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Original Article

Incidence, Mortality, and Burden of Severe Acute Respiratory Infection in Iran in 2015

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Abstract

Background: Severe Acute Respiratory Infection (SARI) is responsible for mortality and hospital admissions in millions of people across the world. The present study, for the first time, aimed at estimating the incidence, mortality, and burden of SARI in Iran in 2015.

Methods: Disability Adjusted Life Years (DALYs) was used as an index to estimate the burden of SARI. The SARI-related DALYs was calculated using a method developed by the WHO for assessing the Global Burden of Diseases. DALYs are calculated as the sum of the Years Lost due to Disability (YLDs) and the Years of Life Lost (YLLs) due to premature mortality. The data on the incidence and mortality were obtained from the SARI surveillance system of Iran's Ministry of Health and Medical Education. The average duration until remission or death and the disease disability weight were set at four weeks and 0.373, respectively.

Results: In 2015, the incidence of SARI was 21309 and 20885 among males and females, respectively. Moreover, 773 males and 737 females died from this disease (Case fatality rate was about 0.035). Total SARI-related DALYs in males and females was 17264 and 16720, respectively. Furthermore, YLLs was responsible for more than 96% of SARI-related DALYs in 2015.

Conclusion: There was no significant difference between males and females in terms of the incidence, mortality, and burden of SARI in 2015. Epidemiological data are required to adopt appropriate policies and responses to prevent and control SARI. The incidence, mortality, fatality, and burden of SARI are significant in Iran. It is necessary to develop appropriate strategies, such as vaccination against major pathogens of the disease at least in high-risk groups, strengthening the disease surveillance system, and attracting the attention of policy makers and health authorities of the country.

Keywords: Incidence; Mortality; Disability adjusted life years; Severe acute respiratory infection; Iran

Introduction

Severe Acute Respiratory Infection (SARI) is responsible for millions of deaths and hospital admissions across the world annually (1). Around 4.2 million cases of death from SARI occur annually in the world (2). It imposes a high socioeconomic burden on communities and is one of the leading causes of hospital admissions in children. In 2010, about 11 million children under the age of 5 affected by SARI were hospitalized in developing countries, and the disease fatality rate was estimated to be 2.3% (3).SARI is caused by a wide range of microbial agents followed by cough and history or presence of a fever (≥38 °C, sublingual). The patients with this disease must be hospitalized (4-6).

As estimated in 2010, severe and very severe Acute Lower Respiratory Infections (ALRI), respectively, were responsible for 11.9 and 3 million hospital admissions among children under 5 year of age worldwide. It also caused 265000 in-hospital deaths in young children, with 99% of the deaths occurring in developing countries. Of all children affected by severe ALRI worldwide, 62% were treated in hospitals; however, 81% of deaths from the disses occurred in patients not admitted to hospitals (3). SARI is responsible for many outbreaks and hospital admissions in Iran (7, 8). The rates of the disease incidence and mortality are recorded by SARI surveillance system in Iran.

In order to prevent and control SARI, proper and reliable epidemiological data are needed for making policies and adopting appropriate response against SARI. Burden of disease is one of the important epidemiological information. Disability-Adjusted Life Years (DALYs) is an index developed by the WHO, the World Bank, and the Health School of Harvard University for assessing the burden of diseases (9-11).

Estimating the burden of diseases helps health sector authorities to better allocate health resources, set goals, focus on high-risk areas, and evaluate health care interventions. To the best of our knowledge, this study is the first that aimed at estimating the incidence and burden of SARI at national and provincial levels in 2015.

Methods

Disability-Adjusted Life Years (DALYs) and the National Burden of Disease indices developed by the WHO were used for calculating the burden of SARI (11). DALYs is calculated through adding Years of Life Lost due to premature death (YLLs) to Years of Life Lost due to disability (YLDs) (12, 13).

DALY= YLL+ YLD

YLL is the number of deaths (N) multiplied by Iranian life expectancy at the age of death in years

$YLL=N \times L$

The data on the incidence and mortality from the disease was obtained from the SARI surveillance system of Iran's Ministry of Health in 2015. In this study, SARI was defined as a disease caused by a wide range of microbial agents followed by cough and history or presence of a fever (≥38 °C, sublingual) (4, 14). As pointed out by the health sector experts, SARI surveillance system is one of the best surveillance systems in Iran that covers about 80% of cases with SARI. Therefore, a coefficient of 1.25 was applied for estimating the real incidence of this disease. No age weight was applied in calculations; however, a discount rate of 0.03 was applied for discounting health values in future years.

For each age group, the mean age of that group was considered as the mortality age for patients died from SARI. However, the average age of mortality for 0-1 and 1-5 age groups was set at 0.1 and 2.6, respectively. Life expectancy left for each age group was calculated using life tables of Iranians reported by the WHO.

YLDs was calculated through multiplying the incident rate (I) by the average duration of the disease until remission or death (D) multiplied by disability weight (DW).

$YLD= I \times DW \times D$

After holding an expert panel, the average period of the disease and its disability weight were set at four weeks (0. 0767 years) and 0.373, respectively (12). The disability weight varied from 0 (complete health) to 1 (death) (11).The data on the population of the country and its provinces in the year of the study were obtained from statistical center of Iran(15).The collected data were analyzed using Excel software (ver.2010).

Results

Table 1 presents the incidence, mortality, and burden of SARI in Iran in 2015. Total DALYs among males and females was 17264 and 16720, respectively. The highest and the lowest DALYs/100000 population in both sexes were observed among 0-4 and 5-14 age groups, respectively.

Table 1: Incidence, mortality, and burden of SARI (DALYs) in Iran in 2015

Age groups	*Sex*	*Total cases of SARI*	*Incidence rate per 100000 Population*	*Case Leading to Death*	*Total YLDs*	*Total YLLs*	*DALYs/1000000 Population*
0-4	Male	3130	91.42	94	89.44	2820.08	84.98
	Female	3068	93.70	90	87.67	2707.02	85.35
5-14	Male	1681	28.55	51	48.04	1493.51	25.21
	Female	1648	27.99	49	47.09	1435.91	25.19
15-29	Male	3494	34.30	126	99.84	3398.59	33.58
	Female	3425	33.63	121	97.87	3281.44	33.18
30-44	Male	4467	42.63	189	127.65	4567.59	44.81
	Female	4376	39.73	181	125.05	4421.67	41.28
45-59	Male	3570	59.77	148	102.01	2786.03	48.35
	Female	3499	62.57	142	99.99	2714.49	50.33
60-69	Male	2152	104.51	67	61.49	917.28	47.53
	Female	2109	98.70	64	60.28	896.77	44.79
70-79	Male	1583	167.28	61	45.24	519.95	59.73
	Female	1552	185.84	58	44.35	514.60	66.93
+80	Male	1233	342.64	35	35.23	152.37	52.13
	Female	1208	335.70	33	34.53	151.00	51.56
Total	Male	21309	53.58	773	608.94	16655.40	43.41
	Female	20885	53.16	737	596.81	16122.90	42.56

Figure 1 presents the percentage of YLLs and YLDs from the total burden of SARI by sex in 2015. YLLs was responsible for more than 96% of male and female DALYs attributable to SARI.

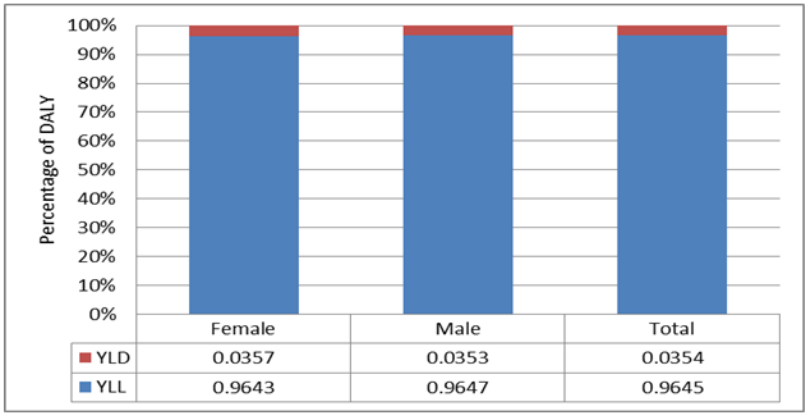

Fig. 1: Share of YLL and YLD in the total burden of SARI (DALY) in 2015

Figure 2 illustrates the burden of SARI by sex and age in 2015. Of all age groups, 30-44 age group had the highest crude DALYs in both males and females. The burden of SARI among males was a little higher than that among females.

Discussion

SARI is responsible for mortality and hospital admissions in millions of people across the world. To prevent and control SARI, epidemiological data are required for making appropriate policies and adopting proper responses against the disease. Our study aimed at providing the data on the incidence, mortality, and burden of SARI in Iran.

In 2015, the total incidence of SARI among males and females, respectively, were 21309 and 20885 cases across the country (incidence rate was about 53 per 100000 population).

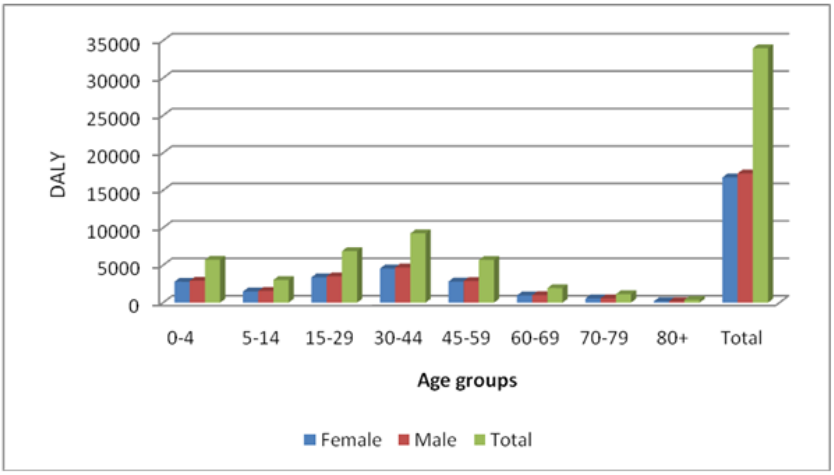

Fig. 2: Share of each sex in the burden of SARI (DALYs) by age-group in 2015

Between 2012 and 2014, 8929 cases with SARI were hospitalized in Kenya. The incidence of the disease was estimated to be 21 per 100,000 people. However, the method used for calculating the incidence of SARI in the mentioned study was different from the method used in our study (16).

Reducing the rate of SARI is still one of the main priorities and challenges in African and developing countries (13, 17). Our results indicated that the incidence of SARI in children and the elderly is higher. The incidence of the disease among children was higher than the rates reported among the same age group in European and American countries (18). Children under the age of five and the elderly are among the high-risk groups at risk of severe influenza (3). In South Africa and Kenya, the incidence of SARI in children under the age of 5 is 56-276 per 100,000 and 92-110 per 100,000 people, respectively (16, 19). About 11,570,000 children under the age of 5 with SARI are annually admitted to hospitals in developing and developed countries (3).

In Kenya, the incidence of SARI was 12.4/100 population among children under the age of 5 years. In order to treat and prevent SARI it is necessary to pay attention to influenza virus pathogens and respiratory syncytial virus (RVS) and develop related technologies and strategies (20).

Respiratory syncytial virus- acute lower respiratory infection (RSV-ALRI) caused 3.2 million (2.7-3.8) hospital admissions among children under 5 year of age across the world in 2015. The estimated value might be attributed to some factors such as health services-seeking behavior among

people, location, geographical status of the studied area, and the use of diagnostic methods (21). In line with the results of our study, the rate of hospital admission among males was higher than that among females. The observed difference might be attributed to the size of breathing channel in males which is smaller than that in females, the higher level of attention paid to boys, and the higher demand for health services for males (21-23). In Madagascar, 54.8% of cases with SARI were male (24).

Based on our findings, SARI killed 773 males and 737 females in Iran in 2015; the disease fatality rate was about 0.035. Annually, around 4.2 million deaths from SARI occur in the world; the disease fatality rate in developing and developed countries is estimated to be 2.3% and 0.6%, respectively (3). Moreover, in 2015, RSV-ALRI infections were responsible for 59600 deaths (48000-74500) among children under 5 year of age across the world, and 99% of the deaths were observed in developing countries (21). Access to hospital care was one of the main determinants of SARI death in developing countries (25, 26).

In our study, total SARI-related DALYs among males and females were 17264.3 and 16719.7, respectively in 2015. Children (0-4 age group) and the elderly had the highest DALYs (per 100000 population). In addition, YLL was responsible for 96% of DALYs in both sexes, indicating the high fatality rate of SARI. Based on the Global Burden of Disease (GBD) reports, lower and upper respiratory infections caused 103.05 million DALYs (1428.8 DALYs/100000 population) and 2.87 million DALYs (38.7 DALYs/100000 population), respectively in 2015. In line with the results of our study, the highest incidence of the disease was observed in children and the elderly (27).

Conclusion

The incidence, mortality, and burden of SARI are significant in Iran, indicating the need to pay more attention to this disease. The incidence, mortality, and burden of SARI were 42194 cases, 1510 deaths, and 33984 DALYs, respectively, and there was no significant difference between males and females in terms of the mentioned items. In order to prevent and control this disease, epidemiological evidence are required for making policies and adopting a proper response against SARI; the results of our study can provide such evidence for making policies. In order to control the disease, it is necessary to strengthen SARI surveillance system, implement vaccination programs against major pathogens of the disease at least in high-risk groups, and attract the attention of policymakers and health system authorities.

Ethical considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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Conflict of interest

The authors declare that there is no conflict of interests.

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