

Profile of mortality from external causes among Seventh-day Adventists and the general populations

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Abstract *This paper aimed to compare the profile of mortality from external causes among Seventh-day Adventists and the general population of Espírito Santo from 2003 to 2009. A search of Adventists was performed in the nominal database of the Mortality Information System containing data on Adventists provided by the administrative offices of the institution. Deaths from external causes occurred during the study period were then divided into two groups: Adventists and the general population. Adventists had lower proportional mortality from external causes (10%) than the general population (19%), and males were the main reason for this difference. In both groups, deaths prevailed in the 20-29 years age group. Deaths from accidental causes were most significant among Adventists (68.08%), while deaths from intentional causes related to assault and self-inflicted injuries were more significant in the general population (53.67% of all deaths). The standardized mortality ratio for external causes was 41.3, thus, being Adventist reduced mortality by 58.7%. It is believed that the benefit of Adventists observed for mortality from external causes is related to this group's abstinence from alcohol consumption.*

Key words *External causes, Mortality, Alcohol abstinence*

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Introduction

External causes represent a great Public Health problem and are an unquestionable challenge to managers of public policies. In Brazil, between 2000 and 2009, external causes were the third most frequent cause of death in Brazil, and the second cause in some regions. In the analysis by age group, external causes ranked first in the population aged between 10 and 39 years¹.

Alcohol is an important factor in the multifactorial determination of external causes. It is estimated that 46% of deaths from traffic accidents, suicide, homicide and other types of intra- and interpersonal violence are related to alcohol consumption, directly affecting mortality due to external causes².

The World Health Organization (WHO) estimates that there are approximately 2 billion people worldwide consuming alcoholic beverages and that 76.3 million of them have some form of alcohol-related disorder³. Globally, alcohol causes about 1.8 million annual deaths, 3.2% of all deaths. Moreover, about 4% of all diseases are related to its use. Of the total numbers of deaths attributed to alcohol, 32% are the result of unintentional injuries, that is, traffic accidents, drowning, burns, falls and others⁴.

Some populations have aroused the interest of the academic community by showing characteristics peculiar to their lifestyle. Of the various groups surveyed and described in the literature, one of particular interest is the Seventh-day Adventists (SDAs). SDAs are a Christian denomination, with more than 17 million regular members worldwide, with about 1,200,000 in Brazil and 50,000 in Espírito Santo^{5,6}.

SDAs preach complete abstinence from alcohol, tobacco and other drugs. The institution also recommends, but does not require, a vegetarian diet with plenty of fruits, grains, vegetables and nuts. However, only a minority of members are completely abstaining from meat food. SDAs still avoid intake of coffee, black tea and other beverages containing caffeine, spicy condiments, as well as highly refined foods (such as refined sugar and white wheat flour). Physical exercises and adequate night rest are also highly recommended⁷⁻¹¹.

The health experience of the SDA population has been studied since 1958¹². There are over 300 scientific papers addressing health studies of SDAs published in scientific journals in Denmark, the Netherlands, Norway, Japan, Australia, as well as the well-known studies of Loma Linda University, California, United States¹².

It is noteworthy that the studies already published on SDAs are based on the impact of SDAs' life habits on general mortality, mortality from chronic degenerative diseases and non-fatal events also linked to chronic degenerative diseases. The impact of life habits, especially alcohol consumption, on external causes has not yet been evaluated.

This study aims to compare the profile of mortality from external causes between SDAs and the general population of Espírito Santo from 2003 to 2009.

Methods

This is a descriptive observational study on deaths from external causes in the state of Espírito Santo from 2003 to 2009, separately for SDAs and general population deaths.

Regarding data collection, the Adventist Church Management System was used to identify deceased SDAs; the State Health Secretariat of Espírito Santo's Mortality Information System (SIM) database was consulted for death certificates; and data from the Brazilian Institute of Geography and Statistics (IBGE) available at the electronic address of the Information and Informatics Department of the Unified Health System was consulted for the population of Espírito Santo each year.

The Adventist Church Management System is an online system used for registration control of members. Data of each member are entered when baptized, which in the denomination occurs after the individual acquires maturity of knowledge of the doctrines and has the power of decision regarding membership. When members are removed from the church (either by abandonment or death, in which case the date of death is informed), their registration is notified and directed to removed members.

Espírito Santo-related system data provided by the administrative headquarters of the church in the state, the Espírito Santo Association (AES) and the Southern Espírito Santo Association (ASES) were used in this study. Data on members removed by death and living members were requested for each year studied. Computerized members' registration in the state started in 2003, and thus was selected as the study's onset.

The state database of the Ministry of Health of the SIM is a consolidation of state death certificates, in which it is possible to access the deceased's name. Data on deaths occurring up to

2009 were collected, since data after 2009 were preliminary at the time of their delivery.

Following data collection, individuals were separated into groups mentioned earlier. Initially, deceased SDAs' names were searched manually in the state database of the SIM. The probabilistic record relationship was used with RecLink III program version 3.1.6.3160 when SDAs were not found in the manual search. In both manual search and the probabilistic relationship, when an individual with the same name was found, other information were checked, such as date of birth, membership, address and date of death to confirm that they were the same person. Upon checking at least three pieces of information, the individual was considered found. A linkage between the SIM and living SDAs was also used to detect possible SDAs that had died and had not yet been removed due to death in the Associations.

After the groups were separated, the total number of deaths from all causes and the number of deaths from external causes were calculated for the proportional mortality calculation. It should be noted that fetal deaths were not accounted for. Subsequently, deaths from external causes were described for gender, race/color, marital status and schooling in both groups.

In order to know the share of deaths from external causes of morbidity and mortality corresponding to the group of accidental deaths and to the group of deaths from violence in both populations, the distribution of deaths according to the mentioned groups was analyzed. Other external causes were not included in this analysis.

We then calculated the expected and observed deaths from external causes for the SDA population in each age group, with the population living in Espírito Santo as the reference population.

In this analysis, deaths of individuals under 20 years of age in both groups were excluded because there were no children and few adolescents among SDA deaths, since the member starts to have his name registered in the church records only when baptized. It was decided to opt for this age due to the large number of deaths from these causes in Brazil in young adults aged 20 to 39 years¹. Moreover, individuals under 20 years of age were not accounted for in exposed populations (living).

The number of expected deaths was obtained by multiplying the mortality rate from external causes of morbidity and mortality of the standard population by age group (rates adjusted every 10 years: 20-29, 30-39, 40-49, 50-59, 60-69, 70-79, 80 and over) by the population of interest in the same age group (living SDAs).

It should be noted that only one mortality rate per age group for the years 2003 and 2009 was calculated by the arithmetic mean of annual deaths of the 7-year period by age group, by the arithmetic mean of the 7-year period for the population of Espírito Santo for the same age group. Regarding SDA (living) population, population means of each age group between 2003 and 2009 were also used.

The number of observed deaths was obtained by the sum of the arithmetic means of SDA population deaths by age group in the seven years studied in each chapter.

Finally, the Standardized Mortality Ratio (SMR) was calculated for deaths from external causes. The SMR was obtained through the ratio between the number of deaths observed (which was the sum of deaths observed in all age groups), and the number of expected deaths (the sum of expected deaths in all age groups) multiplied by 100 % [$SMR = (\text{observed deaths} / \text{expected deaths}) \times 100$]. It was considered that SMR would be significant if the SMR value and the upper limit of the Confidence Interval (CI) were lower than 100, or if the SMR and lower limit of the CI were greater than 100. The CI was obtained using the statistical program R version 2.15.1.

Following the Brazilian ethical precepts, the research was submitted to the Research Ethics Committee of the Health Sciences Center, and to the state network (Children Hospital "Nossa Senhora da Glória").

Results

Between 2003 and 2009, 1,015 deaths were recorded in Espírito Santo according to data from the Adventist Church Management System. Of these, 21.5% (216) were not found in Espírito Santo's SIM (1.9% due to incomplete data to enable search, 1.7% due to uncertainties and 17.9% were not located by either search method). With linkage of living SDAs, 153 additional deceased individuals were found, totaling 952 deaths.

Table 1 shows the proportional mortality of deaths from external causes of morbidity and mortality between SDAs and the general population. There were no gender-neglected deaths among SDAs and in the general population such deaths represented 0.06% of deaths.

Table 2 shows the description of deaths from external causes according to variables gender, age, race/color, marital status and schooling.

In Table 3, deaths from external causes are described for accidental and intentional causes re-

Table 1. Proportional Mortality of Deaths from External Causes of Morbidity and Mortality of Seventh-day Adventists and the general population of Espírito Santo occurred between 2003 and 2009.

Variable	SDA			General population			
	M	F	Total	M	F	I	Total
Total deaths from external causes of morbidity and mortality	68	26	94	21,156	3,988	6	25,150
Total deaths from all causes	486	466	952	81,901	53,874	84	135,859
Proportional mortality from external causes (%)	14	6	10	26	7	7	19

M – Male; F – Female; I – Ignored.

Table 2. Characterization of deaths from external causes of morbidity and mortality of Seventh-day Adventists and the general population of Espírito Santo occurred between 2003 and 2009.

Variable	SDA		General population		
	N	%	N	%	
Gender	Male	68	72	21,156	84
	Female	26	28	3,988	16
	Ignored/not filled out	-	-	6	0
Age group	0 – 9	0	0	657	3
	10 - 19	15	16	3,339	13
	20 – 29	18	19	7,498	30
	30 – 39	17	18	4,645	18
	40 – 49	7	7	3,515	14
	50 - 59	13	14	2,083	8
	60 – 69	12	13	1,122	4
	70 – 79	6	6	914	4
	80 and over	6	6	878	3
	Ignored/not filled out	-	-	499	2
Race/color	White	27	29	6,542	26
	Black	2	2	1,532	6
	Yellow	-	-	5	0
	Brown	31	33	11,619	46
	Indigenous	-	-	10	0
Ignored/not filled out	34	36	5,442	22	
Marital status	Single	39	41	12,982	52
	Married	36	38	5,976	24
	Widow/widower	4	4	1,005	4
	Legally separated/divorced	-	-	840	3
	Unmarried union	-	-	199	1
Ignored/not filled out	15	16	4,148	16	
Schooling	None	2	2	690	3
	1 to 3 years	4	4	1,085	4
	4 to 7 years	9	10	1,878	7
	8 to 11 years	5	5	934	4
	12 years and over	3	3	406	2
Ignored/not filled out	67	71	20,157	80	
Total	94	100	25,150	100	

lated to assault and self-inflicted injuries in both groups.

Finally, Table 4 shows the observed and expected death values by age group for the SDA population between 2003 and 2009. For all the ranges, 11.39 deaths were observed and 27.58 were expected. The SMR from external causes was 41.3 (95% CI: 20.91-73.18), therefore showing statistical significance. Thus, regarding external causes, being an SDA reduced mortality by 58.7%.

Discussion

Initially, it is important to highlight that alcohol consumption was not evaluated in this study and that the probable abstinence from alcohol by SDAs is based on the recommendation of the denomination to its members. A cross-sectional

study conducted in Vitória¹³ with the objective of describing the health profile of SDAs and investigating the prevalence of risk and protection factors for Chronic Noncommunicable Diseases identified that, of the 361 individuals interviewed, 3.4% (95% CI: 1.3-8.5) reported current alcohol use, leading to the conclusion that most members adhere to alcohol withdrawal recommendation.

The results obtained allowed comparing the profile of mortality from external causes between SDAs and the general population of the state of Espírito Santo from 2003 to 2009. When comparing the proportional mortality from external causes in both groups, it is possible to note that it was greater (almost double) in the general population (10% in the SDA population and 19% in the general population). This higher proportional mortality of the general population was expected, since there is evidence that SDAs adhere

Table 3. Absolute and relative frequency of deaths of Seventh-day Adventists and the population of Espírito Santo occurred between 2003 and 2009 by group of chapter XX - External causes of morbidity and mortality.

External causes of morbidity and mortality	Population					
	SDA			NON-SDA		
	T N (%)	F N (%)	M N (%)	T N (%)	F N (%)	M N (%)
Accidental Causes	64 (68.08)	20 (31.25)	44 (68.75)	11,606 (46.32)	2,506 (21.6)	9,100 (78.4)
Intentional causes related to assault and self-inflicted injuries	30 (31.92)	6 (20)	24 (80)	13,450 (53.67)	1,460 (10.85)	11,990 (86.15)

T – Total; M – Male; F – Female.

Table 4. Description of deaths observed and expected by age group of Seventh-day Adventists in relation to Chapter XX - External causes of morbidity and mortality of the 10th International Classification of Diseases from 2003 to 2009.

Age group	Deaths observed*	Mortality Rate ⁺	Expected deaths
20-29	2.71	2.03	8.62
30-39	2.42	1.26	5.35
40-49	1.42	1.17	4.10
50-59	2	1.10	3.07
60-69	1.57	1.01	1.82
70-79	0.42	1.48	1.89
80 +	0.85	3.63	2.73

* Average deaths 2003-2009. ⁺ Mortality Rate from external causes of the general population between 2003 and 2009 (deaths per thousand inhabitants).

to alcohol withdrawal, and as already explained in this paper, alcohol is linked to most deaths from external causes of morbidity and mortality.

Alcohol consumption has been associated with increased risk of injury and death in a variety of situations, including traffic accidents (involving vehicles, bicycles and pedestrians), falls, fires, sports-related injuries and injuries related to recreational activities and self-inflicted injuries resulting from interpersonal violence. There is also some evidence that alcohol in the body at the time of injury may be associated with a greater severity of injury and a less positive outcome^{14,15}.

When comparing the proportions of deaths from external causes between genders, a greater difference was observed in proportional mortalities of males (14% in SDAs and 26% in the general population); we can infer that the difference in the proportional mortality of both populations (10% and 19%) is practically due to the difference between males, since the proportional mortality in females was almost the same in both populations (6% for The SDA population and 7% for the general population).

In view of the above, it is necessary to point out that studies report higher alcohol consumption among men^{16,17}, evidencing that, in this study, the probable alcohol abstinence of male SDAs was the possible cause of the greatest impact in reduced proportional mortality.

It should be noted that the occurrence of deaths from external causes with ignored gender in the general population does not undermine the reliability of proportional mortality in this population, since these deaths accounted for only 0.06% of all deaths from external causes (84 deaths of 135,859).

When analyzing the description of individuals deceased from external causes in both populations, it is interesting to report some aspects. Initially, in relation to the distribution of deaths by gender, it was observed that, in both populations, men were the majority (and they showed higher proportional mortality both among SDAs and the general population).

Regarding the external causes and the male gender, several studies^{1,18} report that most deaths occur in men. In Brazil, in 2009, around 83% of deaths from external causes occurred in men (mortality rate of 122.5 deaths per 100,000 inhabitants, against 24.1 deaths per 100,000 inhabitants in women, 5.1 times greater); and, especially in young men, with 50% of deaths from external causes in men aged 20 to 39 years¹.

Regarding the age group, the 20-29 years age range was predominant in both groups, followed by 30-39 years, which is not surprising since, in Brazil, individuals most vulnerable to death from these causes are exactly young adults aged 20 to 39 years¹.

Regarding race/color, brown and white were predominant in both groups, with a highlight to a large percentage of this variable ignored or not filled out. Regarding external causes and race/color, studies have shown that black individuals, mainly males, have higher mortality rates, especially from homicide, than white individuals^{19,20}. It should be noted that, in this study, only the percentages of each race/color were listed, and it was not possible to affirm which race/color had the highest mortality rate in the populations.

Regarding the SDAs marital status, married people followed by single predominated, which was reversed in the general population. Possibly, this difference, which was not expressive, is due to the slightly higher share of middle-aged and elderly people among SDAs and of children and young adults among non-SDAs. It is worth reminding that no data for children is available among data provided on SDAs. This is a limitation of the study, since deaths from external causes in this age group were not accounted for by SDAs. However, it is believed that the small percentage of deaths from external causes in children in the general population minimizes this limitation.

With regard to schooling, it is not possible to make any inference because of the large proportion of data ignored or not filled out for this variable in both populations.

In the analysis that breaks down external causes into accidental causes and causes related to assault and self-inflicted injuries among the population, it is noted that, among SDAs, accidental causes prevailed over those related to assault, with 68.08% of all deaths from external causes. Among the general population, deaths due to intentional causes related to assault and self-inflicted injuries showed a slight predominance, with 53.67% of deaths related to chapter XX, with, however, a higher percentage than 31.92% of SDAs.

Regarding this higher number of deaths from intentional causes related to assault and self-inflicted injuries in the general population and accidental deaths in SDAs, it seems that there is a greater association between being a victim of alcohol-related violence and being an accident victim, which could explain the finding.

A study that aimed to describe the frequent reference to alcohol intake among emergency care from external causes from the Violence and Accidents Surveillance System in Sentinel Services showed that reference to suspected alcohol use was higher among victims of violence (37.9%) against accident victims (8%), that is, the proportion of alcohol consumption was almost five times higher among the attendance due to violence compared to attendance due to accidents²¹. In another study on the frequency of alcohol intake in victims of external causes attended in emergencies, positive blood alcohol content was more frequent physical assault among victims (57.1%) than falls (18.2%) or traffic accidents (29.3%)²² victims.

As expected, men also accounted for both accidental and unintentional causes related to assault and self-inflicted injuries, due to their predominance in the number of death from external causes already discussed.

The analysis of SMR of Espírito Santo's SDAs revealed a reduced mortality by 58.7% for the External Causes. This result indicates that SDAs have a lower percentage of deaths from external causes, but also a lower risk of dying from external causes verified through SMR.

As already explained in this paper, once again, reduced external causes of morbidity and mortality could be due to SDAs probable abstinence from alcohol. The relationship between dying from external causes of morbidity and mortality and alcohol consumption was previously discussed, with alcohol consumption accounting for 46% of deaths from traffic accidents, suicide, homicide and other types of intra- and interpersonal violence, that is, almost 46% of deaths from external causes².

No analysis of deaths from external causes was found in studies on SDAs already developed in the national territory and other countries, which prevents the comparison of these results.

Regarding study limitations, in addition to the lack of children among SDA deaths, it is noteworthy that some of the deceased SDAs were not found in the SIM (losses), and therefore were not accounted for. It should be noted that a portion of these losses might be from deaths occurring

in other states before 2006, since until 2006, individuals were registered in the SIM of the state where the death occurred instead of the state in which they resided. Only after this time were death certificates reported in the state in which individuals resided.

It is worth reminding that all death certificates of both populations were processed and reviewed by the same health secretariat. Thus, the quality of information of both populations are similar, minimizing data comparison issues.

Finally, it can be concluded that, between 2003 and 2009, Espírito Santo SDAs show lower proportional mortality from external causes than the general population. Accidental deaths are more significant among SDAs, while intentional deaths related to assault and self-injuries are more significant in the general population. SDAs mortality from external causes was reduced by 58.7%. It is believed that possibly the benefit verified in relation to mortality from external causes is related to alcohol consumption. The future performance of analytical studies that evaluate alcohol consumption and its pattern may help in its elucidation and quantification as a risk factor to external causes.

Collaborations

APC Velten worked on the design, outline, analysis and interpretation of data and writing the paper. NV Cade worked on the design, outline, analysis and interpretation of data. GA Silva worked on the outline and analysis of data. ERA Oliveira worked on the design, outline, analysis and interpretation of data.

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