ROAD TRAFFIC NOISE IN PESHAWAR — AN INCREASING PROBLEM

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SUMMARY

This prospective study, based on the hypothesis that overcrowded traffic in Peshawar produces noise, above the maximum permissible level, as compared to that in the silent zones which is increasing progressively, was a continuation of a part of the study conducted in 1995. Road traffic noise was measured at 18 busy locations in 1995, 1996, 1997 and 1998 using Bruel and Kjaer Integrating Sound Level Meter. It was found that road traffic load in Peshawar has increased to a greater extent and is producing noise above the National Environmental Standard for motor vehicle exhaust and noise, i.e., above 85 dB(A). Although, it has shown rising trends during the past four years, the annual rise was not found to be statistically significant ($p>.05$, "F"Test), however, a significant difference was observed when road traffic noise levels of the year 1998 were compared with those of 1995 ($p<0.05$). Moreover, the difference between traffic noise level in the field as compared to that in the silent zones was found to be statistically significant ($p<0.01$).

INTRODUCTION

The term noise is commonly used to describe sounds that are disgusting or irritating, produced by acoustic waves of random intensities and frequencies. It may be defined as any "audible acoustic energy that adversely affects the physiological or psychological well-being of the people".[1]

Peshawar is a thickly populated city of Pakistan. The living has been made hazardous to certain extent due to overcrowding of population in general and of the traffic in particular. Over the past few years, the number of vehicles on road has increased tremendously. The uncontrolled noise of traffic horns and engines, absence of traffic signals at busy areas of the city and traffic jams add to these hazards and affect the physical and mental health of the people.

The effects of noise on health are multiple, the most unfortunate being the damage to the human ears in the form of permanent hearing loss.[2] In most persons, noise-induced hearing loss has an ill-defined onset and is due to prolonged or repeated exposure to noise over months or years.[3] Thus the insidious type of noise-induced hearing loss caused by chronic noise exposure is the most commonly recognized and, is manifested as a high frequency sensorineural loss with a notch in the audiogram at the 3 to 6 kHz area.[4] It has been found that all individuals exposed to a given noise, do not develop the same degree of hearing loss.[5]

There are two types of noise-induced hearing loss. The temporary threshold shift (TTS) is the one where the hearing gradually returns to its original value whereas, in

TABLE – 1

AVERAGE NOISE PRODUCED BY DIFFERENT VEHICLES.

S. No	Name of vehicles	No. of Vehicles examined	Neutral Gear	Around the Crossings
1.	Motor cars	15	64 dB(A)	72 dB(A)
2.	Motor cycles	18	72 dB(A)	88 dB(A)
3.	Scooters	10	82 dB(A)	76 dB(A)
4.	Tractors	8	86 dB(A)	93 dB(A)
5.	Trucks	12	85 dB(A)	87 dB(A)
6.	Long Trailers	6	83 dB(A)	91 dB(A)
7.	Buses	15	86 dB(A)	95 dB(A)
8.	Auto Rikshaws	25	89 dB(A)	91 dB(A)
9.	Car horns	15	—	95 dB(A)
10.	Pressure horns	30	—	104 dB(A)

permanent threshold shift (PTS) the hearing loss does not completely return to its original value[6] In a study in traffic police constables, it was found that percentage of abnormal audiograms showing noise-induced hearing loss increase with the increase in duration of noise exposure.[2]

Speech reception may be interfered due to permanent hearing loss and may lead to social isolation. It has been found that in the elderly, hearing impairment is strongly associated with depression.[7] If hearing impairment in the elderly remains untreated, it may interfere with cognitive function.[8] Noise may cause disruption of work productivity and sleep.[9] Physiological and mental disturbances may also occur due to prolonged exposure to noise.[10] In a study, it was revealed that annoyance to noise was strongly associated with traffic noise exposure levels and men with noise sensitivity were more likely to be highly annoyed by noise exposure than men with less noise sensitivity.[11] On the basis of the results of a study assessing the relationship between noise exposure and blood pressure, it was suggested that noise exposure is associated with higher systolic and diastolic blood pressure.[12]

The present work was conducted to measure traffic noise level at various busy locations of Peshawar at different times of the day, compare it with that in the silent zones, and, to recommend measures for its minimization in order to prevent its hazardous effects on health.

MATERIALS AND METHODS

This prospective study was conducted in 1995, 1996, 1997 and 1998, in order to observe trends in traffic noise levels in Peshawar. Annual measurement of road traffic noise was done during the time from 8.00 to 16.00 hours (hours of active traffic flow) at 18 different places (main roads, traffic signals and streets) at 8.00 a.m., 10.00 a.m., 12.00 noon, 2.00 p.m., and 4.00 p.m in the centre of the crossing, keeping the Sound Level Meter away from the body. Readings were repeated on three different days and mean noise level of three readings at particular area and particular time was

TABLE – 2

AVERAGE TRAFFIC NOISE LEVELS AT DIFFERENT LOCATIONS

LOCATION	Average noise level - dB(A)			
	1995	1996	1997	1998
New Bus Stand	92.5	96.5	95.0	94.0
Gul Bahar Chowk	92.0	95.0	94.5	96.5
Hashtnagri Chowk	92.0	95.0	95.0	96.0
Bacha Khan Chowk	94.0	96.0	92.5	97.0
Dabgari Chowk	92.0	91.0	93.0	95.5
Khyber Bazar	91.0	89.0	93.0	94.0
Chowk Yadgar	90.0	90.0	89.5	93.0
Army Stadium Chowk	95.5	94.0	94.0	96.0
Uni. Town Chowk	92.5	92.0	93.0	95.5
Arbab Road Chowk	94.0	92.0	95.0	98.0
Firdous Cinema Chowk	93.0	90.0	92.0	93.5
Nauthia Chowk	89.0	90.5	88.0	86.0
Yakka Toot Chowk	89.5	91.0	92.5	90.0
F.C. Chowk	88.0	92.0	90.0	92.0
Ramdas Chowk	96.0	94.0	91.5	93.0
Stadium Chowk	90.0	93.0	92.5	95.0
Kohati Chowk	91.0	90.0	90.0	92.0
Stadium Chowk	87.5	88.0	89.0	92.0
MEAN	91.64	92.16	92.22	93.83

calculated and tabulated. Sound level was also measured in certain areas of University Town and Hayat Ababd, having almost no road traffic (silent zones) in the same way. A sound level meter is an instrument designed to respond to sound in approximately the same way as the human ear and to give objective, reproducible measurements of sound pressure level (SPL).The apparatus used in this study for measuring noise level was Bruel and Kjaer Integrating Sound Level Meter Type 2225 with 1/2 inch Bruel and Kjaer Pre-polarized Condenser microphone type 4129. It has a measuring range of 20 dB to 140 dB in four display ranges with "A" weighing frequency. The results were compiled and statistically analyzed with the help of scientific calculator, using "F" test and "t" test.

RESULTS

Table-1 details the noise produced by various vehicles. It is evident that motor cars, motor cycles, scooters, tractors, trucks, long trailers, buses, and auto rikshawas produced 72 dB(A), 88 dB(A), 76 dB(A), 93 dB(A), 87 dB(A), 91 dB(A), 95 dB(A) and 91 dB(A) respectively around the

TABLE – 3

COMPARISON OF AVERAGE TRAFFIC NOISE LEVELS AT DIFFERENT TIMES OF THE DAY

Year	AVERAGE TRAFFIC NOISE LEVEL - dB(A)				
	8.00 a.m	10.00 a.m	12.00 noon	2.00 p.m	4.00 p.m
1995	89.5	91.0	91.0	93.0	91.0
1996	92.0	94.0	93.0	92.0	90.0
1997	92.0	93.0	90.0	94.0	92.0
1998	91.5	95.0	96.0	93.5	93.0

crossings. The noise produced by car horns ranged between 95 dB(A) while that of pressure horns of trucks and buses was 104 dB(A). Table-2 shows the comparison of average noise levels at different locations in Peshawar. Minimum noise level was found to be 87.5, 88.0, 88.0 and 86.0 dB(A) in 1995, 1996, 1997 and 1998 respectively, while the highest level was 95.5, 96.5, 95.0 and 98.0 dB(A) in the respective years and showed a variable trend. Although, there was no significant difference between the means of traffic noise level during the years 1995, 1996, 1997 and 1998 ($p>0.05$ - "F" test), a significant difference ($p<0.01$ - "t" test) was found when the traffic noise levels of the year 1998 were compared with that of 1995. Table-3 indicates the comparison of average noise levels at different times of the day for the year 1995, 1996, 1997 and 1998. Again, the comparison of the means did not provide sufficient evidence of annual increase ($p>0.05$ - "F" test).

Fig-1 depicts the comparison of noise levels in the fields to that in the silent zones of Peshawar. The difference between noise level in the field and the silent zones or offices was found to be significantly higher ($P<0.05$ - "t" test). It was also observed that the noise level in the field was more than 85 dB(A), above the dangerous limit, as compared to that of silent zones, (between 66-75 dB).

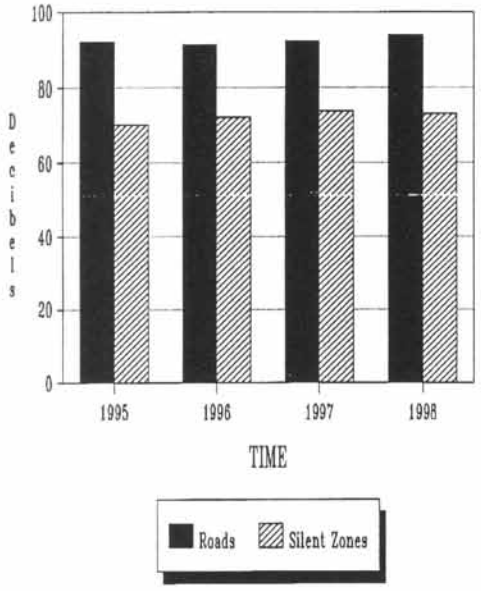
DISCUSSION

Excessive sound is one of the most common cause of hearing loss in the world. The sound levels in urban communities are apparently rising, and the nuisance value of unwanted sound is greatly increased.

In 1970, Occupational Health Safety and Health Act established occupational noise exposure standards, an employee may receive in a working day.[13] According to this standard 90 dB(A) is the maximum permissible noise level of exposure, without the use of ear protectors for 8 hours per day. Occupational Safety and Health Act (OSHA) has given a time weighted risk for noise exposure.[14] According to this, risk of 96 dB(A) for 3 hours and thirty minutes, 102 dB(A) for 1 hour and thirty minutes, 105 dB(A) for 1 hour, 108 dB(A) for 40 minutes, 115 dB(A) for 15 minutes, 124 dB(A) for 4 minutes, and 130 dB(A) for 1 minute of exposure to noise without the use of ear protectors is equivalent to that of 90 dB(A) exposure. In Pakistan, the National Environmental Quality Standard for motor vehicle exhaust and noise has been enforced from 29th August, 1993, according to which noise Emission Standard is 85 dB(A).[15]

Permissible noise limits of various vehicles in Pakistan have been suggested to be between 86-89 dB(A), while after 5 years it should be between 80-87 dB(A).[16]

COMPARISON OF MEAN NOISE LEVELS IN FIELD AND SILENT ZONES



(FIG-1)

However, in the present series, it was found that only the motor cars had an average noise level of 72 dB(A). Rest of the vehicles produced noise above 85 dB(A) around the crossings. Average road traffic noise levels in Peshawar were found to be between 86.5-100 dB(A), the most frequent level being above 90 dB(A), with a mean of 91.64, 92.16, 92.22 and 93.83 annually. Statistically, there was no significant annual rise ($p>0.05$). However, serious attention is required for prevention in future as comparison of the road traffic noise of the year 1998 with that of 1995 showed a significant difference ($p<0.05$). The comparison of average noise levels at different times of the day for the year 1995, 1996, 1997 and 1998 also showed no significant difference between the means ($p>0.05$). The average noise level between 10.00 a.m to 2.00 p.m was found to be the highest, i.e., between 93-96 dB(A), indicating the peak traffic flow during these hours. Correspondingly, in the silent zones, the average noise level was found to be between 66-75 dB(A), the most frequent being between 68-72 dB(A). The maximum limit was recorded between 10.00 a.m. to 12.00 noon (between 72-75 dB) indicating peak working hours. The difference between the traffic noise level in the field was found to be significantly higher than that of the silent zones ($P<0.05$). This can be compared with the results of a study conducted in Karachi in which a peak traffic noise level as high as 106 dB(A) was found in some areas, whereas, on the day of a traffic strike, noise level dropped to less than 60 dB(A).[17] In a study on field investigation on road traffic noise in Greater Cairo, values ranging from 81.6-84.6 dB(A) were reported.[18] In another study, it was reported that in Cairo, road traffic noise ranged from 72 to 110 dB(A). In this study, frequency distribution of the recorded value demonstrated that the most frequent levels ranged from 90 to 100 dB(A), followed by, 80 to 90 dB(A).[19]

Running engines, air turbulence and frictional contact of vehicle's tires with the ground, produce considerable amount of noise.[20] In Peshawar, the higher traffic noise level has been found to be due to progressively increasing traffic load on old fashioned narrow roads, a two-fold increase in the urban population by influx of Afghan Refugees, uncontrolled use of car horns by drivers and pressure horns in large buses and other vehicles, faulty silencers of motor cycles and auto rikshawas, and entry of heavy traffic on roads during busy hours of the day causing traffic jams[2]. According to an estimated figure by Motor Registration Authority of the city, in 1995, more than 0.13 million registered vehicles of different types were on road, with an increase of about 4000-5000 vehicles per year, reaching to about 0.145 million in 1998. Temporarily registered and the vehicles coming from outside are an additional load on the traffic.

There is a general noise level of about 65-75 dB(A) surrounding the city, which varies with the traffic density and time of the day. However, there are peak traffic noise levels of a few second duration when individual vehicles are passing. These peak noise levels vary according to the size, type and speed of the vehicle. In a study on road traffic noise and its control, it was revealed that the increased number and density of all road vehicles invariably increases the road traffic noise.[21] In another study, it was concluded that the noise level increases with increase in traffic volume and flow.[22] Heavy vehicles produce rattles, noise and vibrations according to the degree of loading and age. It was further determined that all vehicles produce more engine noise at faster speeds and a doubling of engine speed can increase the noise level by 13 dB(A).[23]

RECOMMENDATIONS

As noise level in Peshawar is showing an increasing trend beyond maximum permissible limits, measures should be taken for its control by the government as well as the general public. The following recommendations repeated for the pursuance of the authorities.

1. Each vehicle should have regular periodic inspection. Faulty silencers should be replaced to minimize the engine noise and should be maintained in optimum working condition. No motor cycle or auto rickshaw, without a silencer or with a faulty silencer should be allowed on the roads.
2. Legislation, regarding the noise pollution and its control should be strictly enforced and implemented by the government. There should be strict ban on the use of pressure horns. Indiscriminate use of car horns during peak traffic hours should be discouraged and those not obeying the rules should be punished.
3. There should be permanent arrangements for regular measurement of noise levels at different locations in the city so that any increase in noise level at a particular location is noted and corrected at an early stage.
4. Health education regarding noise control should be given due importance, because no noise abatement programme can succeed without people's participation. Their education through the available media is needed to highlight the importance of noise as a community hazard.
5. Traffic police should be actively involved in the projects of Environment Protection Agency, proposed for reduction of noise pollution.

CONCLUSION

Road traffic load in Peshawar has increased to a greater extent and is producing noise above the National Environmental Standard for motor vehicle exhaust and noise, i.e., above 85 dB(A). It has shown rising trends during the past four years. Although, the annual rise was not found to be statistically significant ($P>0.05$ - "F' test), a significant difference was observed when road traffic noise levels of the year 1998 were compared with those of 1995 ($P<0.05$ - "t" test). Moreover, the difference between traffic noise level in the field as compared to that in the silent zones was found to be statistically significant ($P<0.01$ - "t" test).

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