Travel Medicine and Infectious Disease 18 (2017) 36–40

Contents lists available at ScienceDirect

Travel Medicine and Infectious Disease

journal homepage: www.elsevierhealth.com/journals/tmid

Brief report

Foreign citizen mortality in Iceland January 2006 – December 2016

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ARTICLE INFO

Article history:
Received 9 November 2016
Received in revised form
3 January 2017
Accepted 21 March 2017
Available online 23 March 2017

Keywords:
Tourist
Fatality
Iceland
Mortality
Epidemiology

ABSTRACT

Background: In recent years, tourism has become the number one account for foreign exchange income in Iceland, overtaking the fisheries industry and aluminium production. The rise of tourism has strongly affected Icelandic society in various sectors. With the increase of tourists visiting Iceland, the number of foreign citizens that died and were autopsied also rose.
Method: Data were collected from the Department of Forensic Pathology at Landspitali University Hospital in Reykjavik for the period January 2006 – December 2016.
Result: During this time there were 109 autopsies performed on foreign citizens of which 58 died from natural causes, 49 were injury deaths and in 2 cases no certain cause of death could be determined. Most represented were citizens from North America, United Kingdom and Germany (each 11%). The main causes of death were cardiovascular events (41%) followed by unintentional injuries (34%).
Conclusion: The research at hand shows the significant influence of tourism on Forensic Medicine and provides an update on deaths of overseas travellers. Furthermore this study points out variable risks of travel-related injuries and deaths in Iceland.

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1. Introduction

Travelling either for business or pleasure has been growing worldwide during the last years [1]. 1184 million tourists have been travelling the world in 2015, accounting for a continuous yearly above-average growth of more than 4% [1]. With a population of 332.000 people and an area of 103.000 km^2 [2] Iceland is a rather small but very popular country when it comes to travel destinations.

The number of foreign tourists coming to Iceland, either as a stop-over or a long-term holiday, has more than doubled since 2010 [3]. The majority of foreigners come on flights through Keflafik International Airport (around 1.29 million in 2015) and a minor number uses the ferry „Norræna“ through the small town Seydisfjördur (approx. 18.000 in 2015) [3]. This development has made tourism together with fisheries industry and aluminium production one of the country's most important economic sectors.

With an increase of tourism, travel-associated morbidity and mortality rises (Fig. 1). All foreign citizens that died of a possibly unnatural death are being autopsied at the Forensic Medical Department of Landspitali University Hospital in Reykjavik.

Travel to Iceland brings exposure to low temperatures, a quick change in weather and windy conditions. At times of vulcano activity (last eruption was the volcano „Bárdarbunga“ in 2014) tourists might be faced with the possibility of high levels of toxic fumes. Together with unusual physical activities such as glacier climbing, caving expeditions or cold water diving some foreigners overestimate the capability of their cardiovascular and respiratory system with sometimes fatal consequences. In the study at hand our objective was to analyze variable risks of travel-related injuries and deaths in Iceland and to describe the epidemiology of foreign citizens that died during their stay abroad.

2. Material and methods

We evaluated data from the database FlexLab/SymPathy of the Forensic Medical Department in Reykjavik for the period from January 2006 to December 2016. All autopsies that were performed during that time were analyzed. The cases were classified in: age, sex, citizenship and cause of death. The age was subdivided into age groups (Table 1). All data were documented into a Microsoft Excel database. Causes of death were categorized in cardiovascular, respiratory, cancer, unintentional injury, intentional injury (suicides)

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http://dx.doi.org/10.1016/j.tmaid.2017.03.011
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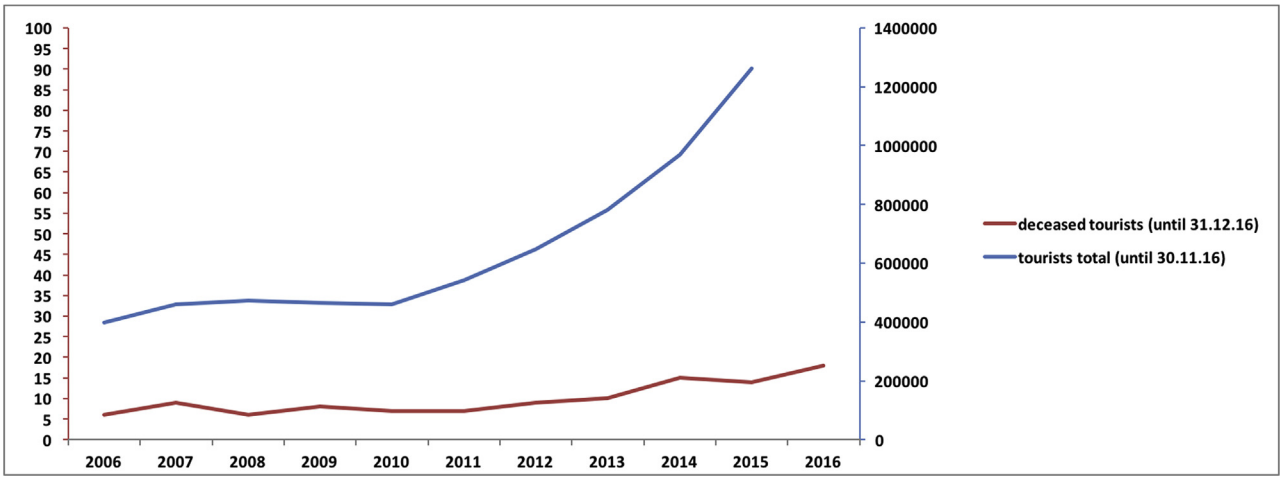

Fig. 1. Tourists visiting and dying in Iceland 01/2006–12/2016.

Table 1
Age groups of autopsies performed 01/2006–12/2016.

Age group	Icelandic citizens	Foreign citizens
0-14 years	49	1
15-24 years	122	7
25-34 years	186	13
35-44 years	216	13
45-54 years	324	15
55-64 years	398	27
65-74 years	306	18
75-84 years	187	11
85 + years	40	2
unknown age	–	2
total	1828	109

Table 2
Causes of death in Iceland 01/2006–12/2016.

Cause of death	Definition	Icelandic citizens	Foreign visitors
Cardiovascular	arteriosclerotic heart disease, ischemic heart disease, myocardial infarction, cardiac arrhythmia, coronary heart disease, aortic stenosis, aortic aneurysm, vascular obliteration, cardiomyopathy, myocardial fibrosis and others	733	45
Respiratory	thrombus, emboli, pneumonia, inflammation, edema, aspiration, others	135	6
Cancer	adenocarcinoma, lung cancer, liver cancer, malignant lymphoma, colon carcinoma, other malignant neoplasms	13	–
Unintentional injury (accidents)	traffic accidents, aircraft accidents, drowning, intoxication (including drugs, alcohol and CO), fall, others	435	37
Intentional injury (suicides)	hanging, gunshot, drowning, intoxication (including drugs, alcohol and CO), fall from heights, others	364	12
homicides	gunshot, strangulation, sharp trauma, others	14	–
Others	gastrointestinal disorders, infectious disease, sepsis, SIDS, unknown	134	9
Total		1828	109

and others (Table 2). Additionally, the deceased were divided into Icelandic and foreign citizens. The home countries of the visitors were assigned to the continents or regions they belong to (Table 3).

Our results were analyzed from an epidemiological as well as forensic point of view and compared to one another.

3. Results

From January 2006 to December 2016 there were 1937 autopsies performed at the Forensic Medical Department in Reykjavik of which were 109 foreign citizens (29 female, 80 male) and 1828 Icelandic citizens (493 female, 1335 male). The number of autopsies of foreigners increased from 6 in 2006 to a maximum of 18 in 2016 (Fig. 1). Around 6% of all autopsies in Iceland were performed on foreign visitors. According to our research, the majority of deceased tourists came from Germany, the U.K. and North America, each with 12 performed autopsies (11%) in 11 years (Fig. 2, Table 3).

The majority of foreign citizens died from natural diseases (53%). The most common causes of natural deaths amoung foreign citizens in Iceland were cardiovascular (45 cases) and respiratory (6 cases) failure, accounting for the majority of all natural deaths (Table 2, Fig. 3).

49 unnatural tourist deaths (45%) occurred during the last 11 years in Iceland of which unintentional injuries accounted for 76% (Table 2, Fig. 3). Amoung unintentional injuries, the most common ones were traffic accidents (33%) and drowning (22%), which were more frequent among younger visitors. For instance, 10 fatal traffic accidents occurred on Icelandic roads in 2015, involving one tourist

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