Original article

Age and sex specific suicide rates in Sri Lanka from 1995-2011

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Background
The suicide rate in Sri Lanka decreased from 47.0/100,000 in 1995 to 19.6/100,000 in 2009
Aims
To describe the age and sex specific suicide rate in Sri Lanka between 1995 and 2011.
Methods
Data on suicide was collected from records of the Sri Lanka Police. Population data on age and sex distribution was obtained from World Bank Database. Rates were calculated per 100,000 population. Time series analysis was carried out to identify trends of suicide over time.
Results
In 2011 the male suicide rate in was 34.8/100,0000 and female rate was 9.24/100,000. The male: female ratio was 3.76: 1. In the 10-19 year age group the female suicide rate was higher. The highest rate in females was in the 20-29 year age group and the highest rates in males were among the 50-59 year and > 60 year age groups.
Conclusions
The age distribution pattern of suicide has not changed from 1995 to2009. The decline in suicide rate among females is more than among males. Globally suicide rates are known to increase with age, a pattern seen among males in Sri Lanka but not among females. In females the highest rates were in the younger age groups similar to patterns in India and China.

Introduction

The suicide rate in Sri Lanka peaked at 47.0 suicides per 100,000 population in 1995 (1). Since then the overall rate has fallen by more than half in 2009 to 19.6 per 100,000 (2). The methods of suicide have changed over time. Before 1960, hanging was the commonest method of suicide in Sri Lanka. In the 1960s ingestion of acetic acid became prominent (3). Since the 1980's the commonest mode of suicide has been pesticides. Organophosphate and carbamate pesticides are the commonest types of pesticides used in self poisoning. The other substances used in poisoning-related suicides include acids, plant poisons and medicinal drugs (4). Other methods used in suicide are burns, hanging, jumping in front of a train and drowning (5). Although the rate of hospital admissions due to poisoning have increased between 1996-2008, admissions due to pesticide poisoning have decreased (2). The main substance used in self poisoning currently is paracetamol and other medicinal drugs (6, 7). This pattern is noted in both urban and rural areas (8, 9).

Prior to 1995 the rate of suicide in males was higher. In 1975, age standardized suicide rates were 25.9 per 100,000 in males and 10.9 per 100,000 in females (1). The suicide rate in Sri Lanka has reduced since 1995 but there is little detailed analysis of the change in suicide rate in Sri Lanka according to age and sex. This study examines the age and sex specific patterns of suicide in Sri Lanka during the period 1995-2011.

Method

Data on suicide was collected from records of the Sri Lanka Police (4). Estimated mid-year population data for Sri Lanka was used to convert data to annual rates.

These estimates are based on the census data of 1983 and 2001(10). The age and sex distribution patterns of the general population was obtained from the database of the World Bank (11). Rates were calculated per 100,000 population.

Statistical analysis
Trends in the incidence rates of suicide were investigated using univariate time series analysis, with the recorded data fitted to linear, quadratic and exponential growth models using Minitab statistical software version 14.0 (Minitab Ltd, Coventry, England). Model adequacy was tested using the mean absolute percentage error (MAPE).

Results

During the period from 1995 to 2011 the rate of suicide was higher among males than among females. In 1995 the male suicide rate was 2.92 times that of the female rate. This has increased to 3.77 times in 2011which indicates a more rapid decline in the female rate.

During the period 1995-201, in all age groups other than in the 10-19 year age group, the male suicide rate was higher than the female rate. Since 2003, in the 10-19 year age category, the suicide rate among males is slightly lower than among females (ratio 0.98-0.73). In 2011 the highest male: female ratio was in the 40-49 year age group (8.46: 1).

From 1995-2011 the suicide rate has reduced in both males and females. The male suicide rate which was 89.94 per 100,0000 in 1995, declined to 34.8 per 100,0000 in 2011(Yt=77.42-3.22). Among females the rate declined from 30.79 per 100,000 to 9.24 per 100,000 during this period (Yt=23.79- 0.97).
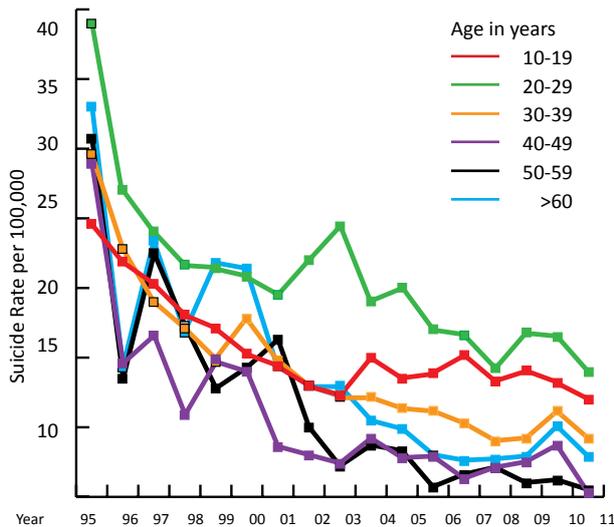
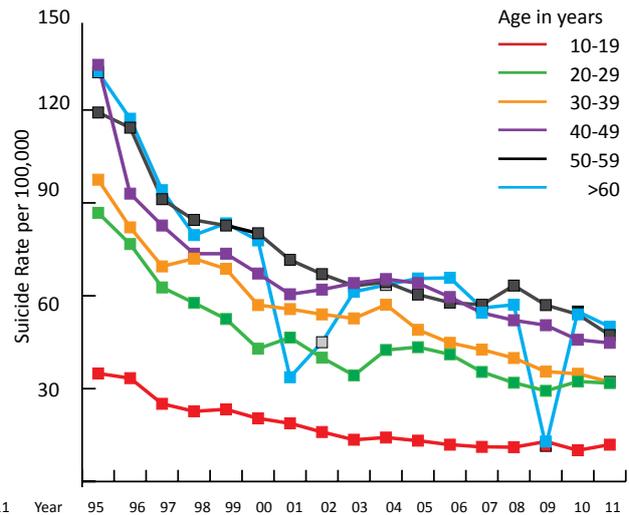**Fig. 1 Age specific suicide rate in females 1995-2011**

Fig. 2 Age specific suicide rate in males 1995-2011

Suicide rate among females

Analysis of suicide rates among females from 1995-2011 showed that the highest rate in most years, was in the 20-29 year age group. However in 1999 and 2000 the highest rate was recorded in the >60 year age group. Although high rates were recorded among older females (> 50 years) during the period 1995-2003, since 2003 the suicide rats among the older age groups have reduced more rapidly than among the younger age groups.

From 1995-2011 a linear decline in suicide rate was observed in all age groups. Time series analysis shows a declining trend in the 10-19 year age group (Yt 20.9 -0.57) and 20-29 year age groups (Yt= 29.36-0.94). But the most significant decline was in the 50 to 59 year age group (Yt=22.06-1.15) and > 60 year age group (Yt=24.69- 1.16).

In 2011 the highest rate was in the 20-29 year age group (13.98/100,000) followed by the 10-19 year age group (11.98/100,000) and the 30-39 year age group (9.15/100,000). The lowest rate was in the 40-49 year age group (5.29/100,000).

Suicide rate among males

During the period 1995-2011, among males, the highest suicide rates were recorded among the 50-59 year and > 60 year age groups. The lowest rate was in the 10-19 year and 20-29 year age groups. Time series analysis shows a declining trend in all age groups. The decline in the younger age groups 10-19 years (Yt= 30.39-1.38) and 20-29 years (Yt=71.86-2.84) were less than in the older age groups of 50-59 years (Yt=105.83-3.68) and > 60 years (Yt=106.53-4.33).

In 2011 the highest male suicide rates were in the >60 year age category (49.95/100,000) and 50-59 year age category (47.3/100,000). The lowest rate was in the 10-19 year age category (11.90/100,000).

Although the highest suicide rate was among the older age groups, when the actual numbers who commit suicide are considered, younger males constitute the most numerous group. Among males the highest number of suicides was in the 21-30 year age group from 1995-1997, 30-39 year age group from 1998-2001 and 41-50 years from 2003 onwards. Among females the highest number of deaths due to suicide were in the 20-29 year age group. In 2011 out of 812 total deaths due to suicide 231 (28.4%) were in females aged between 20-29 years.

Table 1 – Age specific suicide rate/100,000-Females							
	Age in years						
Year	10-19	20-29	30-39	40-49	50-59	>60	Total
1995	24.64	38.95	29.60	28.88	30.66	33.03	30.79
2000	15.32	20.81	17.77	13.95	14.26	21.36	17.30
2005	13.50	20.03	11.41	7.82	8.29	9.95	12.47
2011	11.98	13.98	9.15	5.29	5.47	7.94	9.24

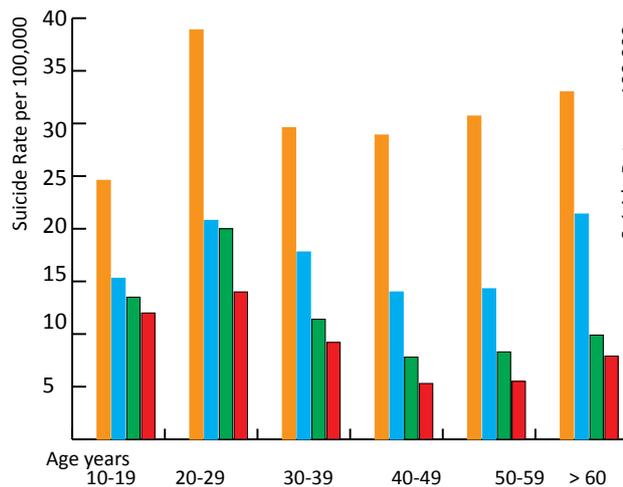| Table 2 – Age specific suicide rate/100,000-Males							
	Age in years						
Year	10-19	20-29	30-39	40-49	50-59	>60	Total
1995	34.92	86.78	97.53	134.56	119.20	132.16	89.94
2000	20.40	42.87	57.02	67.24	80.24	77.93	51.75
2005	13.23	43.42	49.03	64.14	60.36	65.56	46.04
2011	11.90	31.85	32.20	44.78	47.30	49.95	34.80

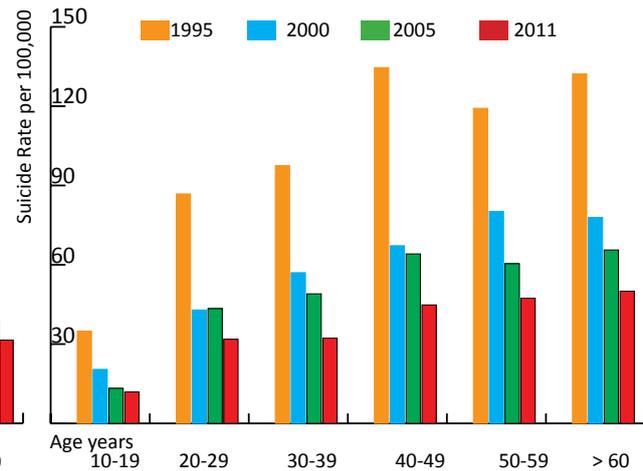**Fig. 3 Female suicide rate 1995-2011**

Fig. 4 Male suicide rate 1995-2011

Discussion

This analysis of suicide data for Sri Lanka has yielded several important findings. During the period 1995 to 2011, there is a decline in the suicide rate among both females and males in all age categories. Overall the suicide rate among males is higher in all age categories except in the 10-19 year age group. Among females the highest suicide rates are in the younger age categories of 10 to 19 years and 20 to 29 years. Among males the pattern is different. There is a gradual increase in the rate with age with the highest rates in the older age groups.

The epidemiology of suicide in Sri Lanka has changed over time. The most striking feature is the reduction in suicide rate among both males and females in all age groups. Several factors have contributed to this. Restriction of import and sale of WHO class 1 toxicity pesticides and endosulfan have contribute to the reduction in suicide rates (1). Better medical management and better access to health care facilities have also helped to reduce in case fatality rates. In addition the change in substances used in self-poisoning from pesticides to less lethal medicinal drugs has contributed greatly to reduction in deaths due to self-poisoning (2, 7). The use of medicinal drugs has been observed in urban as well as rural areas (6, 8, 9).

Globally, the proportion of male: female suicides was 3.6:1 in 1995 and estimated to become 3.9:1 in 2020 (12). The male to female proportion is higher (4:1) in European countries, United States of America (USA) and Australia (13). Asian countries such as India (1.2:1), Singapore (1.5:1) and the Republic of Korea (2.0) have lower male to female proportions than Western countries (13). China is one of the few countries where the suicide rate is higher among females (male: female= 0.8:1) (14). In Sri Lanka, the pattern is similar to that of Western countries with a male: female ratio of 3.76:1 in 2011.

Suicide is a major cause of mortality among the young. Globally in adolescents and youth aged 10–24 years,

suicide is the second most common cause of death after road-traffic accidents. Among female adolescents aged 15–19 years suicide is the commonest cause of death. It is the third most common cause of death in male adolescents after road-traffic accidents and violence (15, 16).

In most parts of the world, the suicide rate among male adolescents aged 15 to19 years is higher than that of females (15, 17). The ratio is estimated to be 2.6:1. However in some Asian countries the suicide rate in this age group is higher in females. Our study found that the suicide rate among adolescents aged 10 to19 years was higher among females but the male suicide rate is higher among youth aged 20 to 24 years. The suicide rate among male adolescents in Sri Lanka is much higher than that of many countries. Among males in the 16 to 24 year age group the suicide rate of 25.8/100,000 is higher than that in countries such as the United Kingdom (UK) (7.9), China (8.0), the USA (16.1) and Japan 20.4 (15). Some countries which have a higher male adolescent suicide rate than Sri Lanka are Finland (26.4), Lithuania (41.3) and Russia (43.7) (15). The suicide rate in Sri Lanka among female adolescents in the 16 to 24 year age group of 15.47/100,000 is higher than that in UK (2.1), China (12.9), the USA (3.5), Japan (9.8) Finland (8.7), Lithuania (6.3) and Russia (7.4). Although Lithuania and Russia have high male adolescent suicide rates, the rates among females are low. High rates of suicide among adolescent and young adults in Sri Lanka is of concern. Studies from India have shown that a combination of social problems such as interpersonal difficulties, family problems, financial hardships and pre-existing mental illness are factors associated with suicides in adolescents and young adults (18). These factors are likely to contribute to adolescent suicides in Sri Lanka too. Studies from India also suggest that suicide is a socially acceptable method of dealing with difficulties (19). This may be an important reason for the high levels of adolescent suicides in Sri Lanka as well.

Countries with high rates of suicide among the older age groups include European Union countries, Canada,

the USA and several Asian countries including Japan, Singapore and Taiwan (20, 21). In these countries the suicide rate among the elderly males is nearly twice that of females. The elderly appear to have suicidal behavior with a higher intent and attempts of deliberate self-harm are less (20).

Factors contributing to suicide may be different among the young and the elderly. In countries such as Korea elderly suicide rates are rising (22). This may be due to 'unprepared' population ageing. Rapid population ageing and a failure to implement adequate health and social services for the elderly probably contribute to this high suicide rate. In contrast, in Japan the highest suicide rate is among middle aged men. In Sri Lanka the highest suicide rate among the males is in the > 60 year age group. Similar to Korea, Sri Lanka has a rapidly ageing population. The social welfare system is yet to recognise the need to care for the elderly. In elderly people in developed countries, suicide is strongly linked to psychiatric disorder, with depression being the main contributor (23). Other important factors are alcohol misuse, physical illness, bereavement, and loss of independence. Despite the improvement in mental health services, inadequate geriatric medical and psychiatric services may also contribute to high suicide rates among the elderly in Sri Lanka (24).

The age and sex specific patterns have some characteristics seen in high income countries such as a high male to female ratio and high rates among elderly males. Although the rate of suicide has fallen by more than half in the last fifteen years the rates are still higher than in Western countries. The overall rate among males is similar to that in Indian states such as Karnataka (39.7) and Maharashtra (30.9). The overall female rate in 2010 in Sri Lanka is similar to those in Gujarat and Maharashtra but lower than in the Southern Indian states of Kerala (32.2), Tamil Nadu (39.7), Andhra Pradesh (32.2) and Karnataka (23.6).

The study had several limitations. Suicide rates were calculated from data from the Sri Lanka Police. All over the world under reporting of suicide is a major drawback. Data from the Northern and Eastern districts in Sri Lanka would have been incomplete due to the civil war. We also did not examine the methods used in suicide and the geographical distribution within the country.

Declaration of interest
None

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