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Effects of Asian Dust Storm on Health-related Quality of Life: A Survey Immediately after an Asian Dust Storm Event in Mongolia

Abstract

Purpose: In spring, Asian dust storm events occur frequently in the deserts of Mongolia and northwestern China. Epidemiological studies have shown that particulate matter during a dust event can cause the deterioration of subjective symptoms concerning the eye and the respiratory. The objective of this study was to assess the possible effects of dust events on health-related quality of life (HRQoL) in the general population.
Methods: A survey of the HRQoL and subjective symptoms related to eye and respiratory systems was carried out for inhabitants in Mongolia after a dust storm event. HRQoL was assessed based on the SF-36. The study participant were 87 nomads.
Results: The scores of SF-36 subscales for group with symptoms were significantly lower than group without symptoms. In the results of the multiple regression analysis, the scores of SF-36 subscales were significantly related to the subjective symptoms.
Conclusion: This result suggested that a decreased HRQoL of people with symptoms, corroborated by subjective symptoms, may be the result of damage from a dust storm event. Measurement of HRQoL in the general population may thus be an index of the effect from the dust storm.

Keywords: Asian Dust storm; HRQoL; Subjective symptom; SF-36

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Introduction

In spring, wind erosion in the deserts of Mongolia and northwestern China has been known to produce Asian dust storm events, which spreads over large areas, including eastern China, the Korean Peninsula and Japan, and is occasionally transported across the Pacific Ocean to North America [1-4]. The dust storms are caused by great wind velocity, which deteriorate the visibility due to high concentration of dust and sand in the air. In 2008, daily observations and the atmospheric concentrations of the dust storm increased steadily [1,5]. Researchers became increasingly concerned about dust storms, not only due to their effects on both regional and global environment, but also due to detrimental effects of dust particles on human health [6].

Epidemiological studies have found that mortality due to respiratory and cardiovascular diseases in the elderly are associated with dust storms [2,7-9]. In the physically healthy person (i.e. general population), researches also have shown that during a dust event, particulate matters can cause the deterioration of subjective symptoms related to eye and respiratory systems [10-13]. However, to the general population, there is little empirical evidence to demonstrate the effects on general health, especially in relation to health-related quality of life (HRQoL).

HRQoL is considered a subset concept of Quality of Life (QoL). QoL has been defined as "a person's subjective sense of well-being, derived from current experience of life as a whole". However, there is no clear agreement on the definition of HRQoL [14]. In general, HRQoL is accepted as a multi-dimensional concept that encompasses the components of physical, psychological, social, spiritual, and role functioning, as well as general well-being. Therefore HRQoL is used to always evaluate general health.

In the present study, designed to assess the possible effects of Asian dust storm events on HRQoL to general population in Mongolia, we assume that the subjective symptoms associated with the eye and respiratory systems are influence of the dust storm.

Methods

Subjects

An intense dust storm event occurred during 26-27 May 2008 in a broad area of Mongolia. We performed a cross-sectional study of the surrounding desert area of Choyr City, Govisumber Province in the southeast of Ulaanbaatar (Figure 1) immediately after the dust storm event. The province covers an area of 5,540

Figure 1: Map of Mongolia with an arrow pointing to the study area

km² and has a population of 12,230. The occupation of inhabitants is nomadism of the domestic animal. We chose Govisumber Province as our study area because it is one of typical nomadic areas to represent overall population of Mongolia desert (in terms of socio-economic status and demographic characters) and this area was raged through the two-day dust storm on 26-27 May, 2008. We visited a convenient sample of 46 nomad households along the main road over a period of four days (May 28-31). The study participants included the people above 20 years but below 65 years in each household (i.e. general population). The data collection method used in this survey was a face-to-face interview with a questionnaire. The investigators first informed the participants of the purpose of the survey and obtained a statement of voluntary participation from the person being interviewed.

HRQoL

HRQoL was assessed based on a 36-item short-form health survey (SF-36). The original questionnaire has 36 items comprising eight subscales. So that the questionnaire in this study could be kept simple, only four subscales, general health (GH), vitality (VT), mental health (MH), and role-physical (RP), were investigated. The scoring of each subscale was performed according to a scoring protocol [15]. Raw scores were converted into numerical scores ranging from 0 to 100. Usually, the higher the values, the better the outcome.

Subjective symptoms and other related indicators

Participants were asked questions relating to their ages, smoking habits, sex as well as symptoms concerning the eye and respiratory systems in relation to the dust events. Examples of such questions are:

"*These several days, have you had any of the following symptoms: itching, hyperemia, and/or lacrimation?"*

"These several days, have you had any of the following symptoms: mucus, nasal congestion, coughing, sputum, and/or dyspnea?"

Statistical analyses

To examine the relationships between HRQoL and subjective symptoms, the scores of SF-36 subscales between group with symptoms and group without symptoms were compared using the student's *t*-test. Furthermore, multiple regression analysis was conducted to adjust the other variables (e.g., age, gender, smoking) using age, gender, smoking, alcohol, eye symptoms, and respiratory symptoms as the independent variables and General health (GH), Vitality (VT), Mental health (MH) and Role-physical (RP) as the dependent variables. At 95% confidence interval $p < 0.05$ were considered significant. Statistical analysis was carried out using SPSS version 13.0.

Results

Table 1 shows the characteristics of study participant (age, 44.2±17.3). A total of 87 participants were enrolled in this study. The mean age was 44.2±17.3 yr. Reasonable proportions were then current smokers (38.4%) and habitual drinkers (21.8%). High proportions had eye (48.3%) and respiratory symptoms (34.7%).

Table 1: Study participants' characteristics (n=87)

Participants' characteristics	***n (%)***
Gender (male)	45(51.8)
Currently smoking	33(38.4)
Habitual alcohol drinker	19(21.8)
Subjective symptoms	***n (%)***
Eye (with symptoms)	42(48.3)
Respiratory (with symptoms)	30(34.7)
SF-36 subscales' scores	***mean***±SD
General health	75.4±19.2
Vitality	73.8±15.3
Mental health	69.9±8.80
Role-physical	85.3±17.0

Figures 2 and 3 show the results comparing SF-36 subscales' scores between groups with and without symptoms. The scores of SF-36 subscales for group with symptoms were lower than group without symptoms, and most SF-36 subscales displayed a statistically significant association with the subjective symptoms.

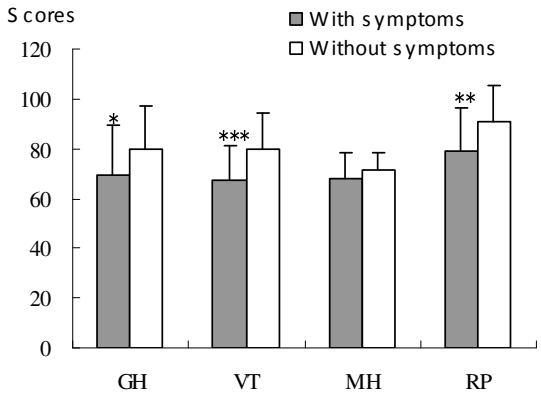

Figure 2: Comparison of SF-36 subscales' scores between group with eye symptoms and group without eye symptoms (GH: General health; VT: Vitality; MH: Mental health; RP: Role-physical. *P<0.05; **P<0.01; ***P<0.001)

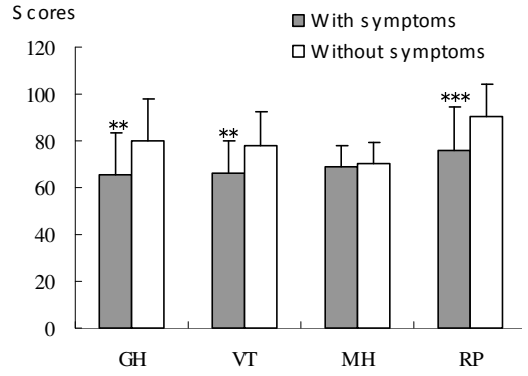

Figure 3: Comparison of SF-36 subscales' scores between group with respiratory symptoms and group without respiratory symptoms (GH: General health; VT: Vitality; MH: Mental health; RP: Role-physical. *P<0.05; **P<0.01; ***P<0.001)

Table 2 shows the standardized partial regression coefficients obtained by multiple regression analysis. The standardized partial regression coefficients of the eye symptoms with VT and RP were statistically significant. The standardized partial regression coefficients of the respiratory symptoms with GH, VT and RP were statistically significant. There was also a statistically significant correlation between the age and RP, and between the alcohol and MH.

Discussion

A large number of HRQoL evaluation methods have been developed during the past three decades. The SF-36 was designed for use in clinical practice and research, health policy evaluation, and general population surveys [16]. The SF-36 is one of the most frequently used generic measurements of HRQoL [17]. Up to now, in Mongolia, there were few studies to assessing HRQoL of inhabitants in Mongolia by SF-36. In this study, HRQoL was assessed by using a four-subscale survey of GH, VT, MH, and RP. The scores of SF-36 subscales were lower among the people with symptoms than those without symptoms. In the results of the multiple regression analysis, eye and respiratory symptoms were significantly related to GH, VT, or RP. Our result suggests that subjective symptoms are the most important factors decreasing the scores of SF-36 subscales. Recent studies have shown that Asian dust storm events coincide with an increase in daily admissions and clinic visits for asthma [18], allergic rhinitis [19], or conjunctivitis [20]. It was reported by the Newsletter of the United Nations in Mongolia in

Table 2: Multiple regression analysis results that assumed each SF-36 subscale a dependent variable

Independent variables	GH	VT	MH	RP
Age	-0.255	-0.116	-0.100	-0.343*
Gender (female=0; male=1)	0.286	0.232	0.098	0.190
Smoking (non=0; current smoker =1)	-0.003	0.195	-0.028	0.083
Alcohol (non=0; habitual drinker =1)	-0.108	-0.065	-0.328*	-0.075
Eye symptoms (without=0; with=1)	-0.103	-0.301*	-0.212	-0.304*
Respiratory symptoms (without=0; with=1)	-0.413**	-0.278*	-0.123	-0.371**

*The values are standardized partial regression coefficients obtained by multiple regression analysis, *P<0.05; **P<0.01. (GH, General health; VT, Vitality; MH, mental health; RP, Role-physical)*

June 2009 that 52 people lost their lives and 320 animals were killed in the 2-day dust storm of 26-27 May in 2008 just before this survey [21]. This dust storm caused many adverse effects on the economic activity and human health. Therefore, our results suggested that a decreased HRQoL level of the people with symptoms, corroborated by subjective symptoms of these ailments, may be the result of damage from a dust storm event.

The results also showed that the age is significantly related to RP. It means that the role physical in the elderly is lower. There is an earlier study that reported that age is related to QoL [22]. Nevertheless, the interpretation of the results of this study is limited by the use of a shortened version of the SF-36 and self-report measures.

Conclusion

The HRQoL after dust storm event are related to the subjective symptoms. This result suggested that a decreased HRQoL level of people with symptoms, corroborated by subjective symptoms, may be the result of damage from the dust storm event. Based on the convenient tools SF-36, HRQoL measurement to the general population can be used as an index of the dust storm effects.

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Conflict of interest

All authors declare they have no conflict of interest associated with this work.

Contribution of Authors

We declare that this work was done by the authors named in this article and all liabilities pertaining to claims relating to the content of this article will be borne by the authors. YK, HU, and SO conceived and designed the study, BB, HM and TYO collected the data, HM, KO, and YK analysed the data while HM and YK prepared the manuscript. All authors read and approved the manuscript.

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