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Iligan city ambient air pollution: knowledge, awareness, perception and health risk assessment among street vendors and security personnel

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Abstract

Roadside vendors and security personnel assigned outside commercial establishments are at most risk to traffic-related air pollutants. This study evaluates the knowledge and perception of this high risk population by means of a question-guided interview. A significant number of the subjects (88.10%) reported to be aware of air pollution, but 18.92% of the said population has misconceptions about air pollution. Assessment of the occurrence of respiratory and cardiovascular diseases was done through history taking and physical examination conducted by health clinicians and was determined to be of no definite association (p -values ranging 0.2979 - 0.8750) between the occurrence of these conditions with the constant exposure of ambient air pollution.

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Introduction

Air pollution and major rise of road vehicles are well associated with the ever growing population in cities causing high levels of urban air pollution. This high level of air pollution in urban areas has shown to be of significant risk to city dwellers (Kumar *et al.*, 2015) since it has not only been exerting greater impact on established health endpoints, but air pollution is also associated with a wider range of disease outcomes (Kelly and Fussell, 2015).

Several cohort studies have reported association of long term exposure to air pollution with mortality (Carey *et al.*, 2013). Exposure to air pollution is linked with elevated blood pressure and cardiovascular diseases (Finch and Conklin, 2015; Hajat *et al.*, 2015). Mortality and morbidity are the most studied endpoint in association with air pollution including cardiovascular, pulmonary mortalities (Vanos, Hebborn and Cakmak, 2014; Schikowski *et al.*, 2014; Rückerl *et al.*, 2011; Gurjar *et al.*, 2010).

Furthermore, there has been mounting evidence suggesting that air pollution contributes to the large global burden of respiratory and allergic diseases, including asthma prevalence, lung cancer, chronic obstructive pulmonary disease (COPD), pneumonia and possibly tuberculosis (Laumbach, Meng and Kipen, 2015; Raaschou-Nielsen *et al.*, 2013).

It is found that there is an association between asthma incidence (Gowers *et al.*, 2012) and significant impact on airway function and respiratory symptoms due to outdoor work with constant exposure traffic-related pollution (Choudhary and Tarlo, 2014).

Despite numerous published studies of air pollution causing respiratory and cardiovascular health risks, there is only one study on air pollution conducted in Iligan City by Colmenares and Laviña in 1998 and there have been no other local studies since.

Providing an overview on the knowledge and perception of street vendors and security personnel towards air pollution are exceedingly important; especially when their working conditions expose them to a range of occupational hazards (Karthikeyan and Mangaslewaran, 2014).

Thus, this research endeavours to assess the knowledge, awareness and health status of this high risk population in Iligan City through achieving the following specific objectives: (1) to evaluate the knowledge, attitude, and perception of street vendors of Iligan City towards air pollution by means of questionnaire-guided interview and (2) to assess general health status of the study population through history taking and physical examination.

An assessment study for this specific population could facilitate the creation of mitigating policies from the government and may also drive the conduct of increased awareness campaigns from other environmental groups. The programs focusing on environmental actions and personal precautionary measures would not only be beneficial to the street vendors but as well as to the public. This could be an avenue in reducing the incidence of respiratory and cardiovascular illnesses in Iligan City.

Materials and methods

Study Area

This study was done along heavily congested major routes of public transportation in Iligan City.

Study Population

The study population, street vendors and security personnel who were constantly exposed to traffic fumes, were recruited through convenient sampling and underwent a questionnaire-guided interview and physical examination.

Question-guided Interview

The question-guided interview was conducted to obtain general knowledge and perception from the study population towards air pollution. The questionnaire, which is collated from De Giusti *et al.* (2012) and de Bono *et al.* (2010), is composed of queries regarding awareness of general pollution and air pollution. The questionnaire-guided interview was conducted personally, in a face-to-face type of interview, which lasted approximately thirty-five (35) minutes per subject.

Physical Examination

Medical examination, conducted by medical practitioners, included the subject's medical-family-and-psychosocial history, review of systems (ROS), and a checklist following Bates' Guide to Physical Examination and History Taking by Bickley and Szilagyi (2012).

Analysis

The data gathered from completed questionnaires were collated on to Excel 2007 for data management. Significant differences of various relationships in this study were then assessed by obtaining *p* values, Mid-p exact Test, and Simple Proportion Test.

Results and discussion

The eighty four (84) subjects recruited to be part of the study are constantly exposed to traffic fumes due to the nature of their work: 32 (38.09%) male security personnel stationed outside establishments, 13 (15.48%) male street vendors and 39 (46.43%) female roadside merchants. Most of the subjects belong to the age range of 30 to 40 years old (32, 38.10%); 57 (67.86%) were married, and half of the population (48.81%) finished secondary education.

The knowledge of the subjects regarding general pollution was assessed based on several guidelines (Table 1). Sixty-nine subjects (82.14%) claimed to be aware of pollution in general and 68 (80.95%) believed pollution to be harmful to the environment and to one's health. Forty-five individuals (53.57%) further claimed to have some knowledge on different types of pollution.

Table 1. Knowledge and awareness of the subjects on environmental degradation and pollution

Criteria	N=84	%	p-value*
Awareness of pollution	69	82.14	<0.0000001
Believes pollution to be harmful:			
a) to environment	68	80.95	<0.0000001
b) to health	68	80.95	<0.0000001
Perceptions about pollution			
a) Process of making resources unsuitable for use	14	16.67	<0.0000001
b) Environmental contamination	20	23.81	<0.0000001
c) Has several types and believes to be harmful	22	26.19	<0.0000001
d) Does not involve contamination and does not do harm	4	4.76	<0.0000001
e) Unsure	8	9.52	<0.0000001
Knowledge on types of pollution	45	53.57	<0.0000001

*All *p*-values were calculated using simple proportion test; confidence level is set at 95%.

Knowledge and Awareness of Air Pollution

Seventy-four (88.46%) subjects reported to be aware of air pollution (Table 2), majority of which perceived air pollution to be harmful to human health and to the environment (50, 67.57%), and is due to contamination of air with harmful amounts of gases, dusts, and fumes (30, 40.54%).

However a portion of the study population (14, 18.92%) have misconceptions and attributed air pollution to the contamination of bodies of water, production of annoying levels of noise, and the destruction of soil ecosystem.

Table 2. Knowledge and awareness of the study population on air pollution.

Criteria	N=74	%	p-value*
Awareness of air pollution (N=84)	74	88.10	<0.0000001
Perceptions about Air Pollution			
a) Harmful to the health and environment	50	67.57	<0.0000001
b) Contamination of air with gases, dusts, fumes in harmful amounts	30	40.54	<0.0000001
c) Introduction of harmful substances in the air	9	12.16	<0.0000001
d) Contamination in the bodies of water and produces annoying levels of noise and destroys the soil	14	18.92	<0.0000001
e) Has no knowledge	4	5.41	<0.0000001
Knowledge about air pollutants	47	63.51	<0.0000001

*All *p*-values were calculated using simple proportion test; confidence level is set at 95%.

As shown in table 3, 53 subjects (71.62%) believed that exhaust from motor vehicles is the primary contributor to air pollution, 44 subjects (59.46%) believed it is due to industrial sources/power plants,

and 38 subjects (51.35%) said it is caused by improper waste disposal. A few subjects believed that pollution is due to household cooking and heating (8 out of 74 subjects, 10.81%).

Table 3. Knowledge of the study population on possible causes of air pollution.

Causes of Air Pollution	N=74	%	p-value*
Exhaust from motor vehicles	53	71.62	<0.0000001
Industrial sources/power plants	44	59.46	<0.0000001
Improper waste disposal	38	51.35	<0.0000001
Cigarette smoke	37	50.00	<0.0000001
Burning of waste	32	43.24	<0.0000001
Construction	17	22.97	<0.0000001
Pollution from other cities/municipalities	13	17.57	<0.0000001
Population growth	13	17.57	<0.0000001
Increased use of air conditioner	9	12.16	<0.0000001
Household cooking and heating	8	10.81	<0.0000001

*All *p*-values were calculated using simple proportion test; confidence level is set at 95%.

The results obtained are in conformity with that of the study conducted by Dedoussi and Barrett (2014) where the identified main anthropogenic sources of pollutants released in the atmosphere are human activities such as transportation (motor vehicles, aircrafts), burning coal, or other fossil fuels for energy demands, industrial processes, or use of chemicals in agriculture, and facilities like power plants, incinerators, landfills, or waste deposition.

Knowledge of the study population regarding health consequences brought about by air pollution was also determined. Sixty subjects (71.43%) reported that air pollution can cause infection and inflammation of the respiratory tract, 44 subjects (52.38%) claimed chronic and

acute respiratory diseases may result from exposure to air pollution, and 31 subjects (36.9%) said air pollution causes heart disease (Fig. 1). Air pollution has been documented to be a cause of respiratory diseases, exacerbating asthma and chronic obstructive pulmonary disease (COPD), and other diseases such as cardiovascular disease specifically atherosclerosis; it could also trigger arrhythmias, cardiac failure, and stroke, which could be fatal (Hoek, 2013; Uzoigwe, 2013; Arbex, 2012; Abelsohn and Stieb, 2011).

It is imminent to the street vendors and security personnel that air pollution can cause a range of health problems from difficulty in breathing and shortness of breath to possible infection and inflammation of the respiratory tract.

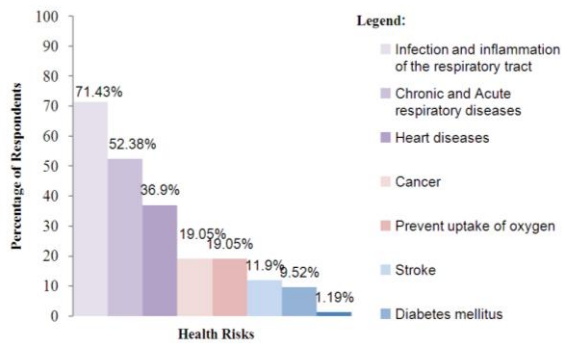


Fig. 1. Possible health risks by air pollution identified by the study population.

Aside from the health effects, 44 subjects (84.62%) stated that air pollution causes other harm (Fig. 2). Forty four subjects (52.38%) pointed out damage to the environment, 41 subjects (48.81%) reported damage to plants, 43 (51.19%) said that it brings harm to animals, and 28 subjects (33.33%) said that air pollution will ultimately cause damage to the economy. The results show that the subjects are well aware of the health risks that air pollution causes and are also acquainted to other effects of air pollution.

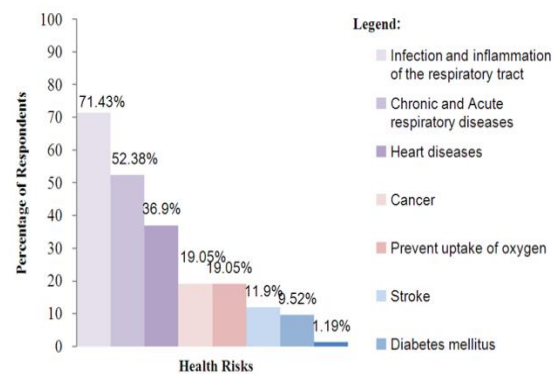


Fig. 2. Reported nonmedical effects of air pollution.

Relationship of Awareness of Air Pollution and Diseases

The relationship between the awareness of the subjects regarding air pollution and the presence of certain diseases (asthma, pneumonia, pulmonary tuberculosis and hypertension) was determined. In Table 4, *p*-values were calculated using mid-*p* exact at 0.05 two-tailed tests. It is shown that *p*-values are greater than 0.05 resulting to insignificance in the association of the awareness of the subjects to its health status.

Table 4. Correlation between subject awareness and diseases of the study population (N=64).

Disease	Aware=56	Unaware=8	<i>p</i> -value*	Remarks
Asthma	13	1	0.5585	Not Significant
Pneumonia	5	1	0.7263	Not Significant
Tuberculosis	1	0	0.8750	Not Significant
Hypertension	11	3	0.2979	Not Significant

*All *p*-values were calculated using mid-*p* exact; Two-tailed at $\alpha=0.05$.

Conclusion

Majority of the subjects were classified as the “aware population” (74, 88.10%) and these are those who claim to have knowledge about pollution in general and air pollution to be specific (82.14% and 88.10%, respectively) and the remaining 11.90% (10 subjects) were under the “unaware population”. More than half of the aware individuals (67.57%) believed that air pollution is harmful to the environment and human health, 53 (71.62%) identified exhaust from motor vehicles to be the number one cause of air pollution, and 71.43% believed that air pollution causes infection and inflammation in the respiratory tract.

Correlation of subject awareness and diseases of the study population were also evaluated and asthma, pneumonia, tuberculosis, and hypertension generated no significant *p*-values.

Recommendations

More studies concerning the monitoring of air pollution especially in urbanized Iligan City is highly encouraged. It is recommended that the government and other environmental organizations shall give more importance in educating or conducting seminars for the general public especially those who are frequently exposed to traffic air related pollutants.

Furthermore, the use of spirometry and peak expiratory flow rates must be used in the assessment and for diagnosing the subjects. Increasing the sample size is also encouraged.

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