Investigation on Cognitive Situation of PM$_{2.5}$ among Elderly People in Xuzhou City, China

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Abstract. To know cognition situations of PM$_{2.5}$ among elderly people in Xuzhou City and provide guidance about healthy exercise with scientific basis, the investigation was carried out by looking for elderly people in the Huai-Hai Campaign Monument Park and Wumingshan Park in Xuzhou City. Results show that the cognition situations for PM2.5 of elderly people in Xuzhou was not optimistic, and the overall cognitive level was lower with misunderstanding in exercise. We should intensify the publicity of air quality, especially health hazard of PM$_{2.5}$ to human body, and scientifically guide this crowd to do physical exercise.

Introduction

In the 1980s, economy is developed at high speed. The environmental pollution problem is increasingly serious along with high-speed development of economy, wherein air fine particle matter (PM$_{2.5}$) pollution has become a major problem in environmental pollution [1]. Air fine particle matter (PM$_{2.5}$) refers to particles in the air with air dynamics equivalent diameter less than or equal to 2.5micron [2]. The fine particles floating in the air may carry bacteria, virus disease, etc. and even trace amounts of heavy metals. These fine particles suspending in the air spread widely with undoubted speed. People expose in air with high concentration, which may increase the incidence of respiratory system and immune system.

Meanwhile, the life quality and health consciousness of people have also been gradually improved. More and more people, especially elderly people will exercise in the park for releasing themselves, which are beneficial for heart and cerebral vessel functions. It is also beneficial for improving lung and kidney functions. Human immunity also can be improved, and own psychological emotion can be adjusted. Exercise actually refers to sports outdoors. However, sports must accelerate our heartbeat and breath. If breathing is accelerated, a lot of fine particles can be inhaled under the condition of more serious PM$_{2.5}$ pollution. Body health of the elderly can be extremely harmed. Daigle, etc. studied and discovered that total particle sedimentation during sports is more than four times compared with that at quiet moment [3].

Currently, people are unfamiliar with related knowledge on air condition influence during physical exercise. They are lack of scientific and rational guidance. Most people, especially the elderly, do not recognize the seriousness of the problem. Therefore, the elderly population exercising in Huaita Park and Wumingshan Park are regarded as objects. People’s recognition condition on PM$_{2.5}$ health harm is investigated from February to April 2016. The elderly can be guided for scientific exercise on one hand, it
also has very profound significance for implementing various bodybuilding plans in China on the other than.

**Research Methods**

**Investigation Field Situation**

Xuzhou Huaita Park and Wumingshan Park are investigated. Huaita Park has a history of forty years, which covers an area of about 80 hectares. The internal buildings of the park include ten scenic spots, namely Huaihai Campaign Monument Park, Huaihai Campaign Steles Forest, Huaihai Campaign Memorial Hall, Huaihai Campaign General Front Committee Sculptures, Xuzhou National Defense Park Five-major Building, Qingnian Lake, Suyu bone ash scattering place, Hu Yaobang planting area, etc. The whole Huaihai Campaign martyr monument park has imposing manner and beautiful scenery. History culture and humanity landscape with deep connotation and long history are produced, the steles sculpture for commemorating revolutionary pioneers is lyrical, the park scenery with large planting coverage has beautiful scenery, which close to nature. It is an excellent tourist resort.

Wumingshan Park is located in Tongshan Administrative Region, Xuzhou, Jiangsu. It covers an area of 26 hectares with high vegetation coverage and pleasant scenery. Total construction investment is up to thirty-three million Yuan, including more than 20 small garden buildings, such as Yinghua Park, Mudan Park, Wangyue Pavilion, Cuizu Park, Art Gallery, etc. and more than ten scenic areas such as famous tree and ancient tree scenic spot, Huaihulu, moon lake, camping square, mid-lake island, hydrophilic platform, etc. It can be described as small sparrow and full equipment. The whole park is characterized by distinct characteristics and rich content, which makes people linger.

**Investigation and Statistics Method**

After documents and data about the investigation is referred, relevant questionnaire is prepared, main content includes the follows: investigation object gender, age, occupation, education, exercise time, location, frequency, PM$_{2.5}$ cognition condition and related measures adopted in response to adverse environmental conditions. Meanwhile, air indexes of Xuzhou within three months are surveyed and investigated. Air condition is recorded each day, thereby achieving certain understanding and analysis on PM$_{2.5}$ condition. One-to-one and face-to-face inquiry modes are adopted in the investigation process, and the questionnaire is filled anonymously. IBM SPSS Statistics 19.0 is adopted for questionnaire to sort and analyze the investigation data.

**Results and Analysis**

**Basic Situation**

A total of 342 valid questionnaires are received in the investigation, including 170 questionnaires in Huaita Park and 172 questionnaires in Wumingshan Park. The following data show that men are slightly more than women (figure 1). Men account for 53%, and women account for 47%. People with junior middle school and lower education background account for extremely high population (35%) in older population. The populations with senior middle school, technical secondary school and college education background are similar. The graduate students account for at least (9%), namely exercise population mostly have lower education background (figure 2).
In the elderly, retired personnel account for 73%, and people without occupation account for 27% (figure 3), and most people enjoy retirement pay. Age structure shows that 60 to 70-year-old men account for 63% of the surveyed population, people younger than 60 years old account for 21%, and people older than 70 years old account for 16% (figure 4). Meanwhile, average exercise duration of the elderly each time is about 2 hours. Exercise frequency of Figure 5 shows that a few people participate in exercise for one to three times and three to five times each week, and they respectively account for 12% and 25% respectively. More than 60% the elderly participate in exercise for six times or more than six times within one week.

Exercise Mode

Most investigated elderly people choose walking and fast walking (figure 6), respectively accounting for 50.29% and 41.52%. Secondly, people selecting running, dancing, martial arts and gymnastics account for 26.02%, 16.37%, 13.16% and 7.60% in turn. Wherein, 89 people adopt two or more than two exercise modes. The exercise modes of the elderly mainly include walking and fast walking with low sports quantity. Long-term insistence of walking and fast walking can keep own body shape effectively, and exercisers can keep young stage, enhance cardiopulmonary function, improve the quality of sleep, etc.; Running is especially beneficial for improving human respiratory system functions; dance and gymnastics can improve physical health, thereby resting fatigue body actively.
Frequency of Watching Weather Forecast and Air Quality

The proportion of focusing on air quality (43.86%) is much lower than the proportion of watching weather forecast (93.86%). Watching frequency shows that the proportion of watching air quality each day (41.52%) is much lower than the proportion of watching weather forecast (93.41%) (Figure 7). Most exercise population will focus on weather of the second day - sunny or cloudy. Therefore, more people watch weather forecast. However, few people will pay attention to air quality. Most population focusing on air quality may not select exercise in foggy day. However, they have less care on fine particle matter influence to health hazard.

PM$_{2.5}$ Cognition Condition

More than 60% people know PM$_{2.5}$ among 342 respondents. 90% people know that PM$_{2.5}$ are harmful to human body. Only less than 20% people show that they can decide to exercise or not according to PM$_{2.5}$ pollution condition. When air pollution is more serious, exercise people should adopt corresponding protection measures as shown in figure 8. Protective measures include the follows: wearing face masks, delaying outdoor exercise time, reducing exercise amount, etc. However, if people wear face masks, inhalation of harmful gas can be properly reduced. However, breathing can be hindered by wearing face masks during exercise. It is suggested that outdoor exercise time can be delayed according to changes of air quality, and correct and proper time can be selected.

Investigation result shows that only 16% people can determine to exercise or not according to PM$_{2.5}$ pollution condition, the remaining 86% people can not investigate PM$_{2.5}$ pollution condition fundamentally (figure 9). When investigators ask people in exercise during investigation, most people show that they may give up exercise when
serious air pollution is produced such as haze, etc. and they can arrange exercise according to weather condition in other circumstances. People focusing on sunny weather on the second day account for less proportion among respondents, few people may focus on air pollution, and they only focus on severe pollution.

**Demand of Air Pollution Knowledge and Desired Acquisition Approach**

Demand on PM$_{2.5}$ air pollution knowledge mainly includes harm on human body. The demand on PM$_{2.5}$ knowledge is not high, which only accounts for 13%. Respondents knowing PM$_{2.5}$ hope to obtain PM$_{2.5}$ information mainly through TV, which account for 61.1%. They are followed by radio and newspaper, which respectively account for 23.4% and 10.8%. Mobile phone and Internet are less, which respectively account for 1.5% and 0.6%. Since many older people don't use smart phones and computer network, the elderly obtains information mainly through traditional information transmission media, which are mainly based on TV, radio and newspaper. In acquisition of air pollution knowledge, most people know that PM$_{2.5}$ is harmful to body, the harm on respiratory system, cardiovascular system, etc. are poorly understood.

![Figure 9. Decided to exercise whether based on pollution situation.](image1)

![Figure 10. The way to get information.](image2)

**Conclusion and Suggestion**

Fine particle matter (PM$_{2.5}$) is the primary pollutant currently in China urban cities [4]. Space change of air particulate matter is obvious in recent years. Its concentration is increased as a whole. Air particulate matter is regarded as one of important atmospheric pollutant; its shape and composition are very complicated. In addition, its toxicity and harm to the environment has been increasingly emphasized. The investigation shows that the elderly does not have optimistic recognition condition on PM$_{2.5}$ with low overall cognitive level, and they have misunderstanding on exercise. Most people can not determine to participate in exercise or not according to PM$_{2.5}$ pollution degree, they only focus on weather. Xuzhou belongs to heavy industry city. PM$_{2.5}$ pollution is relatively serious. In addition, physical health of people will be seriously affected. Particles will be deposited to the alveoli, thereby causing pneumoconiosis, asthma and other diseases, and damaging some organs [5].

Currently, most people are aware of the importance of physical exercise, while many exercisers believe that air is fresh in the morning, thereby people participating in exercise are increasing. The investigation shows that exercise frequency of the elderly in the park is higher each week. The exercise time is longer. However, human body may be harmed by pollutants to certain degree during exercise. Original sound effect must be affected, and even own health can be greatly harmed.
It is obvious through questionnaire that the elderly has more contact with TV and radio among media. Therefore, it is suggested that broadcasting of PM$_{2.5}$ and other pollutants can be added in weather forecast of television and radio. Related suggestions should be given. Transmission of the news can be posted in the park; thereby the elderly exercising in the park can comprehend more deeply.

The country also should attach great importance to air situation. Some reports point out that seven cities in China are listed as top ten cities with the most serious pollution all over the world, wherein air pollution accounts for larger proportion. Therefore, scientific knowledge dissemination activities are carried out to the public. The influence of air pollution on own life health should be scientifically treated. It is especially urgent to eliminate the ‘haze’ in the mind of the public. Relevant departments should guide the public, especially the elderly, to go out for exercise rather than focusing on the weather conditions and ignoring air condition. Firstly, such knowledge can be published on books and newspaper for popularity, some public welfare advertisements can be properly added in television and online advertisement. Secondly, management on air quality should be further emphasized. Currently, pollution is only treated superficially through popularizing knowledge only. The balance point between economic development and environmental protection should be actually emphasized, and the ecological environment should not be seriously damaged with profit-making as the first purpose.

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References


