CLINICAL EXPERIENCE AND IMPACT OF A COMMUNITY-LED VOLUNTEER ATMOSPHERIC HAZE CLINIC IN SINGAPORE

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Abstract. The Pollutant Standards Index reached a life-threatening level of 401 in Singapore on 21 June 2013. Grassroot leaders in Ulu Pandan Constituency conducted the first community-led free atmospheric Haze Clinic from 25 June 2013 to 11 July 2013 to provide accessible medical assessment for affected community members. This provided insight into the common conditions afflicting that community during the haze period while allaying public anxiety. Seventy-two consultations were conducted over the 3 week period, of which 26 (36.1%) were haze related, 18 (25%) were possibly haze related and 28 (38.9%) were non-haze related. The majority of haze-related complaints were respiratory, eye and skin-related. During a haze crisis, such adhoc community-led clinics may help alleviate the surge in patients seen at emergency departments and public primary health clinics. Many of the patients seen were from low income families and a significant number (38.9%) sought help for non-haze related medical conditions.

Keywords: haze, PSI, forest fire, pollution, Singapore

INTRODUCTION

Singapore faced unprecedented severe atmospheric haze in June 2013. Similar to previous haze episodes, this episode resulted from a combination of forest burnings in Sumatra, Indonesia and prevailing winds, causing health-related morbidity and economic loss (Lohman *et al*, 2007). Deforestation in Sumatra using the "slash and burn" technique is fast and easy. Newly cleared land provides fertile soil for cultivation of agricultural products such as rubber and oil palm. Neighboring Singapore and Malaysia become affected by atmospheric haze cause by the burning especially during the inter-monsoonal dry season (Emmanuel, 2000).

The June 2013 haze crisis was first noticed in Singapore on 13 June 2013 (National Environment Agency, 2013). The severity of haze in Singapore is measured by Pollutant Standards Index (PSI), which remained above 100 after 17 June 2013, hitting a record high of 401 on 21 June 2013 (National Environment Agency, 2013). This caused anxiety among the public in Singapore about the health impact of the poor air quality. The PSI is an air quality indicator developed by the United States Environmental Protection Agency, with a scale from 0 to 500, and is based on concentrations of five major air pollutants: sulphur dioxide, particulate matter, nitro-

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gen dioxide, ozone and carbon monoxide (United States Environment Protection Agency, 2006). Besides the traditional PSI, Singapore also reports 24-hour average PM 2.5 levels (National Environment Agency, 2013) which measures the concentration of fine particulate matter less than 2.5 micrometers in diameter, believed to pose a greater health threat since it can lodge deeper in the lungs. The World Health Organization (WHO) recommends the PM2.5 not exceed 25 μg/m^3 over a 24 hour period (WHO, 2006) the PM2.5 concentration in Singapore reached 251-300 μg/m^3 on 20 June 2013 (National Environment Agency, 2013).

At the national level, the Singapore government has a robust crisis management system which includes timely information management, subsidized medical treatment for haze-related conditions and funding for air-conditioning in childcare centers. The Singapore Ministry of Health launched a medical scheme on 21 June 2013 whereby young, elderly and low-income citizens would receive a SGD$30 subsidy for haze-related visits to designated general practitioners across the country (Tan and Auyong, 2013). Costs at government run primary care clinics were capped at SGD$10 for citizens affected by the haze. This medical scheme was stopped on 31 October 2013. The Ministry of Education also put in place a School Continuity Plan for the Haze Situation (Singapore Ministry of Education, 2013), where schools follow a protocol for appropriate mitigation measures based on the daily health advisory, including shifting classes to enclosed indoor spaces and scaling down lessons, while students with a history of chronic heart or lung disease would be placed in air-conditioned rooms with air-purifiers before they were taken to receive medical attention if unwell.

At the peak of the haze crisis, community leaders in Ulu Pandan Constituency organized the first free community-led volunteer Haze Clinic, which was conducted from 25 June 2013 to 11 July 2013, after which there was a significant improvement in the haze. The Haze Clinic was aimed at providing readily accessible, free health consultations for residents concerned about the impact of the haze on their health. Consultations at the Haze Clinic help highlight the problem caused by the haze among local residents.

MATERIALS AND METHODS

Haze clinic

The Haze Clinic at the Ulu Pandan Constituency was held from 25 June 2013 to 11 July 2013, with two clinics a week on Tuesday and Thursday evening, from 8 to 10 PM. The clinic was staffed by volunteer doctors, allied health professionals and non-health care related grassroots volunteers. The Haze Clinic was open to all local residents of the Ulu Pandan Constituency which is part of the Holland-Bukit Timah Group Representation Constituency.

Consultations

Seventy-two consultations were conducted during the six, two-hour clinics. The primary aim of the Haze Clinic was to provide professional health advice about haze related conditions and to allay anxiety in the community. However, patients with other health concerns were not turned away.

Besides providing medical consultations, doctors also suggested over-the-counter medications where appropriate for patients and referred patients to designated general practitioners, government primary care clinics or specialists for further evaluation as nessessary. To offset

the cost of medications, SGD$30 supermarket vouchers were also dispensed to needy patients.

The consultations were divided into haze and non-haze related conditions. Among the haze related conditions, some were classified as directly caused by the haze and others were classified as possibly related to the haze by the treating doctor based on the history of the symptoms and past medical history. To better understand the needs of the community during the haze crisis, demographics of the patients were also recorded.

RESULTS

Seventy-two consultations were conducted during the six clinic sessions, with three patients seen twice. The number of patients seen at each session ranged from 5 to 33, with an average number of 12 per day. The greatest number of patients seen was during the third clinic session on 2 July 2013, likely because of increased awareness of the free Haze Clinic, then the numbers subsequently waned as the haze improved.

Most of the patients who sought help at the free Haze Clinic were elderly living in government housing. Fifty-three patients (76.8%) were at least 60 years old (Table 1). Female patients outnumber male patients by 2.5:1.

Most of the consultations (61.1%) were for conditions associated with haze; 18 were for respiratory symptoms, 15 for eye symptoms and 3 for skin complaints. Among these 44 consultations, 26 (36.1%) were considered directly related to the haze, while 18 were regarded as possibly related to the haze by the treating doctor. Twenty-eight of the consultations (38.9%) were for non-haze related conditions (Table 2).

Table 1
Patient demographics.

Demographic variables	Number (Total: 69)
Gender	
Male	20
Female	49
Age	
<21	5
21-59	11
>60	53

Table 2
Medical conditions seen at the Haze Clinic.

Condition	Number of consults
Haze related	44
Upper respiratory tract illness	18
Breathlessness	7
Eye complaints, such as dryness and irritation	15
Dermatitis	3
Non-haze related	28
Acute illnesses	10
Chronic illnesses	18

All the patients seen at the Haze Clinic received professional medical advice and were advised regarding symptomatic treatment using over-the-counter medications. Thirty-four patients required referrals to general practitioners and two infants were referred to pediatricians for further evaluation and treatment. Of the 36 referred patients, 18 had haze related conditions. Most of the haze related health problems (59%) were managed at the Haze Clinic with advice about lifestyle adjustments during the haze period such as closing the windows, using air-condi-

tioners and air purifiers, limiting outdoor activity and correct use of face masks. Where necessary, patients were advised to use of over-the-counter medications. The majority of referrals for medical follow-up were for chronic conditions that required further investigation, such as chronic cough; even an incidental thyroid nodule was found on examination.

DISCUSSION

The Singapore National Environment Agency is responsible for monitoring air quality and uses both the Pollutant Standard Index and the PM2.5 concentration (Lohman *et al*, 2007). It publishes the 24-hour PSI and PM2.5 findings as well as 3-hour PSI levels to report the immediate air quality situation. A PSI level between 101 and 200 is considered unhealthy, 301 to 400 is considered hazardous and above 400 is potentially life-threatening to ill people or the elderly. The PSI levels in Singapore pushed past the unhealthy level on 17 June 2013 and reaching a peak of 401 on 21 June 2013 before abating in early July. Concerns about the health impact of the haze were wide-spread and fuelled by some unsubstantiated social media reports (Goh, 2013).

The Haze Clinic was an ad-hoc arrangement, encourged by community leaders wanting to allay anxiety, alleviate the load on the public healthcare system and improve the standard of healthcare during the haze period. The clinic was started within 4 days of the peak PSI level, and as anticipated, saw mostly patients with acute adverse effects related to the haze. The conditions seen were the same as those conditions reported during a 1997 haze crisis survey: respiratory, ophthalmic and skin conditions (Emmanuel, 2000). The haze affecting Singapore in 1997 resulted in a 30% increase in attendance at the 16 government polyclinics for haze-related conditions. Finlay *et al* (2012) documented the health impact of wildfires and reported respiratory morbidity predominates, while ophthalmic and cardiovascular complications may also occur. We did not see any patients with acute coronary events at the Haze Clinic, likely because such patients would have gone directly to the hospital. Finlay *et al* (2012) also reported on possible long term psychological morbidity, including risk for depressive illness among children when they view their health is at risk. A prospective study of the impact of air pollution on children with atopic dermatitis in Korea found outdoor air pollution acts as an aggravating factor for atopic dermatitis, although there may be a delayed response or lag effect of one to two days from exposure to the pollutant to exacerbation of the atopic dermatitis (Kim *et al*, 2013). Three patients were seen at our Haze Clinic for dermatitis, two with an exacerbation of atopic dermatitis.

A study on the impact of vegetation fire on health identified groups at high risk for the harmful effects of smoke: children, elderly, pregnant women, smokers and people with chronic respiratory problems (Weinhold, 2011). Similarly, most of our patients seen in the Haze Clinic were elderly. Only 11 patients (15.9%) were adults aged 35-39 years in our study. The rest were children (aged 0.5 months to 14 years) and the elderly (aged ≥60 years).

Political solutions to the haze include adoption of the ASEAN Haze Monitoring system and ministerial level meetings, such as the Conference of Parties to the ASEAN Agreement on Transboundary Haze Pollution (COP-9) (14th Informal Asean Ministerial Meeting, 2013). However, Indonesia

has yet to ratify the ASEAN Agreement on Transboundary Haze Pollution, so Singapore needs to be prepared for the next haze crisis (Hussain, 2013). The haze did return to Singapore in early 2014, with PSI levels reaching the moderate zone on 4 March 2014 and PM2.5 levels reaching unhealthy levels on 12 March 2014 (Chua, 2014). The prolonged dry spell during January and February 2014 resulted in forest fires (Soeriaatmadja, 2014). Illicit burning and clearing of land in Johor and Sumatra usually only occurs during June to October in the dry season (Soeriaatmadja, 2014).

The ageing population of Singapore is particularly vulnerable as a growing high risk group. Most of our patients with haze-related conditions were adequately managed at the Haze Clinic without further referrals. A community-led Haze Clinic run by voluntary doctors, could potentially alleviate the heavy load on government primary care clinics and emergency departments caused by a haze crisis. Besides healthcare preparedness, logistic preparation, such as distribution of face masks during a haze crisis, development of a crisis management infrastructure and improved information dissemination should be considered.

An unexpected finding of the Haze Clinic was the substantial percentage (38.9%) of patients seeking free medical attention for non-haze related conditions. These included queries about chronic conditions, such as hypertension and thyroid nodules, and seeking treatment for acute medical conditions such as minor burns and falls. This may point to an unmet need among residents with limited resources.

ACKNOWLEDGEMENTS

The authors thank the volunteers of the Ulu Pandan Haze Clinic, including Dr Victor Lee, Dr Kok Sen Ho, Dr Cynthia Kew and Dr Steven Teo. We also acknowledge Julia Tan for nursing support and Alastair Liew, junior volunteer. We thank Kang Boon Seng for the sponsorship of fruits for the patients.

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