Peak Expiratory Flow Rate amongst an Aboriginal Community in Peninsular Malaysia

Hui Jean Yap [1*], Wooi Wooi Khaw [1], Patmapriya Ramasamy [1], Siti Nurayu Muhammad Idris [1], Baitil Ai'zah Mohd Sibi [1], Daniel Ngu Leong Hoe [1], Loh Li-Cher [2], Abdul Rashid Khan B. Md Jagar Din [3]

[1] Department of Public Health Penang Medical College, Penang, Malaysia
[2] Prof.; Department of Medicine, Penang Medical College, Penang, Malaysia
[3] Assoc Prof.; Department of Public Health, Penang Medical College, Penang, Malaysia

* ***Corresponding Author:*** *blizzardhazzard@yahoo.com*

Abstract

Background: The 'Orang Asli' or the aboriginal people of peninsular Malaysia have high morbidity, mortality and poverty rates and they lag very far behind in basic infrastructure, literacy and education. Information on peak expiratory flow rate (PEFR) among Orang Asli is extremely limited and there has only been one such study which was carried out in 1971.

Aims & Objectives: To determine the lung function of a community of Orang Asli in Peninsular Malaysia and to determine their association with various socio-demographic and anthropometric factors with their lung function.

Methods: PEFR was measured using the Wright Peak Flow meter and the best of the three readings taken was used. A total of 119 respondents participated in the study.

Results: A total of 79 respondents (66.9%) reached 80% of their predicted PEFR value while 39 (33.1%) fell below 80% of their predicted PEFR value. Results showed a significant association in PEFR between genders (p=<0.001), height (p=0.004), exposure to noxious particles (p=0.023) and level of education (p=0.014). Linear regression showed that the PEFR increased with increasing height (p=0.004) and was higher in men (p=<0.001), those not exposed to noxious particles (p=0.023) and those with a higher education level (p=0.014).

Conclusion: Orang Asli who are tall, male, with higher levels of education and not exposed to noxious particles have better lung function.

Keywords: Peak expiratory flow rate (PEFR), Orang Asli, Malaysia

Introduction

Orang Asli is the Malay term literally meaning 'original people'. This is the term used for the indigenous minority people living in peninsular Malaysia. The Orang Asli in Peninsular Malaysia comprises of three main ethnic groups namely Negrito, Senoi and Proto Malay. Each ethnic group is further divided into multiple sub-ethnicities. The sub ethnic groups of the Negrito group include Kensiu, Kintak, Lanoh, Jahai, Mendriq and Bateq. The Senoi include Temiar, Semai, Semoq Beri, Che Wong, Jah Hut and Mah Beri and the sub ethnic groups of the Proto Malay include Temuan, Semelai, Orang Kanaq, Orang Kuala and Orang Seletar. According to 2008 data, they numbered about 141,230. It is reported that 36.9% aborigines live in rural areas, 62.4% in marginal areas and 0.7% in city areas.[1] The morbidity and mortality rates among the Orang Asli are high.[2] The Orang Asli have three times the incidence of tuberculosis as the national average.[3] The poverty rate for Orang Asli has been reported as higher than the mainstream Malaysian population[4] and they lag very far behind in basic infrastructure, literacy and education.[5] The Orang Asli used to survive by hunting and foraging food in the jungle[1], but recently due to the encroachment by developers and loggers into their land some ethnic groups of Orang Asli are living closer to the cities and townships. This forced urbanization has led to the changes in types of employment and lifestyle which has led to changes in their daily activities leading to a sedentary lifestyle. New occupations which expose them to noxious substances may have an impact in their lung capacity.

Peak Expiratory Flow Rate (PEFR) value can be used as an indicator of a person's health and it is a clinical tool in diagnosis, management and follow up for respiratory diseases. It has been shown that as a person ages, their PEFR decreases.[6] Peak flow measurements can be used to measure the strength of muscles of respiration[6] and thus can be used to monitor respiratory impairment. Diurnal variation of PEFR is used to diagnose and in the management of bronchial asthma.[6] Self-monitoring of PEFR by asthmatic patients also helps to increase the effectiveness of treatment.[7] Limited research has been carried out and published in the area of measuring lung function using peak flow meter in Malaysia let alone among the Orang Asli. The studies that were carried out in Malaysia were mainly focused on the elderly or children.[8,9,10] Only one reported study was carried out among the Orang Asli to determine their lung function in 1971 by Dugdale *et al.*[11] They found most of the respondents peak expiratory flow rate (PEFR) value was lower than the predictive value. However, the ethnicity of the Orang Asli population in that study was not specified. Furthermore, because of the differences in culture and practices and the magnitude of health problems among these communities than that of mainstream Malaysians it is important to evaluate whether the socio-demographic, economic and anthropometric indices would affect the Orang Asli's respiratory function. An overview of their general lung functions and factors contributing to the impairment of lung function can be recognised and can be used as a reference for future studies and as a comparison to the general population. Thus, this study was conducted to evaluate the lung function among the Semai Orang Asli living in Cameron Highlands, Malaysia by determining the Peak Expiratory Flow Rate (PEFR) using a Peak Flow Meter.

Methods

Setting

This study was conducted among the Semai people who are the sub-ethnic of the Senoi Orang Asli living in Cameron Highlands, Malaysia. The village is located on a hilly land with the houses spreading across the hill and is approximately one km to the nearest town. Most of the villagers here are employed as elementary workers such as hotel cleaners, garbage collectors and laborers.

Study design

A cross sectional study was conducted in April 2012.

Sampling

There were approximately 1300 Semai Orang Asli living in this village.[12] A convenience sampling method was used to sample the study population from a total of 63 households. All healthy subjects who were 20 years and above, who consented and were able to communicate effectively were eligible to participate in the study. Excluding criteria included those who were bedridden, because participants were required to sit upright to perform the assessment. Other exclusion criteria's included those who were diagnosed with pulmonary tuberculosis (PTB) and were on medication at the time of the study. This was done as a preventative measure to avoid potential spread of PTB. Respondents with severe wheezing, shortness of breath, severe oral deformities and oral diseases were also excluded as they would not have been able to perform the test due to their condition. Respondents who failed on three consecutive attempts due to incorrect technique despite adequate instructions were also excluded from the study to avoid causing annoyance to them. Respondents suffering from acute or chronic cough with or without productive sputum were included; however it was ensured that they cleared their sputum before blowing into the peak flow meter. Respondents with dental deformity or wearing dentures were also included as only the lips are required to completely seal the mouthpiece. Respondents who were diagnosed with pulmonary tuberculosis but have been successfully treated were also included.

Tools

A questionnaire was designed for this study. The interviews were conducted in the participant's homes. Data was collected by trained medical students. The students were trained in the classroom and were taught the correct method of using the peak flow meter. Besides the baseline socio-demographic information, peak expiratory flow rate was measured using the Wright peak flow meter which is a rapid and reliable measure of ventilator function.[13] The instrument is inexpensive, portable and easy to operate and is practical for both hospital and general practice and as a screening tool in epidemiological studies.[13] The Wright Peak Flow meter was used with the respondent in an upright sitting position. By holding the peak flow meter with the finger's grip of the right hand away from their mouth, respondents were told to inhale as deeply as possible followed by sealing the disposable mouthpiece tightly with their lips. Respondents were given instruction to exhale as quickly and completely as possible. Three satisfactory readings were taken from the peak flow and the highest measurement of the three was taken as the maximum peak flow value for the study.[14] Besides the PEFR, Slim guide skinfold caliper was used to measure the thickness skin fold and its subcutaneous fat from four areas – biceps, triceps, subscapular and suprailiac. Body density was then calculated using the skinfold measurements using Durnin and Womersley formula.[15] The density value was then converted to percentage body fat using the Siri equation.[16] The respondents body fat were classified separately for gender as too low, essential fat, athletes, fitness, acceptable, and obese as describe by American Council on Exercise.[17] These 6 groups were then further clustered into health (essential fat, athletes, fitness) and unhealthy (too low, fitness, acceptable). BMI of each respondent was calculated using the formula; body weight in kilograms divide by height in metres squared (kg/m2). The respondents were categorised as healthy weight (18.5 to 23.9), overweight (24.0 to 26.9) and obese (27.0 and more) based on their BMI measurement.[18] A cut-off point for waist circumference of more than 102cm in men and more than 88cm for women were used to define abdominal obesity and blood pressure was also measured.[19] To analyze the effects of noxious particles to lung function, respondents were divided into two groups i.e. exposed and unexposed to noxious particles according to their occupation. Employment categorized as exposed to noxious particles included respondents who were working in the forestry, agricultural, elementary, or construction site categories. Not exposed included respondents who were professionals, students, housewives, unemployed or working in the tourism & services sector.

Ethics

An informed verbal consent was obtained from each respondent prior to participation in the study. An ethical approval was obtained from the ethics committee of the public health department of the institution prior to commencement of the study. The anonymity of the respondents is assured.

Analysis

Data was analyzed using SPSS version 20. Data is tabulated and descriptive statistics were expressed in frequency and percentage. Inferential statistics were done using independent sample t-test, ANOVA and Scheffe Post Hoc test was used to compare the significance of the difference between means of different groups within 95% confidence limit. Linear regression was used to identify the predictive variables. The level of significance was set at P<0.05.

Results

A total of 119 respondents out of the 161 eligible villagers participated in the study giving a response rate of 73.9%.

As shown in table 1 most of the participants were female (58.8%), in the age group 20-29 (42.0%), educated (84.0%), earning more than RM750 (40.5%) and were non smokers. A significant proportion were obese (37.3%) but with a normal waist hip ratio (71.4%) and a healthy body fat percentage (64.7%) and were normotensive (57.1%). The mean height and weight were 154.5cm and 62.4kg respectively. The predicted PEFR value for each individual was calculated using calculator incorporating age, height and gender.[20] A total of 79 respondents (66.9%) reached 80% of their predicted PEFR value and 39 respondents (33.1%) fell below 80% of their predicted PEFR value.

As shown in table 2 the differences in the mean PEFR in gender (p=<0.001), level of education (p=<0.001), smoking status (p=<0.001) and body fat percentage (p=0.002) were statistically significant. The mean PEFR of those earning more than RM750 was higher than those earning RM251-500 (p=0.007).

A linear regression was conducted using gender, height, exposure to noxious particles and level of education as predictor variables. 62.0% (R^2 0.62) of the variability in the PEFR score was explained by the variables in the model. Females had a lower mean PEFR as compared to males (p=<0.0001). Increase in height was associated with an increase in PEFR (p=0.004). Educated individuals (p=0.014) and those not exposed to noxious particles had better lung function (p= 0.023).

Discussion

PEFR is the maximum rate at which air is expelled from the lungs, measured in L/min. In people with obstructive airway disease, whether acute or chronic, measuring the PEFR provides an objective indication of the degrees of obstruction and predicted PEFR value is often used as a management plan.[20,21] In the present study 66.9% of the respondents reached 80% of their predicted PEFR value. This finding contradicts the results of the Dugdale *et al.* study which showed the majority of the respondents had PEFR value below their predicted values.[11] The difference found could be explained because of the altitude. People living in high altitudes have higher lung volumes[23] due to the increase in lung diffusing capacity resulting in better lung function. The Semai tribe in this study is living in the hilly terrains of Cameron Highlands which requires physical exertion to track up the hills to their living quarters as compared to the aborigines from Dugdale *et al.* study who were mostly living on level terrains.

Most studies show that gender and height affect lung function with males and taller subjects having a higher PEFR.[24,25] A study among adult Singaporean Chinese[13] and another study among rural residents of Tamil Nadu, India[26] also found similar results. This could be explained by the morphological differences in the lung structure between genders. It has been suggested that men have larger lung volumes, larger diameter airways, and larger diffusion surfaces compared to women.[27] Women have smaller lung volume because they tend to have fewer total numbers of alveoli therefore a smaller surface area. Smaller lung volume accounts for smaller diameter airways in women and inevitably cause lower maximum flow rate.[27,28] Another reason why there is a difference in PEFR between genders is because generally, males are taller compared to females. A study conducted among Kelantanese Malaysians[24] found higher mean PEFR in both sexes compared to the respondents of the present study. This could be attributed to the difference in body height where the average heights of the participants of that study were taller to that of the present. In general the Orang Asli's are shorter than the general Malaysian population.[29] Another reason for the differences in gender could be because increase of estrogen levels in women tends to increase fluid retention and therefore increase blood volume which could potentially affect gas-exchange in the lung.[30]

People who are not exposed to noxious particles have better lung function with higher PEFR compared to those exposed to noxious particles because air pollution has a negative effect on an adults' lung function.[31] Inhalation of noxious particles causes abnormal inflammatory response which leads to airflow limitation.[32,33] In the present study most of the participants who were exposed to noxious particles were uneducated or having lower levels of education and were employed as elementary workers. There is a close association of occupation and education. People who receive higher education are more likely to have a better working environment. Those working as elementary jobs were more likely to be exposed to dust, hazardous chemicals such as pesticides, insecticide aerosols which may contribute to decreased lung function.[34,35] A study done in Boston in 1988 showed that PEFR was positively related to education.[36] Furthermore, education may enable individuals to make better informed choices concerning food and lifestyles.[37] It has been suggested that high intake of nutrients with antioxidant properties may reduce the rate of loss of lung function in adults.[38-40]

Conclusion

From this study, it can be concluded that height, gender, level of education and state of exposure to noxious particles have an effect on the PEFR among the Semai Orang Asli. Individual who are taller, male, with higher levels of education and not exposed to noxious particles have better lung function. It should be emphasized, however, that the amount of literature investigating these factors are limited especially among the Orang Asli. Therefore, more research is needed to further validate these findings.

There are a few limitations in this study. In general the Orang Asli population has lower life expectancy which resulted in the smaller sample of those aged 60 years and above. Most of the participants in this study were females because the breadwinner of the house which is usually the male was out working during the days when the study was undertaken.

Competing Interests: The authors declare that they have no competing interest.

References

1. Center for Orang Asli Concerns. Orang Asli population Breakdown. [Cited 27 Apr 2012] Available from: http://www.coac.org.my/codenavia/portals/coacv2/code/main/main_art.php?parentID=11374494101180&artID=11432750280711

2. Ng MS, Van K, Pala J. Demographic Situation of the Aborigines in Malaysia. Kuala Lumpur: Quarterly Review of Malaysian Population Statistics, 1992; 18, 9-18.

3. Jeyakumar D. Between Myth and Reality: Why are Orang Asli More Prone to Illness? Paper presented at the World Conference of Primary Care Physicians, Kuching. 1999.

4. Zainal Abidin Haji Ali. Pentadbiran Orang Asli: Ke Mana Hala Tujunya? Pengalaman dan Cabaran. Paper presented at the Seminar Warisan Orang Asli. 2003.

5. Lim HF. Orang Asli, Forest and Development. Kepong: Forest Research Institute Malaysia. 1997.

6. Mridha MA, Kabir ARML, Amin MR. Peak Expiratory Flow Rate (PEFR) – A simple ventilator lung function test. A review article. [Internet] [Cited 2012 June 07]. Available from: http://protiddhoni.com/AlAmin/PEFR-%20a%20review.pdf

7. Adenlyi BO. The peak flow meter and its use in clinical practice. A review article. AJRM [Internet]. 2011 March [cited 2012 June 07]; pp 5-8. Available from: http://www.africanjournalofrespiratorymedicine.com/articles/march_2011/Peak%20flow%20meter.pdf

8. Srinivas P, Chia YC, Poi PJ, Ebrahim S. Peak expiratory flow rate in elderly Malaysians. Med J Malaysia. 1999 Mar;54(1):11-21.

9. Omar AH, Henry RL. Peak expiratory flow rate (PEFR) of Malaysian children. Med J Malaysia. 1999 Mar;46(1):82-87.

10. Ismail Y, Azmi NN, Zurkurnain Y. Lung function in Malay children. Med J Malaysia. 1993 Jun;48(2):171-4.

11. Dugdale AE, Bolton JM, Ganendran A. 1971. Respiratory function among Malaysian aboriginals. Thorax BMJ. 1971;26, 740.

12. Sylvia Looi, Wong PM. One dead and six missing as massive landslides hits orang asli village in Cameron Highlands. The Star Online. [Internet]. 2011 Aug 08 [cited 2012 June 07]: Nation. Available from: http://www.asiaone.com/News/AsiaOne%2BNews/Malaysia/Story/A1Story20110809-293496.html

13. Da Costa JL, Goh BK. Peak Expiratory Flow Rate in normal adult Chinese in Singapore. Singapore Medical Journal. 1973;14, 4.

14. Using a Peak Flow Meter [with reference to WHO guidelines]. Asthma Health Center [Internet]. 2005. [cited 2012 Apr 12]. Available from: WebMD website: www.webmd.com/asthmaguide/peak-flow-meter

15. Durnin, J.V.G.A. and Womersley, J. Body fat assessed from the total body density and its estimation from skinfold thickness: measurements on 481 men and women aged from 16 to 72 years. British Journal of Nutrition, 1974;32, 77-97.

16. Siri, W. E. Body composition from fluid space and density. In J. Brozek & A. Hanschel (Eds.), Techniques for measuring body composition 1961;pp. 223-244. Washington, DC: National Academy of Science.

17. Digate Muth N. What are the guidelines for percentage of body fat. [homepage on the Internet]. December 2, 2009 [cited 2012 Jul 31]. Available from: http://www.acefitness.org/blog/112/what-are-the-guidelines-for-percentage-of-body-fat

18. WHO Expert Consultation. Appropriate body mass index for Asian populations and its implications for policy and intervention strategies. Lancet 2004; 363: 157-63.

19. WHO Expert Consultation. Waist Circumference and Waist Hip Ratio. Geneva, 8-11 Dec 2008: 27.

20. Zapletal A, Paul T, Samánek M. Significance of contemporary methods of lung function testing for the detection of airway obstruction in children and adolescents. Z Erkr Atmungsorgane. 1977 Aug;149(3):343-71.

21. British Thoracic Society Scottish Intercollegiate Guidelines Network. British Guideline on the Management of Asthma. Thorax. 2008 May;63(4):1-121.

22. Ayoob T. Peak Expiratory Flow Rate Measurements Guidelines. The Royal Free Hampsted NHS Trust. 2009.

23. Droma T., McCullough R. G., McCullough R.E., Zhuang J. cymerman A., Sun S., Sutton J.R., Moore L.G. Increased vital and total lung capacity in Tibetan compared to Han residents of Lhasa (3,658m). Am. J. Phys. Anthropol. 1991;86: 341-351.

24. Bandyopadhyay A. Pulmonary function studies in young healthy Malaysians of Kelantan, Malaysia. Indian J Med Res. 2011;134:653-657.

25. Crapo RO, Morris AH, Gardner RM. Reference values for pulmonary tissue volume, membrane diffusing capacity, and pulmonary capillary blood volume. Bull. Eur. Physiolopathol. Respir. 1982;18:893–899.

26. Ray D, Rajaratnam A, Richard J. Peak Expiratory Rate in rural residents of Tamil Nadu, India. Thorax. 1993;48,2.

27. Mead, J. Dysanapsis in normal lungs assessed by the relationship between maximal flow, static recoil, and vital capacity. Am. Rev. Respir. Dis. 1980;121: 339–342.

28. Thurlbeck, W.M. Postnatal human lung growth. Thorax. 1982;37: 564–571.

29. Mohamad D. Development of a Malaysian anthropometric database [Internet]. 2012. [cited 2012 April 29] Available at: http://www.eng.ukm.my/mrg/images/stories/ergonomics/conferences/development%20of%20a%20malaysian%20anthropometric%20database%202010_mohamad.pdf

30. C.A. Harms. Does gender affect pulmonary function and exercise capacity? Respiratory Physiology & Neurobiology. 2006;151: 124–131.

31. Sukhjinder K. Dhillon SK, Harkirat Kaur, Narinder Kaur. A Comparative Study of Peak Expiratory Flow Rates of Rural and Urban Males. Indian Journal of Fundamental and Applied Life Sciences.2011;1(4):255-258

32. Pauwels RA, Buist AS, Calverley PM, Jenkins CR, Hurd SS. Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease. NHLBI/ WHO Global Initiative for Chronic obstructive Lung Disease (GOLD) Workshop summary. Am. J. Respir. Crit. Care Med. 2001;163:1256-1276.

33. Demedts IK, Demoor T, Bracke KR, Joos GF, Brusselle GG. Role of apoptosis in the pathogenesis of COPD and pulmonary emphysema. Respir Res. 2006;7(1): 53.

34. Hernández AF, Casado I, Pena G, Gil F, Villanueva E, Pla A. Low level of exposure to pesticides leads to lung dysfunction in occupationally exposed subjects. Inhal Toxicol. 2008 Jul;20(9):839-49.

35. Hoppin JA, Umbach DM, Kullman GJ, Henneberger PK, London SJ, Alavanja MC, Sandler DP. Pesticides and other agricultural factors associated with self-reported farmer's lung among farm residents in the Agricultural Health Study. Occup Environ Med. 2007 May;64(5):334-41.

36. Cook NR et all. Peak Expiratory Flow Rate in an Elderly Population. American Journal of Epidemiology. 1988;130, 1.

37. Shohaimi S, Welch A, Bingham S, Luben R, Day N, Wareham N, Khaw KT. Area deprivation predicts lung function independently of education and social class. Eur Respir J. 2004;24: 157-161.

38. McKeever TM, Scrivener S, Broadfield E, Jones Z, Britton J, Lewis SA. Prospective study of diet and decline in lung function in a general population. Am J Respir Crit Care Med. 2002 May 1;165(9):1299-303.

39. Schünemann HJ, McCann S, Grant BJB, Trevisan M, Muti P, Freudenheim JL. Lung function in relation to intake of carotenoids and other antioxidant vitamins in a population-based study. Am. J. Epidemiol. 2002; 155(5): 463-471.

40. Butland BK, Fehily AM, Elwood PC. Diet, lung function, and lung function decline in a cohort of 2512 middle aged men. Thorax. 2000;55:102-108.

Table 1: Descriptive statistic of the respondents

Variables	Frequency	Percentage
Gender (N=119)		
Female	70	58.8
Male	49	41.2
Age (N= 119)		
20 - 29	50	42.0
30 - 39	33	27.7
40 - 49	26	21.9
50 - 59	6	5.0
60 – 69	4	3.4
Level of education (N=119)		
Uneducated	19	16.0
Educated	100	84.0
Exposure to noxious particles (N=119)		
Exposed	62	52.1
Not exposed	57	47.9
Individual income per month [RM] (N=89)*		
1- 250	4	4.5
251 - 500	22	24.7
501-750	27	30.3
>750	36	40.5
Smoking status (N=119)		
Non-smokers	82	68.9
Smokers	37	31.1

Exposure to passive smoking (N = 89)		
Exposed	26	29.2
Not exposed	63	70.8
BMI (N=118)**		
Healthy	43	36.4
Overweight	31	26.3
Obese	44	37.3
Waist hip ratio (N=119)		
Normal	85	71.4
Central obesity	34	28.6
Body fat percentage class (N=119)		
Healthy	77	64.7
Unhealthy	42	35.3
Hypertension (N=119)		
Normotensive	68	57.1
Hypertensive	51	42.9

*30 respondents who were housewife, student, unemployed or retired had no income.

**1 respondent was excluded for height and weight measurements due to his disability. Although he was able to sit upright but he was unable to stand unassisted for measurements of height and weight.

Table 2: Comparison of mean of PEFR between variables

Variables	Mean PEFR (±SD)	ANOVA(F) or t value / p
Gender		
Male	462.0 (± 81.7)	-10.412 / 0.000
Female	320.1 (± 58.9)	
Level of Education		
Uneducated	311.1 (± 56.6)	-4.915 / 0.000
Educated	391.4 (± 99.5)	
Exposure to noxious particles		
Exposed	375.2 (± 103.4)	-0.0384 / 0.702
Not exposed	382.2 (± 93.2)	
Individual income per month [RM] (N=89)*		4.289 / 0.007**
1- 250	335.0 (± 55.7)	

251 - 500	355.7 (± 102.5)	
501-750	367.2 (±96.4)	
>750	435.1 (± 100.9)	
Smoking status		
Smokers	427.2 (± 100.8)	3.850 / 0.000
Non-smokers	356.5 (± 89.3)	
Exposure to passive smoking (N = 89)		
Exposed	353.9 (± 92.0)	-0.323 / 0.747
Not exposed	361.0 (±95.2)	
Waist hip ratio (N=119)		
Central obesity	366.3 (± 102.1)	-0.859 / 0.392
Normal	383.5 (± 96.9)	
Body fat percentage (N=119)*		
Unhealthy	342.3 (± 84.3)	-3.241 / 0.002
Healthy	398.4 (± 100.2)	
Hypertension (N=119)		
Hypertensive	398.5 (± 96.7)	1.941 / 0.055
Normotensive	363.6 (± 97.5)	

Table 3: Linear regression

Model	**Unstandardized coefficients**		**P value**
	B	**Std. Error**	
Gender (male)*	-126.804	17.170	<0.0001
Height (cm)*	2.805	0.943	0.004
Exposure to* noxious particles (Exposed)	27.173	11.753	0.023
Level of Education* (Uneducated)	42.875	17.157	0.014
Income (RM)	-0.030	0.016	0.067

***significant**