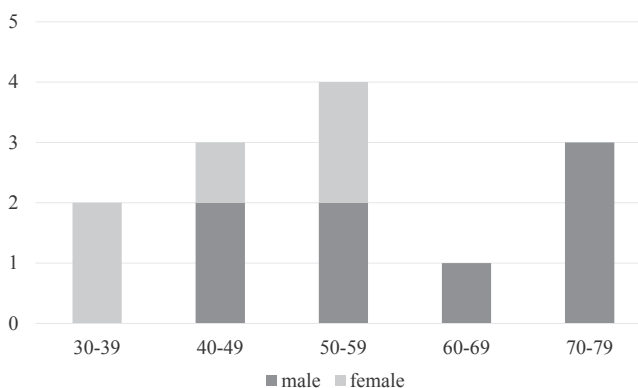


Fig. 4. Age distribution according to sex.

arson (six patients). Kerosene or gasoline was used for self-immolation. In cases of arson, blankets, laundry, carpets, and other materials were used for burning.

4.3. Burn injuries

TBSA was 14.0% (0%–100%), BI was 9.0 (0–100), and PBI was 68.25 (33–167). Patients were then divided into two groups according to TBSA distribution: less than 30% and more than 60% (Fig. 5). In particular, four cases with PBI > 130 were confirmed to have died immediately after transport or several hours later (Fig. 6). We further compared the suicide methods by dividing the patients into two groups: low (PBI < 90) and high (PBI ≥ 90) PBI groups. Accordingly, our findings showed that the low PBI group tended to commit arson, while and high PBI group tended to self-immolate (p < 0.05, φ = 0.7319) (Table 2).

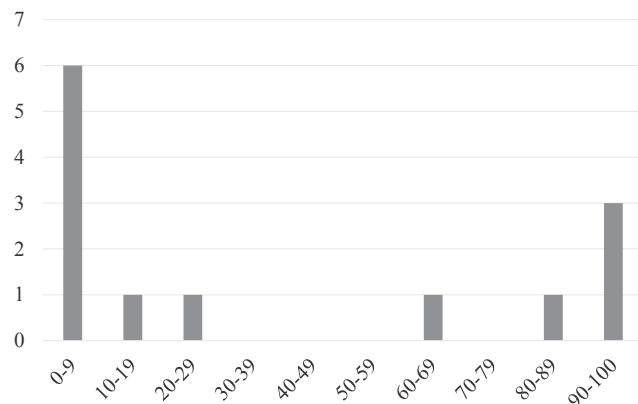


Fig. 5. Distribution of total body surface area.

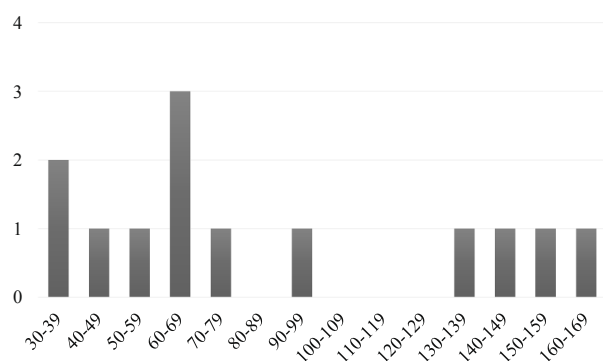


Fig. 6. Distribution of prognostic burn index.

Table 2 Relationship between suicide methods and severity of burn.

	low PBI group	high PBI group
self-immolation	2	5
arson	6	0

P value < 0.05, φ = 0.7319.

4.4. Motives for suicide

Five patients had schizophrenia with auditory hallucinations as the main motive for suicide, among whom four had low PBI (Fig. 7) and three had a history of suicide attempts by jumping, hanging, and self-immolation, respectively. Two patients who attempted suicide due to depression and financial reasons had complex suicides with combined neck and left wrist incisions, respectively.

4.5. Location of suicide attempt

The most frequent location of suicide attempts for both the low and high PBI groups was at “home,” with other locations including “garden,” “car,” “mountain,” and “park” (Fig. 8).

4.6. Comparison between the suicide and non-suicide groups

The non-suicide group had a median age of 66.0 (11–95) years, TBSA of 1.0% (0%–100%), BI of 0.5 (0–100), and PBI of 69.5 (11–170). No significant difference in TBSA or PBI was noted between both groups (Fig. 9). The analysis of outliers in TBSA of the non-suicide group

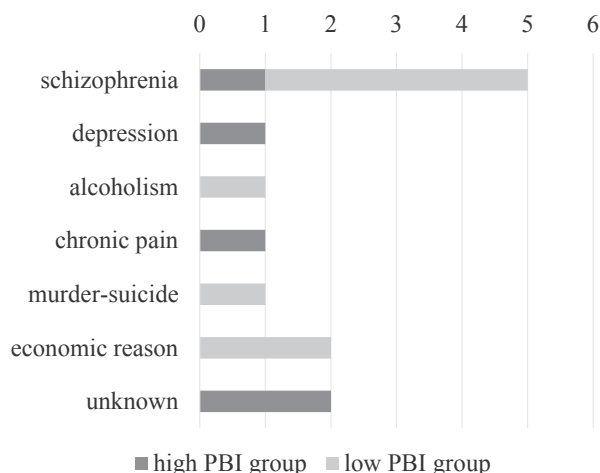


Fig.7. Motives for suicide.

revealed that most of the cases with TBSA > 80% (5 of 6) had their clothes catch fire. This finding suggests that clothes catching fire was a major cause of accidental burns. After comparing the severity between those who clothes caught fire and other groups, we found a significantly higher severity in the former than in the latter among the non-suicide attempt group and overall group (Figs. 10 and 11). Furthermore, no significant difference was observed between the suicide and non-suicide groups whose clothes caught fire (including self-immolation) (Fig. 12). After analyzing the number of airway burns and CMP complications between both groups, we found that CMP was significantly more prevalent in the suicide than in the non-suicide attempt group (p < 0.05, φ = 0.2726) (Table 3).

5. Discussion

The current study revealed the following three points. First, among those who attempted suicide, the low PBI group tended to commit arson, while the high PBI group tended to self-immolate. After dividing suicide attempts into severe and mild groups, our results showed that the mild group preferred arson as the suicide method. The reason for the mild injuries could have been that patients became distressed by the smoke and could not endure it, leading them to flee the site or extinguish the fire. On the other hand, some cases involved other people (victims of murder-suicide and arson) and were considered to reflect serious social and economic implications. Second, patients who attempted suicide tended to have more CMP complications, which might be related to the previously discussed reason. In other words, those who opted commit arson as a suicide method are expected to be at high risk for airway burn and CMP given that they leave the scene after enduring extreme heat. However, while the current study found a significant difference in CMP, the absence of a significant difference in airway burns could have been due to information bias, which will be discussed later. Third, those whose clothes caught fire tended to have more severe flame burns, regardless of whether or not they attempted suicide. Previous reports have indicated that individuals attempting suicide had strong preparedness and were more severely injured compared to those with other flame burns [6]. However, the current study showed that among the non-suicide attempt group, those patients whose clothes caught fire had serious injuries that did not differ significantly from those who attempted self-immolation. This suggests that although self-immolation can be severe due to their willpower, having one’s clothes catch fire might be, by itself, an independent risk factor for severity.

A study by Thombs et al. based on the National Burns Registry in a more economically developed country showed that 10% of those who committed self-immolation were diagnosed with psychiatric disorders and/or substance abuse, 5.8% were diagnosed with alcohol abuse or dependence, and 3.3% were diagnosed with drug addiction to cocaine or opioids [8]. In addition, Hahn et al. showed that many people who commit self-immolation have impulsive behaviors with a background of psychiatric disorders or substance abuse (alcohol or drug addiction), or are reacting to stressful events or loss [9]. The present study confirmed a history of psychiatric disorders in 6 of the 13 patients (46%) and alcoholism in 1 patient (8%) but no drug addictions. However, we could not confirm such histories in two cases because the patients died, and information about alcoholism or drug addiction might not have been actively sought or obtained during the transport of critically injured patients. According to the data published by the Ministry of Health, Labor and Welfare, there is not high incidence of psychiatric disorders in Akita Prefecture. Therefore, although may be considered only a reference value, the percentage of individuals with a history of psychiatric disorders among those who attempted self-immolation in Akita Prefecture could perhaps be greater than commonly believed, which warrants future investigations. Furthermore, studies have reported that patients with schizophrenia have higher rates of “suicide attempt within one year” and “previous suicide attempts” compared to those with depression, with “suicide attempt within one year,” in particular, increasing

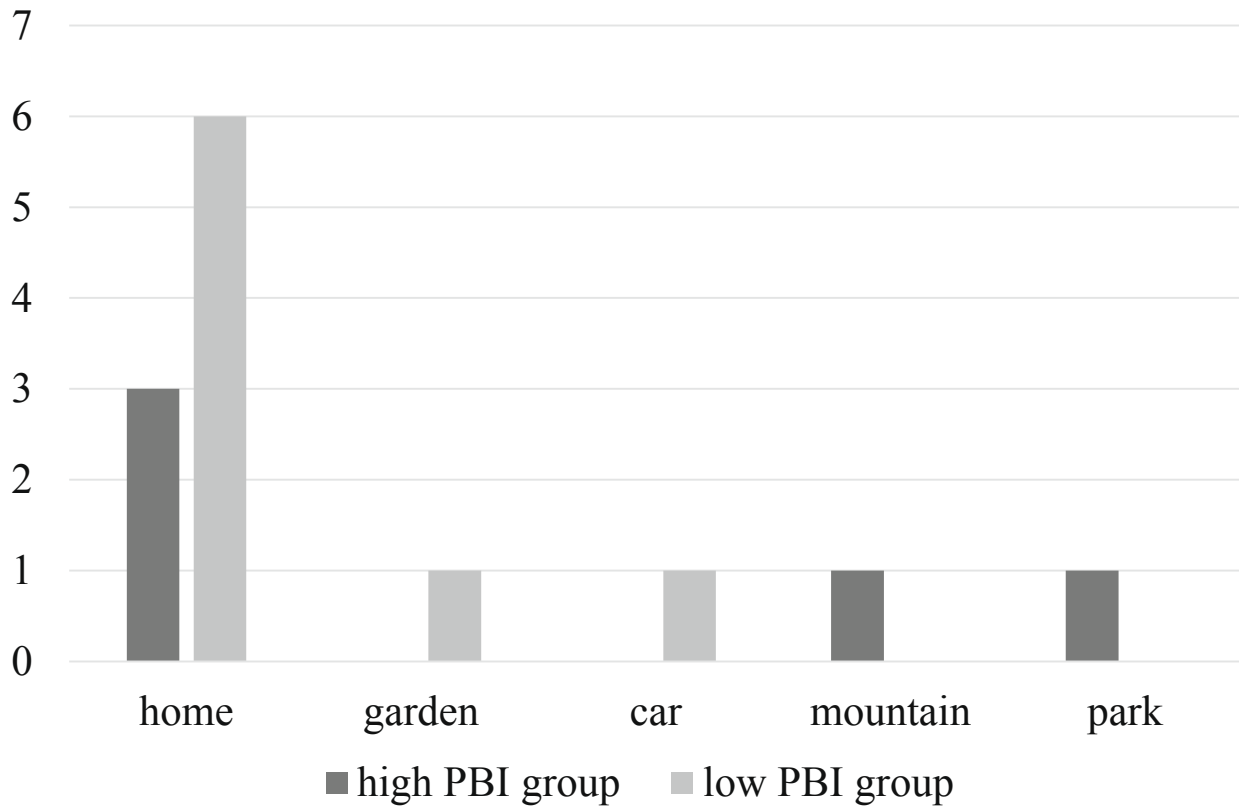


Fig. 8. Location at which suicide was attempted.

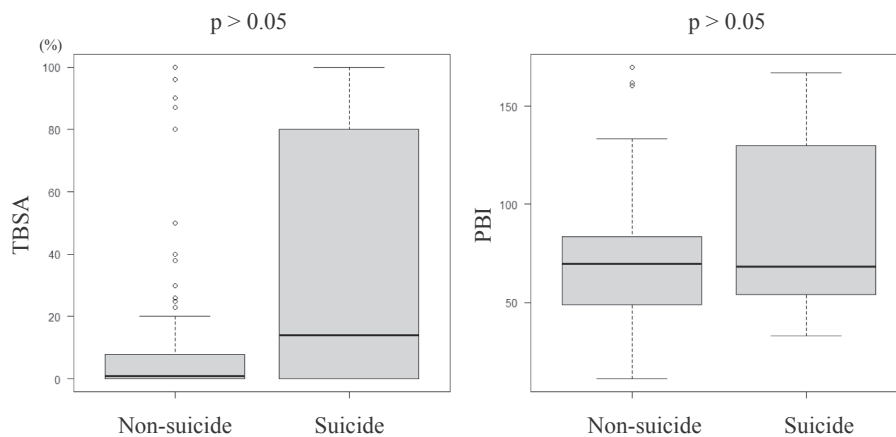


Fig. 9. Comparison of total body surface area and prognostic burn index between suicidal and non-suicidal groups.

the severity of the suicide method [10]. In the present study, two of the six patients with schizophrenia had a history of suicide attempts. Although patients with schizophrenia who had no history of suicide attempt often had mild injuries, there is a need for focused psychological care given concerns regarding possibly more lethal methods of suicide in the future.

In addition, in this study, the causes of burns in the non-suicide group included candles from Buddhist altars (five cases), burning of garbage (three cases), stoves (two cases), and lamps (one case). Most of the accidents occurred in situations in which fire is used frequently on a daily basis and resulted when the clothes of elderly individuals living alone caught fire.

Although CMP tended to be more frequent in patients who attempted suicide in this study, this could have actually been caused by

information bias given that CMP is often suspected based on the situation at the scene, with high doses of oxygen being administered. Akita Prefecture is part of the Tohoku region that had not been affected by the Great East Japan Earthquake 2011. The epicenter of the earthquake was on the Pacific Ocean side, approximately 300 km away from Fukushima near the epicenter. Thus, the direct damage was lesser than that on the Pacific Ocean side. However, the subsequent impact on the economy and lifestyle was not insignificant. Given our inability to confirm the reason for the suicides in the two cases that died after arriving at the hospital, it remains unclear whether the deaths were related to the earthquake. In addition, the first reported cases of suicides in Japan possibly linked to the global COVID-19 pandemic had been confirmed on January 16, 2020, with the first cases in Akita Prefecture having been confirmed in March. Considering that the state of emergency had been

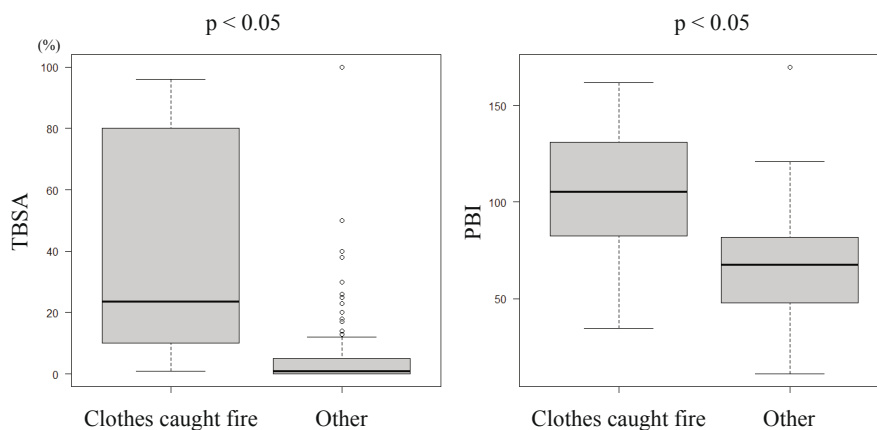


Fig. 10. Comparison of total body surface area and prognostic burn index between those who clothes caught fire and other patients in the non-suicidal groups.

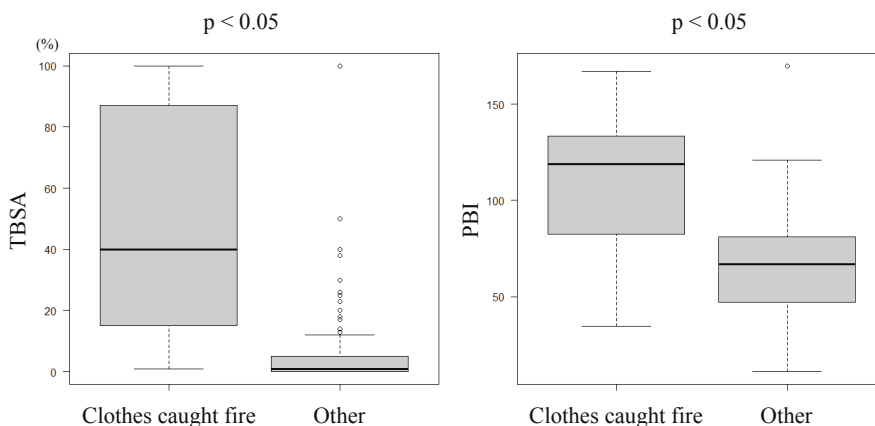


Fig. 11. Comparison of total body surface area and prognostic burn index between those who clothes caught fire and entire patient groups.

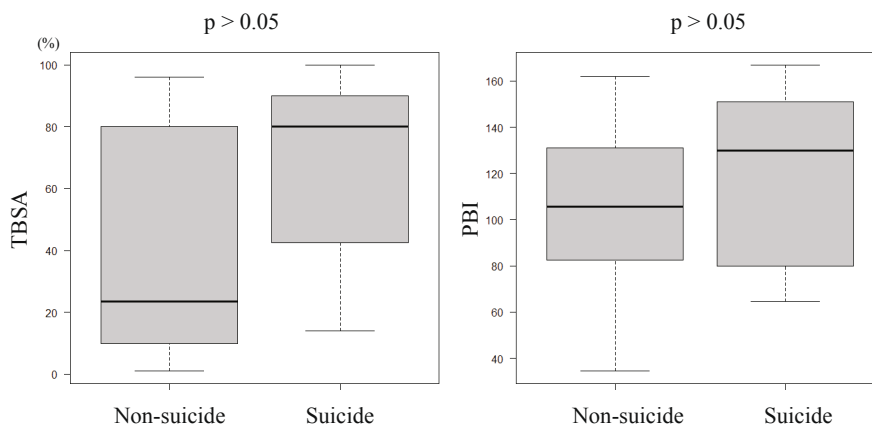


Fig. 12. Comparison of total body surface area and prognostic burn index between suicidal and non-suicidal groups according to whether their clothes caught fire.

declared on April 7, this could not have impacted the current study.

6. Conclusion

This study conducted a survey regarding self-immolation in Akita Prefecture. Accordingly, 13 self-immolations had been identified

Table 3

Comparison of airway burn and carbon monoxide poisoning between suicide and non-suicide groups.

	Non-suicide group	Suicide group
Airway burn		
(+)	49	8
(-)	93	5
Carbon monoxide poisoning*		
(+)	22	7
(-)	120	6

*P value < 0.05, $\phi = 0.2726$.

throughout the past 5 years, with a slight male predominance. The novel findings include the following: among the suicide group, those with low PBI tended to commit arson, while those with high PBI tended to self-immolate; the number of CMP tended to be slightly higher in the suicide group; and those whose clothes caught fire (including self-immolation) tended to have more severe flame burns, regardless of whether suicide was attempted. Furthermore, in Akita Prefecture, the percentage of patients with a history of psychiatric disorders may be higher than commonly believed. Patients who attempt self-immolation require long-term medical and nursing support even after epithelialization due to the severity of the injury. Therefore, focusing on prevention among high-risk patients, together with societal support, is necessary. A more detailed understanding of the mental state of self-immolation is necessary in the future to develop effective prevention measures.

Author contribution

NH provided conceptual advice. All authors have read and approved the final manuscript.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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