Assessing Noise Pollution and its Impact on Student's Blood Pressure and Their Learning Performance in Palestine

Muralia Hustim[1,*], Alaa El Zaza[2] , Wesam Al Madhoun[3], Ziad Abu Heen[2] , S Hamid Aly[1], and Muhammad Isran Ramli[1]

[1]Department of Environmental Engineering, Universitas Hasanuddin, Indonesia
[2]Environment and Earth Science Department, The Islamic University of Gaza, Palestine
[3]Department of Civil and Environmental Engineering, Universiti Teknologi Petronas, Malaysia

Abstract. The aim of this research was to assess noise pollution trends and to examine the relationship between noise levels and blood pressure (systolic and diastolic), pulse rate and the students' performance at several Palestinian preparatory and secondary schools. Noise levels were monitored at 41 preparatory and secondary schools in Gaza, Palestine. Trends were compared among schools and with the world health organization (WHO) standards as well. Student's blood pressure (systolic and diastolic) and pulse rate were recorded for (432) students, (184 male /248 female). The readings were taken before and after exposure to noise at schools' environment for at least four hours, where the age of these students were between (13-17) years. In order to investigate the effect of noise on the student's blood pressure, pulse rate and performance, an experiment was conducted on two groups of students, the first was controlled group and the second was trial. In this study, two devices were used, the sound level meter, and the mercurial pressure device. T-test was performed to investigate correlation among the variables. The results show that the noise levels range from 49.0 to 67.5 dB, where Bashir Rayes Secondary Girls School had the highest level of noise while Kafr Qasim Secondary Girls School had the lowest level of noise. The results showed also that there is a positive correlation between noise exposure and the students blood pressure, pulse rate and achievement.

1 INTRODUCTION

Noise, defined as 'unwanted sound', is perceived as an environmental stressor and nuisance (Matheson, 2003), typically it is characterized by the intensity, frequency, periodicity

* Corresponding author: muraliahustim@yahoo.com

(continuous or intermittent) and duration of sound. Sound is the result of pressure changes in the air caused by vibration (Basrur, 2000). Noise is considered to be an environmental challenge in schools today because it causes annoyance and impairs communication and learning (Dockrell, 2004).

However, the harmful effects of noise in general are not fully understood, WHO (2011), reported cardiovascular disease, cognitive, impairment, sleep disturbance, tinnitus and annoyance as effects that noise exerts on heath. Its estimated that at least one million healthy life years are lost every year due to traffic related noise in western Europe (Dockrell, 2003). Exposure to excessive noise is a major cause of hearing disorders worldwide; 16% of the disabling hearing loss in adults is attributed to occupational noise, ranging from 7% to 21% in the various sub-regions (Nandi & Dhatrak,2008).

In order to better counteract noise induced hearing loss, European directive which took effect in February 2006, established the minimal safety level at the equivalent noise exposure limit to 80 dB(A) (Education, 2012). The motive to investigate the impact of noise on students because they are more susceptible than adults (Basrur, 2000). In most countries, noise regulations suggest that the maximum outdoor noise level for educational buildings should be 55dBA (lAeq). Levels beyond 55dBAl (lAeq) at outdoor will cause a decrease in educational efficiency (Enmarker, 2004).

Nowadays noise pollution is common in Gaza, where it comes from different sources such as traffic and power generators which could affect the Gazans life quality. Education wise, there are many factors that affect the student's achievement and blood pressure. Firstly, the location of the school (on main streets or near markets); secondly, the high density of students in classrooms and thirdly, the educational activities in classrooms. Lastly, the location of the playgrounds if its very close to the classrooms. The previous sources cause high levels of noise, consequently create negative impacts on students. This challenging situation urges researchers to investigate noise in order to find out the trends of noise, its potential impacts and to propose coping mechanism.

In the current research, schools in west Gaza were classified according to noise levels then the effect of high noise on the student's achievement and blood pressure were investigated. The aims of this study were, to investigate the relationship between environmental noise levels and the student's achievement in West Gaza secondary schools, and to examine the impacts of noise on the student's blood pressure.

2 MATERIAL AND METHODS

Methodology

A field study to monitor noise in all schools of West Gaza was conducted and the measurements were classified into high noise schools and low noise. A representative sample from the two categories was selected, blood pressure and pulse were examined and the student's achievement of both categories was assessed. Moreover, two samples, a control group sample and an experimental sample were tested, in order to confirm the extent of the impact of noise on the students' achievement and blood pressure and pulse rate.

Geographic Context

Gaza strip is divided into seven educational areas as follows: (East Gaza, West Gaza, North Gaza, Middle area, Khan Yonis, East Khan Yonis and Rafah). The number of schools in Gaza governorates are (693) school, ministry of Education and Higher Education supervises 398 schools, 245 school are supervised by The United Nations Relief and Works Agency

for Palestine Refugees in the Near East (UNRWA) and 50 schools are supervised by the private sector. There are 468,653 students in Gaza strip for the current academic year, 228,076 study at the government al schools, 224,795 students are registered in the UNRWA schools and 15,782 students are enrolled in private schools.

Site Selection

In this study, the governmental schools in the West Gaza directorate were selected, which oversees 82 schools which are 20% of governmental schools. The number of the students in the governmental schools were 47850 students, 32624 were at the preparatory schools and 15226 were at the secondary schools. The map in figure 1 shows the study location. The present study has conducted a road traffic noise (RTN) which consist of noise level, traffic volume, and vehicle speed. The survey located at 40 roadsides in Makassar City, Indonesia. Table 1 presents the characteristics of the roads such as length, lane, width, and the distance between the point measurement of the noise level measurement and the centerline of the roads.

Study Sample

The study sample included 41 schools out of 82 government schools in West Gaza Directorate. Thirty-three schools (out of 82) were excluded because the age of the students is between six and twelve years, where it's difficult to examine their blood pressure and achievement . Furthermore two secondary schools were excluded because their students are deaf.

Instruments

The student's blood pressure (systolic and diastolic) were measured using Blood Pressure Monitor (Bokank Instrument co . ltd. Model mercurial sphygmomanometer Model No: BK1001 Min) as shown in Figure 2, which has a measuring range of 0 mmHg to 300 mmHg . The Capillary was 3.5 mm ± 0.1. (instruction for Desk-Model-Mercurial-Sphygmomanometer-BK1001,2011). While the pulse rate was measured manually.
The Sound Level Meter which shown in Figure 3, was used to monitor ambient noise levels. It is designed to approximate the loudness level sensitivity of the human ear. It gives objective, reproducible measurements for the sound pressure level. The microphone (1/ 2 inch Electret condenser) changes the sound to an equivalent electrical signal, which differs in with the acoustical signal. The noise levels were measured using the Auto Ranging type BI- Ds-102,integrating and logging sound level meter, in (dB) units with an accuracy of ± 1.5 dB(ref 94dB@ 1 KHz) Resolution: 0.1 dB and with 10mV/ dB, impedance approx. 100 ohm and its dynamic range is 50dB (Instruction for Sound Level Meter, 2010).

Noise Monitoring

Schools basic data (number of students, location and design) were collated, filed visit was conducted before start the noise monitoring campaign. Noise levels were measured at different points of the schools, three readings were recorded at each floor and readings were averaged. Finally, the schools were classified to noisy and quiet according to noise standards.

Blood Pressure Examination

The study population was selected based on the statistical software Epi. Info.7, it was chosen from eight government schools in west Gaza as follows:

Students were selected from the highest and lowest readings of noise levels in male and female secondary and preparatory schools,484 students were chosen from these schools. Their blood pressure and pulse rate were measured twice a day, the first one was at 7:15 am before starting the lessons and the second was after 4-5 hours from staying in school. In addition, the results of the students in the final exam were noted to investigate if there is any relation between noise levels and students' performance (average), pulse rate and blood pressure.

Noise and Students Achievements

Forty female students from the same level of achievement (85% - 90%) were selected as an experimental sample, taking into account the social and environmental conditions. Firstly, the blood pressure and pulse rate were examined, followed by explanation of a lesson on" Nitrogen Cycle in Nature" by the same teacher . Then the students were divided into two groups each of them contains 20 to provide them with unified exam. The first group answered the exam in a quiet environment where the noise level was 45 dB or less, after that blood pressure and pulse rate were measured. The second group of students answered the exam in a noisy environment where noise level was 73 dB or plus, then their blood pressure and pulse were examined. Finally, the students results were analyzed and compared to investigate the relationships among noise level, student achievement, their pulse rate and blood pressure.

3 RESULTS AND DISCUSSION

Field Visit

The following data were collected during the field visits to the preparatory and secondary schools at West Gaza throughout the study durations, these schools were classified according to gender, 47% of the schools were males and 53% were female schools. Secondly, the schools were divided according to the class density, school level and location, as shown in table (1).

It can be found in the fluctuations of noise levels, LAeq, LA05, LA50, and LA95 for 10 minutes from 8 a.m. to 5 p.m. that noise levels are almost constant through the measurement times (8 a.m. to 5 p.m.); the difference between ten LAeq s during the measurement hours is within 3dB in all roads. In further, 40 data of LAeq,day for each road are within 68dB and 77dB, and the arithmetic average of them is 73dB. This shows that all the areas along the surveyed roads are very noisy, and if the Environmental Quality Standard for Noise in Indonesia shall be applied, more than 90% of the areas exceed the standard even though the highest value of the Standard (70dB) is adopted.

Table 1 Schools Characteristics

Variables		Average
School Division	Preparatory	49
	Secondary	51
School location	Main Street	55

	Minor Streets	45
Density of class	20-30	6.4
	31-40	76.6
	41-50	17

The field survey results show that 49% of the schools were preparatory and 51 % were secondary, moreover; 55 % of the schools were located nearby main streets and 45 % were on minor streets. In terms of classrooms density 6.4 % of the schools had 20 – 30 students in the class, 76.6 % had 31-40 students in the class and there were 17 % which had 41-50 students. This shows that the schools buildings in west Gaza were not enough, where there were 55 buildings for 82 schools which accommodated 47850 students.

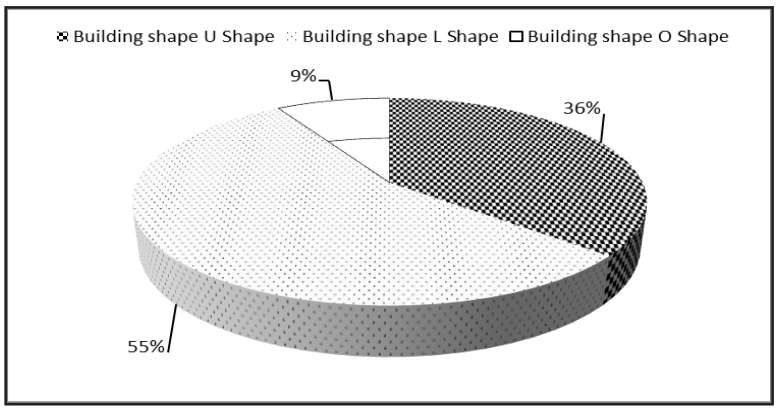

Figure 4 Classifications of schools according to Buildings Shape

Most of the schools (31.9%) were located in Al-Remal area, which is the middle of west Gaza and its classified as overpopulated area. On the other hand, Al Sahaba area contains only 2.1 % of the West Gaza schools. Shape wise, the school buildings were classified into (U) shaped with 36%, (L) shaped with 55 % and (O) shaped close buildings with 9 %.

The schools were operated on two shifts, where 72.3% of the schools were at the morning shift and 27.6% were at the afternoon shift, it was reported that there were three (3) secondary schools in the afternoon shift while twenty-one (21) schools were in the morning shift. In the preparatory schools, 7 was in the afternoon shift while the other 18 schools were in the morning shift.

It was observed that the glass of classrooms windows at several schools were smashed, consequently more outdoor noise will impact classrooms environment. Moreover, majority of the classrooms were crowded with student where 76.5% from these schools had 31 to 40 students in the classroom. This large number of students inside classrooms increases the possibility of causing indoor noise, especially; the dialogues among students and the educational process sounds.

Noise Monitoring

The noise measurements average in different areas inside and outside the female preparatory schools shown in table 2. The highest noise level was in Fahmi Al-Jerjawi “A” with 61.4 dB and the lowest was at Hassan Salameh “A” with an average of 56.2 dB. While the highest noise level in preparatory boys schools was at Al Yarmouk “B” with 66 dB and the lowest level was at Anas Ibn Malik “A” school with 58.8 dB.

Table 2 Summary of Average Noise Levels

No.	Name (Female)	Noise level (dB)	Name (Male)	Noise level (dB)
Primary				
1.	Hassan Salameh "A"	56.2	AnasIbn Malik "A"	58.8
2.	Al SaydaRoqya	56.7	Al Neel	60.3
3.	Al Shareqa "B"	56.8	Al Yarmouk "A"	60.7
4.	Hamama	57.4	Amer Ibn El Aass "B"	60.9
5.	Al Majeda way IbnAmmar "A"	57.5	Suleiman Sultan "A"	61.7
6.	Al Majeda way IbnAmmar "B"	58.3	Al Sauafeer	62.5
7.	Al SheakhEajlean	59.8	Sarafand	62.7
8.	Mustafa Hafez	61	Suleiman Sultan "B"	63
9.	Al Shareqa "A"	61.2	Asdoud	64.6
10	Fahmi Al-Jerjawi "A"	61.4	Al Yarmouk "B"	66
Secondary				
11	KafrKasem	49	Khaled Al Alamy	50
12	RamizFakhrea	51.7	Abu Thar Al Ghaffari	52.5
13	Shuhada Al Shatti	53.5	Zuhair Al Alamiy	53
14	Zahraa Al Madaean "A"	53.7	Sami Al Alamiy	54.3
15	Balqees Al Yaman	55	Adnan Al Alamiy	54.6
16	Yaser Arafat "A"	56	Khalil Al Wazeer	56.9
17	Zahraa Al Madaean "B"	57	Jules	58
18	Bashir Al Rayes "B"	62.4	Yaser Arafat "B"	60
19	Ahmed Shawki "B"	65.6	Palestine	64.7
20	Bashir Al Rayes "A"	67.5	Alkarmel	65.4

Furthermore, the results show that the highest noise level at female secondary schools was at Bashir Al Arayes "A" with 67.5 dB as shown in table (2), and the lowest noise level was in Kafr Kasem school with 49 dB . However the lowest noise level in secondary boys schools was in Khaled Al Alamy with 50 dB and the highest noise level was in Alkarmel with 65.4 dB .

Table 3 The Noisy and Quiet Schools According to Gender and Grade

N.	School	Sex	school level	Noise Level
1	Bashir Al Rayes "A"	Female	Secondary	67.5
2	Al Yarmouk " B"	Male	Preparatory	66
3	Alkarmel	Male	Secondary	65.4
4	Fahmi Al-Jerjaoi " A"	Female	Preparatory	61.4
5	AnasIbn Malik "A "	Male	Preparatory	58.8
6	Hassan Salameh " A"	Female	Preparatory	56.2
7	Khaled Al Alamy	Male	Secondary	50
8	Kafr Kasem	Female	Secondary	49

After comparing the noise levels among schools which shown in Table 2, the school with highest and lowest levels of noise at both males and females were selected to be the study sample as shown in Table 3.

Table(3) shows that: firstly, the highest noise rate in secondary girls schools was in Basher Al Rayes "A" with 67.5 dB, because it located between two main streets and it's beside a preparatory school from the north side. While, the lowest noise rate was in Kafr Kasem school with 49 dB, due to its location which is far from main streets. On the other hand, the highest noise rate in secondary boys schools was at Alkarmel school with 65.4 dB, since its located on a main street, and it's near a preparatory school from the north, the building is closed and the class density was high. However, the lowest noise rate was at Khaled Al Alamy Boys school with 50 dB, as it's far from the traffic noise at the main street. The location of the school at roadside is a main factor of noise (Haines et al 2000; Department of Education and Employment 1999; Wernar & Boike 2001).

It also obvious in Table (3) that, the highest noise rate in preparatory girls schools was in Fahmi Al-Jerjawi "A" with 61.4 dB, because it located on two streets and near workshops. The lowest noise rate in preparatory girl's schools was in Hassan Salameh "A" with 56.2 dB, although the school located on a main street; it was quiet, because the classes were far away from the street and the school area is wide. Al Yarmouk "B" school had the highest noise level of 66 dB among preparatory boys' schools, as a result of its location on a main street, near a kindergarten and surrounded with two other schools.

While the lowest noise rate among preparatory boys' school was at Anas Ibn Malik "A" with 58.8 dB, where the school is located far from the main street and its very wide. The noise levels which were recorded inside and outside the schools' classrooms were compared with the WHO standards, it was found that the noise levels were higher than the permissible limits. According to WHO standard, the noise level should be 35dB inside the classroom and 55 dB outside. Furthermore, the sound level outside schools should not exceed 60 dB if its at a road side (nearby main streets) and 40 dB in the populated areas 40dB.

The correlation between noise levels, student gender, school level, school location and school shift were investigated. As shown in Table 4, ANOVA results indicate that there was a difference between male and female schools, where the male schools were higher with an average noise level of 60.3 dB and there was no statistical significance.

Table (4): Correlation Between Noise and Sex, Grade and School Location and shift

Properties		**N**	**Means**	**Standard Deviation**	**ANOVA**	**Sig.**
Sex	Male	22	60.281	4.971	1.546	0.129
	Female	25	58.290	3.846		
School Division	Primary	23	**60.799**	2.682	2.497	0.016
	Secondary	24	57.711	5.317		
School Location	Main	26	60.269	4.646	1.831	0.074
	Branch	21	57.926	3.982		
School Shift	AM	34	59.011	4.892	-0.519	0.606
	PM	13	59.774	3.230		

While in terms of schools division, there was a significant difference, which means that the noise levels at the studied preparatory schools were higher than the noise at the secondary schools. It was found that the average noise level in the preparatory boys schools was between 58.8-66 dB. On the other hand, noise levels at the secondary boys schools ranged from 50 to 65.4 dB.

Furthermore, it was found that the noise levels at the preparatory girls schools was between 56.2 to 61.4 dB, while the noise levels at the secondary girls schools ranged from 49 to 67.5 dB. The results of this research agreed with other studies (WHO,1999; Niskar et al 1998; Dockrell & Shield, 2002).

Pulse Rate, Blood Pressure and the Students Achievement

The pulse rate, blood pressure and the students achievements were examined for 430 students from the schools mentioned in Table 5. These schools include four schools with high noise level (2 for males and 2 for females) and another four schools with low noise level. Both categories (noisy and quiet) were compared for pulse rate, blood pressure and the student achievement.

The schools listed in Table 5, were visited before classes started, the pulse rate , systolic blood pressure and Diastolic blood pressure were examined. Same indicators were tested after four hours of schooling, measurements were reported and analysed to find out the differences.

The results in Table (6) show the differences by gender in pulse rate, blood pressure and students achievement before and after classes. The ANOVA results indicate that there were statistical significant differences between pulse rate, blood pressure and students gender due to physiological difference between genders before classes started (Maranon and Reckelhoff, 2013).

Table (5): Sample Results for Pulse, Blood Pressure and the Student Achievement

Variables		**Frequency**	**Percent**
Name of School	Khaled Elalamy	50	11.574
	Elkarmel	50	11.574
	Hasansalama	66	15.278
	Anas ben malek A	50	11.574
	Basher elrayes A	58	13.426
	KaferGasem	65	15.046
	Elyarmok B	34	7.870
	FahmeEljerjawy	59	13.657
Sex of the Student	Male	184	42.593
	Female	248	57.407
Grade of the Student	Preparatory School	209	48.380
	Secondary School	223	51.620
Noise Level	Noisy	201	46.528
	Quiet	231	53.472
Total		**432**	**100.00**

Table (6): Correlation between Pulse, Blood Pressure and the Students achievement of the Student based Gender

	Sex	N	Means	Standard Deviation	ANOVA	Sig.
Before Classes						
Pulse Rate	Male	184	74.489	10.671	-5.737	0.000
	Female	248	**81.641**	14.192		
Systolic Blood Pressure	Male	184	**112.717**	14.930	2.358	0.019
	Female	248	109.476	13.502		
Diastolic Blood Pressure	Male	184	**72.120**	9.786	2.348	0.019
	Female	248	69.960	9.199		
After Classes						
Pulse Rate	Male	184	76.902	10.866	-4.139	0.000
	Female	227	**82.674**	16.189		
Systolic Blood Pressure	Male	184	110.598	14.379	1.748	0.081
	Female	227	108.370	11.463		
Diastolic Blood Pressure	Male	184	71.522	12.005	1.597	0.111
	Female	227	69.824	9.546		
The students achievement	Male	184	79.674	12.052	-2.585	0.010
	Female	248	**82.863**	13.128		

Furthermore, The ANOVA results in Table 6 show that after classes ended, only the measured pulse rate of students was significantly different when compared males with females, which may caused by different respond to the physiological stress which agrees with Khaksari et al., (2005). Also there was a significant difference between male and female students in term of marks achievements.

According to this research findings, the blood pressure in males were affected more compared with the females which is in line with the study output of Marwan ,(2013), but in terms of pulse rate, this study revealed that females were affected more than males which was vice versa according to Marwan ,(2013).

The findings in Table (7) show the differences by schools stage (Prepartory and Secondary) in pulse, blood pressure and students achievement before classes started and after they ended. The ANOVA analysis clearly shows significant difference at all records of pulse rate, blood pressure and students achievement and this explained by the Physiologic respond differences by ages as stated by Andropoulos, (2011).

Table (7): Pulse, Blood Pressure and The students achievement According to Grade

	Grade of the Student	N	Means	Standard Deviation	ANOVA	Sig.
Pulse Before	Preparatory School	209	**81.751**	13.262	4.909	0.000
	Secondary School	223	75.637	12.623		
Systolic Blood Pressure Before	Preparatory School	209	107.990	12.777	-4.136	0.000
	Secondary School	223	**113.543**	14.955		

Diastolic Blood Pressure before	Preparatory School	209	69.306	9.689	-3.372	0.001
	Secondary School	223	**72.354**	9.101		
Pulse after	Preparatory School	209	**83.933**	15.603	5.741	0.000
	Secondary School	202	76.114	11.656		
Systolic Blood Pressure after	Preparatory School	209	108.086	12.056	-2.059	0.040
	Secondary School	202	**110.693**	13.586		
Diastolic Blood Pressure after	Preparatory school	209	68.852	10.360	-3.369	0.001
	Secondary School	202	**72.376**	10.849		
The Students Achievement	Preparatory school	209	**2.722**	1.404	6.123	0.000
	Secondary School	223	2.000	1.031		

Moreover the results in Table 7 show that there is a significant difference between preparatory and secondary schools in terms of students performance which agree with Shield and Dockrell,(2003) that stated noise has an effect on children's achievement's at schools.

The finding of this research agreed with the results of other studies on noise impacts, certainly blood pressure and hypertension where were detected in workers who were exposed to Noise (WHO,1999; Green et al.,1991; Wu et al.,1998; Melamed &Ribak, 1997; Regecova &Kellerova,1995). This research is also conforms with studies of (Dawabsha, 2012; Sadeq,2011; Ahmad,2011; Saeed, 2010) which show that blood pressure has a positive correlation with noise exposure.

Experimental Sample

To confirm the credibility of the previous results ,an experiment were conducted, where 40 female students from the same level of academic achievement (students who have a GPA of 85% - 90%) were selected, student's social and environmental conditions were taken into consideration.

Table 8: Pulse Rate, Blood Pressure and Students Achievement for the Experimental Sample

Variables		**N**	**Means**	**Standard Deviation**	**ANOVA**	**Sig.**
Pulse before exam	Quiet	20	82.100	8.663	0.354	0.725
	Noisy	21	81.143	8.633		
Systolic Blood Pressure Before exam	Quiet	20	109.000	9.679	0.289	0.774
	Noisy	21	108.095	10.305		
Diastolic Blood Pressure Before exam	Quiet	20	70.500	7.592	0.193	0.848
	Noisy	21	70.000	8.944		

Pulse After exam	Quiet	20	85.700	6.490	-2.555	0.015
	Noisy	21	**91.762**	8.508		
Systolic Blood Pressure After exam	Quiet	20	111.000	10.712	-1.849	0.072
	Noisy	21	117.143	10.556		
Diastolic Blood Pressure After exam	Quiet	20	68.500	8.751	-2.652	0.012
	Noisy	21	**75.238**	7.496		
The students achievement exam	Quiet	20	**84.500**	12.763	2.864	0.007
	Noisy	21	72.619	13.749		

Firstly, the blood pressure and pulse rate of the selected students were examined, then a lesson entitled " Nitrogen Cycle in Nature" was explained by the same teacher. The students were divided into two groups of 20 students, to provide them with a unified exam. The first group answered the exam in a quiet place, where the noise level was 40 dB or less and then the student's blood pressure and pulse were recorded. While the second group answered the exam in a noisy place with a noise of 75 dB and plus, likewise followed by measuring of student's blood pressure and pulse. Finally, exams were marked and the results were analysed to investigate the relationship among noise level , student achievement, their pulse rate and blood pressure .as shown in the Table 8.

The results in Table 8 showed that there were a significant statistical differences (p value < 0.05) between quiet and noisy conditions of the class rooms, when correlated with the student's blood pressure and their academic performance after setting for the exam.

4 CONCLUSSION

This study investigated the noise trends and impacts at Gazan preparatory and secondary schools. The highest value of noise was 67.5 dB and the lowest value was 49dB. However the average noise level at the secondary male schools was between (50– 65.4) dB while it was around (49 – 67.5) dB at the female secondary schools. On the other hand, the average of the noise levels at the male preparatory schools was 58.8 – 66 dB while it was 56.2 – 61.4 dB at the female preparatory schools.

It was noticed that the noise levels in preparatory schools were higher than secondary schools with a mean of 60.79 dB, which means that noise levels in classrooms and playgrounds across these schools were higher than WHO allowable levels for community learning environments. High noise levels generated due to several factors such as, high class density, hawkers, building shape and school location. Whereas ,the class density was the main cause that led to the highest noise levels with a mean of 66.06 dB.

The chronic exposure to noise caused many health problems, this research studied the correlation between exposure to noise, the increase in blood pressure and pulse rate according to gender ,grade and average of the students. There was a significant difference (p- value<0.05) in Pulse rate before classes started , in females with a mean of 81.6 dB, also there is a significant difference (p-value<0.05) in pulse after, to females with an average of 82.6 dB. Whereas, there is a significant difference in systolic blood pressure and diastolic blood pressure before classes to males with 112.7 dB and 72.1 dB . There was insignificant in the systolic and diastolic blood pressure after classes in all schools. In the other hand, there is a significant differences in the average according to gender to females with an average of 82.8 dB.

Consequently, there was a significant difference in pulse rate after classes and pulse before to preparatory schools, but the significant in diastolic and systolic blood pressure is to secondary schools. However, in the average of the students the significant is to preparatory schools.

According to the experimental sample, the significant difference in pulse after classes ended to the students who exposed to noise with a mean of 91.7 dB and the significant difference in the diastolic blood pressure after classes to the student s that exposed to noise with an average of 75.2 dB.

The following recommendations can be applied to reduce noise at schools environment: schools design should follow the open building style rather than the closed one, classrooms floors should be covered by anti -reflection material of high noise a absorbence and double glass windows should be installed, future school zoning should be planned carefully to avoid congested areas, raising awareness on noise pollution risks and negative impacts on children through media campaigns, planting and grow trees around schools where trees leaves absorbs 25% from noise vibrations. It was noticed that the noise level was reduced about 3dB in every floor higher. So it's better to use the ground floor for administrative purposes.

REFERENCES

1. Andropoulos, D. B. Pediatric Physiology: How Does it Differ from Adults?, Chapter (Edited by: Mason, K. P. , Pediatric Sedation Outside of the Operating Room. 77-91 (2011).
2. Basrur, S. Health Effects of Noise, City of Toronto ,Community and Neighbourhood Services ,Toronto Public Health,Health Promotion and Environment Protection Office (2000).
3. Shield, B. and J. Dockrell. The Effects of Noise on Children at School: a Review.J. Building Acoustics **10**, 97-106 (2003).
4. Ministry Of High Education. Annual-educational-statistics 2010- 2012.
5. Enmarker, E. (2004). Noise Annoyance Responses of Middle School Pupils and Teachers. Journal of Environmental Psychology **24**, 527–536 (2012).
6. Matheson, S. Noise pollution: non-auditory effects on health British Medical Bulletin **68**, 243–257 (2003).
7. Ischemic Heart Disease: A Meta-analysis, Environmental Health Perspectives **110** ,Num. 3,Pages 307 – 317
8. Annie Ward, Howard W. Stoker, Mildred Murray-Ward Educational Measurement: Theories and applications, http://books.google.ro/books?id=dWTx7RXc028C. (1996).
9. Ministry Of High Education, Annual-educational-statistics-2012-2013, pages 7,8 (2013).
10. WHO, Hypertenion fact sheet, Department of Sustainable Development and Healthy Environments (2011).
11. Shield, B. and J. Dockrell. External and internal noise surveys of London preparatory schools. Journal of the Acoustical Society of America, **115** (0001-4966), 730-738 (2004).
12. Nandi SS, Dhatrak SV. Occupational noise-induced hearing loss in India.Indian J Occup Environ Med.**12**, 53-6. doi: 10.4103/0019-5278.43260 (2008).
13. Nandi, S. and Dhatrak,S., Occupational noise-induced hearing loss in India (2008).
14. Kang,J. Urban Sound Environment . London:Taylor and Francis (2006).
15. Ahmad,R. Effect of Noise Pollution on Hearing Threshold,Blood Pressure and Oxygen Concentration in Blood of Workers in the Hospitals in Jenin City Palestine,master thesis, An- Najah National University ,Nablus ,West Bank,Palestine (2011).

16. Richard, E., Cardiovascular Physiology Concepts.2nd edition ,Lippincott Williams & Wilkins pub,93-95 (2005).
17. Berntein,D., Nelson Textbook of Pediatrics,18th ed. Philadelphia,Pa: Saunders Elsevier pub,422 (2007).
18. Aasvang, G. Noise, sleep and poor health: Modeling the relationship between road traffic noise and cardiovascular problems. a Institute of Transport Economics, Norway (2011).
19. Ahmad, R. Blood Pressure and Oxygen Concentration in Bloodof Workers in the Hospitals in Jenin An-Najah National University (2001).
20. AslakFyhri, R. Road traffic noise, sensitivity, annoyance and self-reported health—A structural equation model exercise. nstitute of Transport Economics Gaustadalleen, 21. (2007).
21. Berglund B., Guidelines for community noise. World Health Organisation (1999).
22. Birgitta,T. and Dietrich H. Guidelines for community noise World Health Organization (1999).
23. Carlos Rogério Degrandi Oliveira, G. Occupational Exposure to Noise Pollution in Anesthesiology. Journal of Anesthesiology, **62**, 253-261 (2007).
24. CCRMA. ound Pressure, Intensity, and Power. from https://ccrma.stanford.edu/courses/150-2001/SPL.html (2007).
25. Dictionaries,O. decibel.from http://www.oxforddictionaries.com/definition/english/decibel (2013).
26. Dictionary,T. blood pressure. from http://www.thefreedictionary.com/blood+pressure (2010).
27. FIU, F. Mathematics Matters Every Day. from http://web.eng.fiu.edu/mathmatters/m2ed/index.htm (2008).
28. Fooladi1, M. Involuntary and Persistent Environmental Noise Influences Health and Hearing in Beirut, Lebanon. nstitute of Transport Economics Gaustadalleen, **5**, (2012).
29. Health, C. Noise Pollution from www.cehn.org (2009).
30. Health, S. Anatomy and Physiology of the Ear. from http://www.lpch.org/DiseaseHealthInfo/HealthLibrary/ent/anatomy.html (2010).
31. hyperphysics. Loudness. from http://hyperphysics.phy-astr.gsu.edu/hbase/sound/loud.html (2009).
32. MNT. What Is High Blood Pressure? What Causes High Blood Pressure? , from http://www.medicalnewstoday.com/articles/159283.php (2009).
33. Myvmc. Anatomy of the ear. from http://www.myvmc.com/anatomy/ear/ (2004).
34. Noise, N. NIGHT NOISE GUIDELINES FOR EUROPE World Health Organization (2004).
35. Nunez, D. Cause and Effects of Noise Pollution. University of California (1998).
36. Organization, w. CHILDREN AND NOISE Children's Health and the Environment WHO Training Package for the Health Sector World Health Organization from www.who.int/ceh (2013).
37. Pilkington, F. Informing transport health impact assessment inLondon Institute of Occupational Medicine (2000).
38. Ronald P. and Kinga, J. a Consultant Aerospace Medicine, AH-Mk 1 Systems (Apache), Directorate of Army Aviation, Middle Wallop, UK. University of Texas Medical Branch (2002).
39. Salameh, A. Effects of Occupational Noise Exposure on Blood Pressure, Pulse Rate, and Hearing Threshold Levels of Workers in Selected Industrial Plants in Jenin City, Palestine. An-Najah National University (2005).

40. SinayJuraja, B. Implementation of auditory and non-auditory effects of noise in the risk assessment process in mechanical engineering. MMaMS (2012).
41. Srspharma. ISCHEMIC HEART DISEASE : CAUSES, SYMPTOMS, PREVENTION & TREATMENT. from http://www.srspharma.com/ischemic-heart-disease-treatment-causes-symptoms.htm (2010).
42. Tanner, E. Environmental Influence on Student Behavior and Achievement. from http://sdpl.coe.uga.edu/researchabstracts/acoustical.html (1999).
43. UNSW. What is a decibel? , from http://www.animations.physics.unsw.edu.au/jw/dB.htm (2012).
44. Van Kempen, B. Selection and evaluation of exposure-effectrelationships for health impact assessment in the field of noise and health. EEMM (2005).
45. Vijayalakshmi, D. Noise Pollution. Proceedings of the Third International Conference on Environment and Health, **25**, 597 – 603 (2003).
46. Alberti, P. THE ANATOMY AND PHYSIOLOGY OF THE EAR AND HEARING. University of Toronto Department of Otolaryngology, from palberti@attglobal.net (2012).
47. WebMD. Hypertension/High Blood Pressure Health Center. from http://www.webmd.com/hypertension-high-blood-pressure/guide/hypertension-symptoms-high-blood-pressure (2012).
48. Yourdictionary. student achievement from http://www.yourdictionary.com/student-achievement (2008).
49. Ingela Enmarker, Eva Boman, Available online 26 January 2005. Noise annoyance responses of middle school pupils and teachers, Journal of Environmental Psychology **24** 527–536 (2004).
50. Neil D. Weinstein, Individual Differences in Reactions to Noise: A Longitudinal Study in a College Dormitory, Journal of Applied Psychology, **63**, 4, 458-466 (1987).
51. Lauren M. Ronsse Lily M. Wang, 2010. Effects of Noise from Building Mechanical Systems on Elementary School Student Achievement, Published in ASHRAE Transactions **116**, 2 (2010).
52. Paul, S. COSTING THE EARTHguidance for sentencersThe Magistrates' Association is a registered charity, no. 216066.28 Fitzroy Square, London W1T 6DDt. 020 7387 2353, f. 020 7383 4020www.magistrates-association.org.ukISBN 978-1-905313-81-5 (2009).
53. Alkasim, A. and Abubakar-Sadiq,S. Effect of human activities on noise level measurement of some selected areas of Kano metropolis,Kano State Northern NigeriaDepartment of PhysicsModibbo Adama University of TechnologyP.M.B. 2076, Yola NigeriaNigerian Journal of Physics **21**, 2 (2010).
54. Maria, El. Computational Processing and Analysis of Ear Images
55. Dissertation submitted to obtain the Master's degree in Biomedical Engineering (2009).
56. BSc in Biomedical Engineering by the School of Industrial Studies and Management, Polytechnic Institute of Porto.
57. Sam, S. Acoustic Glossary of Terms and Definitions for soundproofing and noise control research, products and materials. from http://allnoisecontrol.com/glossary/index.cfm: (2010).
58. Maranon, R. and Reckelhoff, J. F. Sex and Gender Differences in Control of Blood Pressure, Clin Sci (Lond). **125**, 7, 311–318. (2013).
59. Khaksari, M. Mahmoodi, M. Rezvani, M.E. Sajjadi, M.A. Karam, G.A. Hajizadeh, S. Differences between male and female students in cardiovascular and endocrine responses to examination stress. J Ayub Med Coll Abbottabad, **17**, 2, 15-9 (2005).