

## The Research of Environmental Factors of Northern Taiwan Metropolitan and The Costal Areas Impact on The Adolescent Asthmatic Students with Their Physical Fitness

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**Abstract:** The main purpose of this research is to investigate the difference of the asthmatic teenagers effected by environmental factors of the northern Taiwan metropolitan and the costal areas. There are 52 asthmatic students from Taipei Municipal Cheng Yuan High School and 75 asthmatic students from Tamshui Junior High School as search samples. Correlated with the survey which is published by the Taiwan Central Weather Bureau and the Environmental Protection Department on the study of the asthmatic student in their learning environment and their physical fitness. After the collection of the data, the ratio Z distribution test, and independent samples t-test are analyzed with stastical methods. The research results as the following conclusions: 1. The asthmatic student ratio in northern Taiwan costal metropolitan areas are high than any other metropolitan areas. 2. The CO, PM<sub>10</sub>, and SO<sub>2</sub> are much higher in the environmental factor of northern Taiwan metropolitan are a than any other coatal metropolitan area for the students. 3. The male asthmatic students of northern Taiwan metropolitan have a better physical fitness ratio than other costal metropolitan. Asthmatic symptoms may be improved in the daily basis. 4. The female asthmatic students in northern Taiwan metropolitan areas have better cardiorespiratory fitness than other costal metropolitan area in ratio.

[Tsau HC, Yeh CT, Hong W. C. Chang CM. **The Research of Environmental Factors of Northern Taiwan Metropolitan and The Costal Areas Impact on The Adolescent Asthmatic Students with Their Physical Fitness.** *Life Sci J* 2013;10(4):3544-3549]. (ISSN:1097-8135). <http://www.lifesciencesite.com>. 472

**Keywords:** CO, PM<sub>10</sub>, SO<sub>2</sub>

### 1. Introduction

Dramatic weather changes or a high concentraion of air pollution can easily cause discomfort or health problems. World Health Organization [W.H.O.] (2008), Kuebler, Bchsel, and Balkstra (2008) states that Asthma is related to environmental factors. Historical research pointed out that asthmatic patients not only their allergetical body and abnormal nervous regulation factor, but the enviromental changes is an important factor (Chiang, Huang, & Lu, 1999). Taiwan is a typical island-type subtropical climate, and it is more likely to cause respiratory over react result in asthma for teenagers due to severe climate changes between Spring to Summer or Fall to Winter because of extreme changes of temperature and humitivity (Liao, 2003; Yang, 2001) Asthma is a common sickness for students to absence from classes, and even affect the physical, emotional, and social adjustment, and academic performance (Chang, 2002). Although the treatment of asthma greatly improved with progression of medical technology, but studies show that asthmatic children and teenagers population are increasing (Mallol, Sole, Asher, Clayon, Stein, & Soto-Quiroz, 2000; Weiland, Husing, Strachan, Rzehak, Pearce, & ISAAC, 2004; Webber, Carpiniello, Oruwariye, & Appel, 2002). Taiwan asthmatic children and teenagers population and severity are increased significantly (Huang, 2005; Lin, & Wang, 2006). Thus the asthmatic population not only

increase in teenagers, but also becomes one of the global health issues. This will influence individual in school, daily life, and social adaptation, and possiblity result in economical burden for the family, and increase social costs (Chiang, 2005; Kyngas, Kroll, & Duffy, 2000).

Lin and Wang (2006) Integrated with Taiwan asthma study, the risk factors may include: (a) demographic characteristics: gender and age, (b) the allergen, (c) climate, (d) genetic factors, (e) air quality (f) lower respiratory tract infection accompanied by repeated wheezing (g) indoor wet environment (h) Sports and other factors. In these factors, enviromental factor (climate, the quality of air, and indoor humidity) and sport factor are four important factors. With the development of technology and industrial metropolitan sociaty, metropolitan environment has great influce on asthma (Jlan, 1989). Lin with Sung and others schoiar (2001) investiaged base on metropolis progression for the areas and finds out that the prevalence of asthmatic teenagers of 11.2% in highly metropolized area, 7.4% for medium metropolized area, and only 6.9% for low metropolized area. So, the higher the area metropolized, the students is likely to have asthma.

Asthmatic students cannot fully participate with learning activities and normal physical activities due to theillness syptoms lead to easy fatigue, lack of energy, and feel the pressure. Slight activity cuases

short of breathing is because of lack of exercise and short of stamina for activities. Domestic research on the prevalence of asthmatic teenager discover that there is higher prevalence of having asthma for those lack of exercise than those who exercise more often (lack exercise: 11.9%, often exercise: 10.0%) ( $p < .001$ ) (Wu et al., 1998); therefore, lack of exercise will cause a vicious circle for the adaptability and respiratory illness control (Rasmussen, Lambrechtsen, Siersted, Hansen1, & Hansen, 2000). There are reaserch pointed out that proper exercise for the asthma patients not only safe, but also can interated with other treatment to reduce the sympton, reduce the absence, improve self-esteem, and improve peer relationship, and improve the quality of life (Disabella, 1998; Kendrick, 2000; Neder, Nery, Silva, Carbral, & Fernandes, 1999; Rimmer, 1989). Medical center held a short-term summer camp for those asthmatic students to teach them about asthma and physical activity. The result shows great improvement for these asthmatic students, and recommended that the schools should make school sport class more fun, so the asthmatic students can join the class more, and improve the learning efficiency, and physical fitness (Lai, Wu, Lu, Wu, & Huang, 2006) The asthmatic patients should have proper exercises to prevent asthma to be triggered by any sports, and the exercise is actually a very important factor. With all above documents that the quality of life of asthma students is affected by the location of the metropolitan environment and physical fitness. This research discusses the different northern Taiwan metropolitan enviromental factors to asthmatic students' physical fitness, and hope to decrease the the affect of the environmental factor to Taiwan asthmatic teenagers,

and provide proper exercise lessons reference to physical education teachers for those asthmatic students.

### 1.1 Purpose of research

Teenager asthma problems affects society, family, and school increases everyday, and multiple factors which cause asthma are being studied and focused. This research conducts the difference between northern Taiwan metropolitan and costal area environmental factors, and asthmatic teenagers' physical fitness.

1.Discussing difference between asthmatic students in different metropolitan areas.

2.Discussing difference between asthmatic students in different metropolitan environmental factors.

3.Discussing difference between male asthmatic students in different metropolitan areas.

4.Discussing difference between female asthmatic students in different metropolitan areas.

## 2. Methods

### 2.1 Reliability of Test Materials

.Study object and scope: Research target and range: this research takes sample from Taipei Municipal Cheng Yuan High School from Taiwan's capital city, and Tamshui Junior High School from near by costal area. Both schools will be tested with environmental factors and physical fitness of each asthmatic students for research target and range. All asthmatic students are recorded and have doctor's approval in 2012; therefore. The two schools suffer from asthmatic students in Table 1.

Table 1. Asthmatic students statistics

	Male	Female	Asthmatic students	Total number of students	%
Chenyuan high school (junior high)	38	14	52	1175	4.42%
Tamshui Junior High School	49	26	75	1400	5.35%

Climat and Quality of Air data: For the liability, the information is collected from the Cetral Weather Bureau of Taiwan's Ministry of Transportation. The data is the average temperature and air pressure from 1881 to 2010 (The Central Weather Bureau annouces as average of 30 years monthly basis, and renew every January, and the latest update is January 2011). The air quality data is monitored by Taiwan Environmental Protection Administration and averaged every month for 3 years (2008 to 2010, closest observatory station to to Cheng Yuan High School is Guting station; closest observatory station to

Tamsui Junior High School is Tamsui station. The climate and air factors analysis in Table 2.

Student physical fitness testing method: According to "Teacher's fitness guidebook" (Ministry of Education, 2004) by Taiwan's Ministry of Education, the standard testing medods are sit & reach (flexibility), standing jump (instantaneous force), one minute si-ups (muscular strength and endurance), and 1600m (men) / 800m (girls) (cardiorespiratory endurance). For the reliability and validity of the data and safety concer, the physical fitness tests are held by teachers with assessment tools for adjustment based on the guide book.

## 2.2 Data analysis

After collecting and confirming data, the data are filed with SPSS 14.0 Chinese version for statistical analysis. In this research, statistical analysis methods, including: ratio Z-square analysis, and independent samples t-test.  $\alpha = .05$ , for this statistical calculation.

Table 2: The climate and air factors in the area of School

	School	Jan.	Feb.	Mar.
TEMP	Chenyuan	16.1	16.5	18.5
	Tamshui	15.2	15.6	17.4
HPA	Chenyuan	1020.2	1018.6	1016.1
	Tamshui	1018.7	1017.2	1014.8
co	Chenyuan	.70	.78	.74
	Tamshui	.48	.54	.52
PM <sub>10</sub>	Chenyuan	54	55	77
	Tamshui	45	42	60
SO <sub>2</sub>	Chenyuan	3.6	3.5	3.8
	Tamshui	2.9	2.9	3.3

Continue Table 2.

	School	Apr.	May	Jun.
TEMP	Chenyuan	21.9	25.2	27.7
	Tamshui	21.1	24.5	26.9
HPA	Chenyuan	1012.7	1008.9	1005.8
	Tamshui	1011.4	1007.6	1004.6
co	Chenyuan	.73	.65	.76
	Tamshui	.50	.45	.51
PM <sub>10</sub>	Chenyuan	61	55	45
	Tamshui	47	42	40
SO <sub>2</sub>	Chenyuan	3.2	3.5	3.5
	Tamshui	2.7	2.9	3.2

Continue Table 2.

	School	Jul.	Aug.	Sep.
TEMP	Chenyuan	29.6	29.2	27.4
	Tamshui	28.8	28.6	26.7
HPA	Chenyuan	1005.2	1004.4	1008.3
	Tamshui	1003.9	1003.2	1006.9
co	Chenyuan	.58	.55	.50
	Tamshui	.30	.33	.32
PM <sub>10</sub>	Chenyuan	41	42	38
	Tamshui	29	32	31
SO <sub>2</sub>	Chenyuan	3.3	3.2	2.6
	Tamshui	3.5	3.3	2.5

Continue Table 2.

	School	Oct.	Nov.	Dec.
TEMP	Chenyuan	24.5	21.5	17.9
	Tamshui	23.7	20.6	16.9
HPA	Chenyuan	1013.8	1017.5	1020.3
	Tamshui	1012.4	1016.0	1018.8
co	Chenyuan	.55	.59	.71
	Tamshui	.34	.37	.53
PM <sub>10</sub>	Chenyuan	47	45	65
	Tamshui	39	33	53
SO <sub>2</sub>	Chenyuan	2.8	2.8	3.5
	Tamshui	2.3	2.3	3.4

## 3. Result and Discussion

### 3.1 The difference between two different metropolitan areas asthma student

Taipei Chenyuan high school for junior a high students to the total number of 1175, which suffers from asthma, there were 52 students; the New Taipei City Tamshui Junior High School, students to the total number of 1,400, including 75 students suffering from asthma. The Test by Zulliger Z have the  $Z = 2.18$ ;  $p < .05$ , shows that the two schools the number of asthmatic students are significant differences. Tamshui Junior High School the Asthma student ratio is higher than the Chenyuan a high school for junior high asthmatic students. Also shows that the coastal metropolitan areas, students with asthma students than the students of the Taipei metropolitan area.

### 3.2 The difference of different metropolitan area environment factors for the asthma student

From Table 3; there is no significant different among different metropolitan areas environmental factors in climat (temperature and air pressure). There are significant difference among air quality factors: CO ( $t=5.74, p<.05$ ), PM<sub>10</sub> ( $t=2.59, p<.05$ ), SO<sub>2</sub> ( $t=2.12, p<.05$ ). The result shows that the environmental factors CO, PM<sub>10</sub>, and SO<sub>2</sub> is higher in taipei metropolitan area than coastal metropolitan area. Also, it shows the air factors greatly influenced asthmatic students in different metropolitan areas. This results is similar Wu and other scholars (Wu et al., 1998) pointed out that air pollution is related to respiratory disease, especially the air pollution is from cars and motor shooters in Taipei City., and because of the special basin topography and climatic conditions prevents air pollution from diffusion and resolution.

### 3.3 Comparison of different metropolitan areas of asthmatic male student physical fitness

According to Table 4, there is a significant difference in standing Muscular Strength ( $t=3.82, p<.05$ ), and Muscular Endurance ( $t=2.64, p<.05$ ) for male asthmatic student between different metropolitan areas, but there is not much of difference for Muscular Flexibility, and Cardiorespiratory Endurance. This result shows that Taipei metropolitan area male asthmatic students are better in instantaneous force, and muscular strength and endurance than the coastal metropolitan area.

### 3.4 Comparison of different metropolitan areas of asthmatic female student physical fitness

From Table 5, there is a significant difference for Cardiorespiratory Endurance ( $t=3.66, p<.05$ ) between different metropolitan areas, but there is not much of difference for Muscular Flexibility, Muscular Strength and Muscular Endurance. This result shows that Taipei metropolitan area female asthmatic students have better cardiorespiratory endurance than coastal metropolitan area  $p<.05$ .

Table 3. Asthmatic students of different metropolitan areas in the environmental factors paired t-test summary table

	Area	Months	Avg	SD	t	p
TEMP	Chenyuan	12	23.00	4.96	.41	.69
	Tamshui	12	22.17	5.06		
HPA	Chenyuan	12	1012.65	5.96	.56	.58
	Tamshui	12	1011.29	5.88		
CO	Chenyuan	12	.65	.10	5.74**	.00
	Tamshui	12	.43	.09		
PM <sub>10</sub>	Chenyuan	12	52.09	11.43	2.59*	.02
	Tamshui	12	41.09	9.31		
SO <sub>2</sub>	Chenyuan	12	3.28	.37	2.12*	.05
	Tamshui	12	2.93	.42		

\*p&lt;.05, \*\* p&lt;.01

Table 4. Asthmatic male students physical fitness of different metropolitan areas in the t-test summary table

Fitness	Area	Male	Avg	S.D.	t	p
Muscular Flexibility	Chenyuan	38	26.82	9.61	1.30	.20
	Tamshui	49	23.96	10.56		
Muscular Strength	Chenyuan	38	193.21	36.52	3.82**	.00
	Tamshui	49	166.22	26.99		
Muscular Endurance	Chenyuan	38	41.39	11.86	2.64**	.01
	Tamshui	49	35.24	9.85		
Cardiorespi-ratory Endurance	Chenyuan	38	581.45	104.47	.55	.58
	Tamshui	49	594.41	112.33		

\*p&lt;.05, \*\* p&lt;.01

Table 5. Asthmatic female students physical fitness of different metropolitan areas in the t-test summary table

Fitness	Area	Male	Avg	SD	t	p
Muscular Flexibility	Chenyuan	14	35.57	10.96	1.20	2.39
	Tamshui	26	31.60	9.50		
Muscular Strength	Chenyuan	14	142.29	26.11	.22	.82
	Tamshui	26	140.42	24.96		
Muscular Endurance	Chenyuan	14	32.64	12.66	.78	.44
	Tamshui	26	29.81	9.90		
Cardioresp-iratory Endurance	Chenyuan	14	276.79	40.15	3.66**	.00
	Tamshui	26	338.42	55.49		

\*p&lt;.05, \*\* p&lt;.01

#### 4. Conclusion and Suggestion

##### 4.1 Conclusion

*Difference between different metropolitan area for asthmatic students*

There is big difference in asthmatic student number between both Taipei Municipal Cheng Yuan High School and Tamshui Junior High School. This means Taiwan coastal metropolitan area has more asthmatic students than Taipei city metropolitan area.

*Difference between different metropolitan environmental factors for asthmatic students*

The asthmatic students of different metropolitan areas where environmental factors and air factor have significant differences. There are more CO, PM<sub>10</sub>, and SO<sub>2</sub> in northern Taiwan metropolitan is probably because the cars and motor scooters emissions and basin topography is not easy to diffuse and resolute the pollution, which may cause affection on the learning environment of metropolitan asthma students.

*Difference between different metropolitan asthmatic students' physical fitness*

Northern Taiwan metropolitan male asthmatic students have better tanding jump, and one minute si-ups than costal metropolitan students. Which means that norther Taiwan metropolitan asthmatic students have better physical fitness, so it could improve from asthmatic symptoms.

*Difference between different metropolitan asthmatic students' physical fitness*

Northern Taiwan metropolitan female asthmatic students have only better in cardiorespiratory endurance than costal metropolitan area, and there is no significant difference between other catagories. Therefore, it can only concludes that northern Taiwan metropolitan asthmatic females students have better cardiorespiratory endurance than costal metropolitan area.

**4.2 Suggestion**

According to the above findings and conclusions, the suggestions as follows:

- Northern Taiwan metropolitan areas might be easily to be influed by air quality, polution, climax, and topography, which might result in increaseng incidence of asthma. The suggestion is that metropolitan asthmatic students should try to avoid going out or exercise while rush hour with all the emittions.

- The school teacher and the parents of the asthmatic students should encourage asthmatic students to participate proper exercises to improve physical fitness, in hope of improving learning and live quality.

- In this research, only different metropolitan areas in northern Taiwan are being studied. It is suggested that future research can expand the samples to the entire region of Taiwan and the costal areas of school.

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12/23/2013