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Original Research Article

Day-night community noise level during COVID pandemic: a nationwide study

Joyanta Chandra Mandal*

Department of Speech Pathology and Audiology, AYJNISHD(D), Mumbai, Maharashtra, India

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***Correspondence:**
Dr. Joyanta Chandra Mandal,
E-mail: joyantachmandal@gmail.com

ABSTRACT

Background: Community noise, also known as environmental or residential noise, encompasses all noise sources except industrial noise. The primary sources of community noise include road, rail, and air traffic, public construction works, neighborhood noise, and even industrial noise. During the lockdown, there was a complete shutdown across India, affecting all public sectors, institutions, and offices. This led to a significant reduction in community noise levels and their adverse effects.
The aim was to measure day and night noise levels in various areas across India during the lockdown period and to compare these levels with available data from the pre-COVID era.
Methods: For this study, community noise levels at specific times of the day and night were considered. Environmental ambient noise was measured on each measurement day, over a span of 30 separate days. During the lockdown period, data was collected from the locality using the "noise meter" application on an Android mobile phone, either from the balcony or the rooftop of the house.
Results: This study showed that the noise levels were even considerably low than the permissible noise level criteria given by central pollution control board (CPCB). The day time noise levels measured during the lockdown in the various part of country ranged between 36.7 dB to 50.14 dB. And during the night time was in the range of 10 dB-47.44 dB which was considerably lower.
Conclusions: These noticeable changes in the noise levels have given a scope of managing the noise levels by proper ordering of the activities accustomed to cause noise pollution and noise induced hearing loss also.

Keywords: Community noise, COVID, Day noise, Night noise, Noise meter, Lockdown period, India

INTRODUCTION

Humanity advances to progress in development of a transport vehicle by burning the fossil fuel in the combustion engine. Shortly with the development of the plane and car, we started to fly and drive them more and more. By the mid-20th century, the road traffic noise and the aviation noise hold the top-notch position in contributing the noise pollution.[1] Along with this noise, some sources like industry, resource extractions (mines) also came up with the additional acoustic trash.

According to public health experts, the noise exposure risks accounts for 25% of the burden of disease.[2] Community noises, also called as environmental noise or residential noise are those noise sources which includes all the sources emitting noise other than industrial noise the main source of community noise includes noises from road, rail and air-traffic, public work construction works, as well as the neighborhood noise and the industrial noise. The most common types of environmental noise sources are directional and include road traffic noise, air craft noise, train noise, industrial noise and outside environmental facilitator's sources. All these types of

environmental noise are produced by multiple sources which in many cases are moving. Thus, the characteristics of individual sources as well as the characteristics of combined sources must be considered.

People experience noise-induced symptoms such as bad temper, loss of concentration, headache, hearing problem and sleep disturbance, they are unaware of the ill-effects of noise on health.[3] Noise pollution also creates negative emotions of annoyance and irritation in people. Due to the adverse effect of noise, people reported that they suffered from frequent irritation, hypertension and loss of sleep. Sleep is disturbed when outdoor noise levels are above 45 dB, and indoor noise levels are above 30 dB. After-effects of sleep disturbance include inability of concentration and mild-severe headache and irritability as well.[4]

With the promulgation of the environment (Protection) act, 1986 in India noise pollution was deemed to be an offence. The most common configuration of the noise-induced hearing loss is the bilateral symmetric hearing loss, with an initiation of notch between 2-6 KHz. Sound pressure level above 115 dB SPL may cause a permanent threshold shift (Marshall, 2009). Even the impact of temporary threshold shift (TTS2) and acoustic trauma cannot be ignored due to impulse noise, domestic noise and other recreational noise which are sometimes being considered as "not noteworthy".

With the worldwide outbreak of the corona virus disease (COVID-19) caused by the severe acute respiratory syndrome Corona-virus 2 (SARS-CoV 2), primarily originated from China led a severe impact on India. On 22nd March, 2020 the whole India observed a voluntary public curfew of 14 hours, followed by a nationwide lockdown of phase-1, phase-2, phase-3 and phase 4 (24th March- 31st May, 2020). With the lockdown there was a complete shutdown observed in whole of India including all public sectors, institutions, offices.

This in turn made a wide downfall of community noise level and their adverse effect and it may gradually or eventually increase during unlock phases though the noise level during pre-COVID era not yet been reached. Thus, it throws light to measure the community noise level during the silent pandemic and its' impact on the human being.

Need of study

As lockdown rings in sound of silence worldwide, due to the outbreak of the COVID-19, the number of vehicles on the roads, industrial activities, market noises have been reduced drastically. Lack of significant exposure of noise may alter the hazardous and adverse effects on living beings as human are the most sensitive to it. Thus, the need exists with reference to measurement of day-night exposures in rural and urban contexts for exploring these distinguishable evidences.

Aim

The aim of the study was to measure the day and night levels of noise at various areas during lockdown period in India and to compare the same with the available data during pre-COVID era.

METHODS

In order to make an appropriate assessment of noise, it is important to have some appreciation of the characteristics of environmental noise sources and how a sound propagates from them. One should consider the directionality of noise sources, the variability with time and frequency content. If these are in some way unusual, and the noise may be more disturbing than expected. For this study, community noise for certain time of day and night has been considered. Environmental ambient noise has measured on each measurement day. Measurements have been conducted over 30 separate days. During the lockdown period the data has been collected at the locality from the balcony or top of the roof of house using "noise meter" application in android mobile phone.

Tools used

'Noise meter' application software, version 3.9.1 by JINASYS was used with the help of android smart phones. These devices take sounds as input from the inbuilt microphone with a sampling speed of 48000 sample/second (Hz). Peak SPL values were recorded, average, maximum, minimum values of ambient noises displayed in dBA. Measurements were recorded using the phone's inbuilt microphones that is tiny electrode condenser or MEMS (Micro electro mechanical system) class microphones. The microphone was placed at least 03 meters away from any other sound reflecting surface.

Placement of microphone

Outdoor measurements were made at least from one meter distance from any open external window/door. The noise has been measured from balcony of the house or top of the roof of the house at the locality, as there were restrictions to move outside.

Data collection zone

Noise data were collected at several localities across 08 different states of India: West Bengal, Bihar, Jharkhand, Odisha, Haryana, Meghalaya, Delhi, and Uttar Pradesh. These data collection zones were also distributed as urban and rural areas.

Precaution during data collection

The diffuse sound field generated in the environment meant that precise location and size of the smart phones does not have more influence on the result of the study. All phone covers were removed prior to the testing to

avoid any interference on the microphone. Only the A-weighted sounds levels measurements were considered.

Measurement procedures

For noise measurement 'noise meter' application was opened in mobile phone and placed on balcony or the main gate of house. The microphone, automatically selected by the application was not changed. Each smart phone device was retained on a fixed level from the floor during the time of measurement and same position was used for each and every time of data collection. Each Smartphone were oriented horizontally, during routine time use. After 05 minutes of recording, the average value, minimum and maximum values were collected. "Day time" and "night time" data were collected for 30 separate dates which was selected randomly during lockdown period. Day time is considered as within 06 am to 09 pm IST and night time is reckoned to be 09 pm to 06 am IST.

Statistical analysis

Data tabulation was done in MS-excel for 30 days for the selected day time and night time in urban and rural areas. Shapiro-Wilk test was done to check the data distribution. Comparative method was used to differentiate the day vs. night noise levels and also urban vs. rural noise levels during the lockdown period.

RESULTS

Day time and night time noise level for different urban areas and rural areas were summarized in Table 1 and 2. Shapiro-Wilk test results showed p=0.553 for urban area's data and 0.427 for rural area's data, so it was assumed that the data were normally distributed (since $p>\alpha$, at significance level $\alpha=0.05$).

The average noise level for urban was found to be 43.42 dBA with for daytime and 30.72 dBA for night time. Minimum and maximum peak were 25.86 dBA and 56.65 dBA for daytime and 10.3 dBA and 54.6 dBA for night time.

In case of rural areas, average the daytime and nigh time noise level was 42.14 dBA and 33.97 dBA. Minimum and maximum peak noise levels were measured as 34.7 dBA and 55.44 dBA for daytime and 26.22 dBA and 40.7 dBA for night time.

By comparing day time and night time noise of urban areas with t-test, it has been found that p value is less than 0.05 (Here at $\alpha=0.05$ level of significance, 95% confidence level) and t value is 2.25, which revealed significant difference in day time and night time noise in urban areas. In case of rural areas also significant difference was found between day and night noise levels using t test, where p=0.023, less than α (Table 3).

Table 1: Noise measurement data across different urban areas in India.

Noise measurement areas		Day time noise (dBA)				Night time noise (dBA)			
		Average (Mean)	SD	Min	Max	Average (Mean)	SD	Min	Max
Urban areas	Kolkata, West Bengal	44.5	9.5	34.1	72.3	31.61	4.25	29.1	46.1
	Chandan Nagar, West Bengal	45.3	7.2	29.5	58.3	31.20	8.75	25.2	60.2
	Barasat, West Bengal	25.86	9.3	19	56.2	10.3	3.08	8.1	20.44
	Rampurhat, West Bengal	47.5	6.42	31.1	56.8	37.7	4.25	31.7	48.7
	Bihar Sharif, Bihar	36.7	9.3	24.2	61.4	18	6.65	9	35.6
	Lucknow, UP	50.14	9.22	35.4	72.3	47.14	2.97	37.6	49.5
	Shillong, Meghalaya	36.4	9.41	25.66	63.3	19	11.1	17.9	62.5
	Delhi	56.65	3.35	50.1	63.5	54.6	3.76	47.35	62.4
	Cuttack, Odisha	47.7	3.52	43.7	57.8	27	9.32	12.3	49.6

Table 2: Noise measurement data across different rural areas in India.

Noise measurement areas		Day time noise (dBA)				Night time noise (dBA)			
		Average (Mean)	SD	Min	Max	Average (Mean)	SD	Min	Max
Rural areas	Puruliya, West Bengal	48	3.65	39.5	54.1	33.06	2.75	31.1	42.1
	Badanganj, West Bengal	36.7	4.02	33.2	49.3	30	5.67	26.2	48.9
	Krishnanagar, West Bengal	34.7	9.32	31.2	68.6	26.22	10.9	21.6	65.5
	Dankuni, West Bengal	42.1	7.2	29.5	58.3	35.5	8.2	30.1	62.9
	Hooghly, West Bengal	48	9.75	32.8	71.8	40.2	5.85	29.1	52.5
	ChutwakhuJowai, Meghalaya	34.7	11.7	10	56.9	31	8.8	28.3	63.5
	Siswal, Hisar, Haryana	37.44	9.12	28.9	65.4	35.05	8.2	28.3	61.1
	Godda, Jharkhand	55.44	8.8	36.9	72.1	40.7	2.22	35.6	44.5

Table 3: Comparison between day time and night time community noise.

Variables	DF	T value	P value	Interpretation
Day and night noise levels in urban areas	16	2.25	0.038	p<0.05, significant difference
Day and night noise levels in rural areas	14	2.53	0.023	p<0.05, significant difference

DISCUSSION

This study showed that the noise levels were even considerably low than the permissible noise level criteria given by CPCB, (Table 4). In India the average noise levels during the day were 67.8 decibel and that violates the CPCB limits in residential areas by >20 decibels.[5]

Table 4: CPCB criteria for permissible noise level.

Areas	Day time permissible levels of noise (in dBA)	Night time permissible levels of noise (in dBA)
Industrial areas	75	70
Commercial areas	65	55
Residential areas	55	45
Silent zone	50	40

The finding of present study contradicted the earlier trend of increased noise levels crossing the permissible noise limits given by CPCB, there was reduction of 15-20 decibel in the noise measured during the day time and the night time during the lockdown in the various parts of the country due to lockdown. As per the Order of govt. of India under national disaster management act public transports, schools, colleges, offices, malls, hotels, restaurants, even commercial establishments were closed during lockdown period. Peoples were self-quarantined at homes, also strict instructions for social distancing were implemented; which in turn as a result showed significant reduction in community noise.

The day time noise levels measured during the lockdown in the various part of country ranged between 36.7 dB to 50.14 dB which was considerably lower than the permissible noise limits by CPCB and most of the noise levels were even below the silent zone level which is 45dB.These peculiar findings were observed during the lockdown as the major source of noise pollution traffic was completely shut down during lockdown resulting in reduction of noise levels across various parts of country.

The noise levels measured during the night time was in the range of 10 dB-47.44 dB which was considerably lower than the permissible limits given by CPCB board of 45 dB in residential zone and 40 dB in silent zone. The noise level was considerably lower and even below 40 dB in most places. These peculiar findings were achieved due to lockdown in country as restrictions were opposed during corona virus which in turn restricted human activity in various fields leading to noise pollution.

During lockdown the noise pollution in Kolkata has been reduced by 50-755 as reported by West Bengal pollution control board which supports findings of this study as the major areas are in the West Bengal for present study by WBPCB, 2020. After comparison, it was noted that significant less noise during night time as compared to daytime for both urban and rural areas (Figure 1 and 2). Although, there was very minimal traffic noise or no constructional noise during lockdown, but in community, people used to live with different gadgets like TV, fridge, AC, washing machine, phones, also different utilities in kitchen and we mostly use these in day time. So those sources probably the reason to have more noise in day time compare to night. In case of Delhi and Lucknow, noise level was higher than other cities, because the density of population is most in these cities, causing more community based noise even during lockdown.

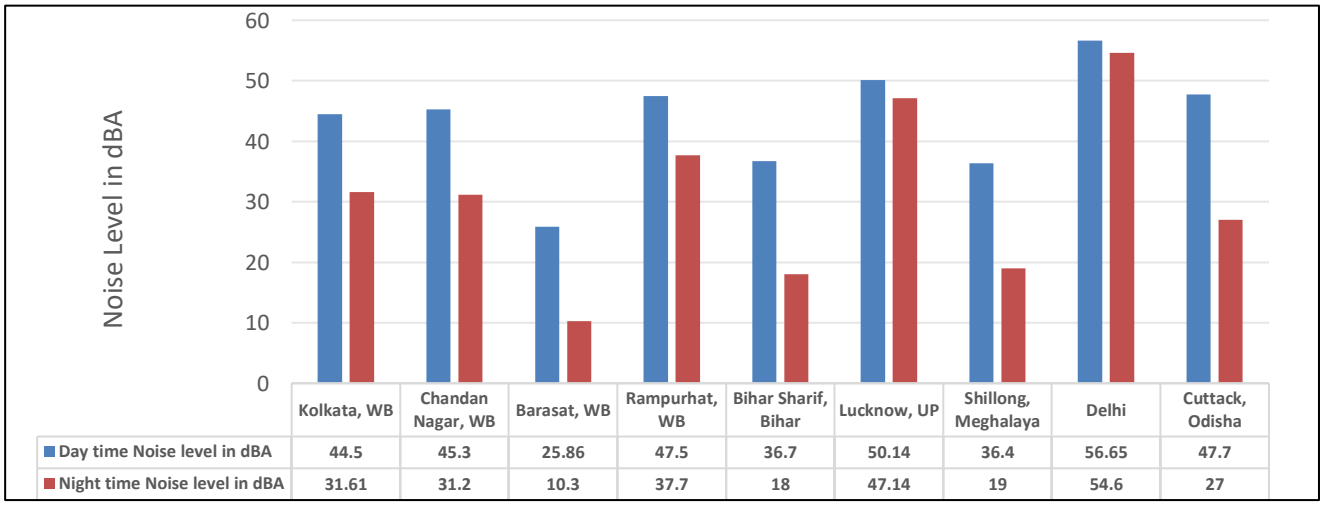

Figure 1: Noise across different urban areas in India.

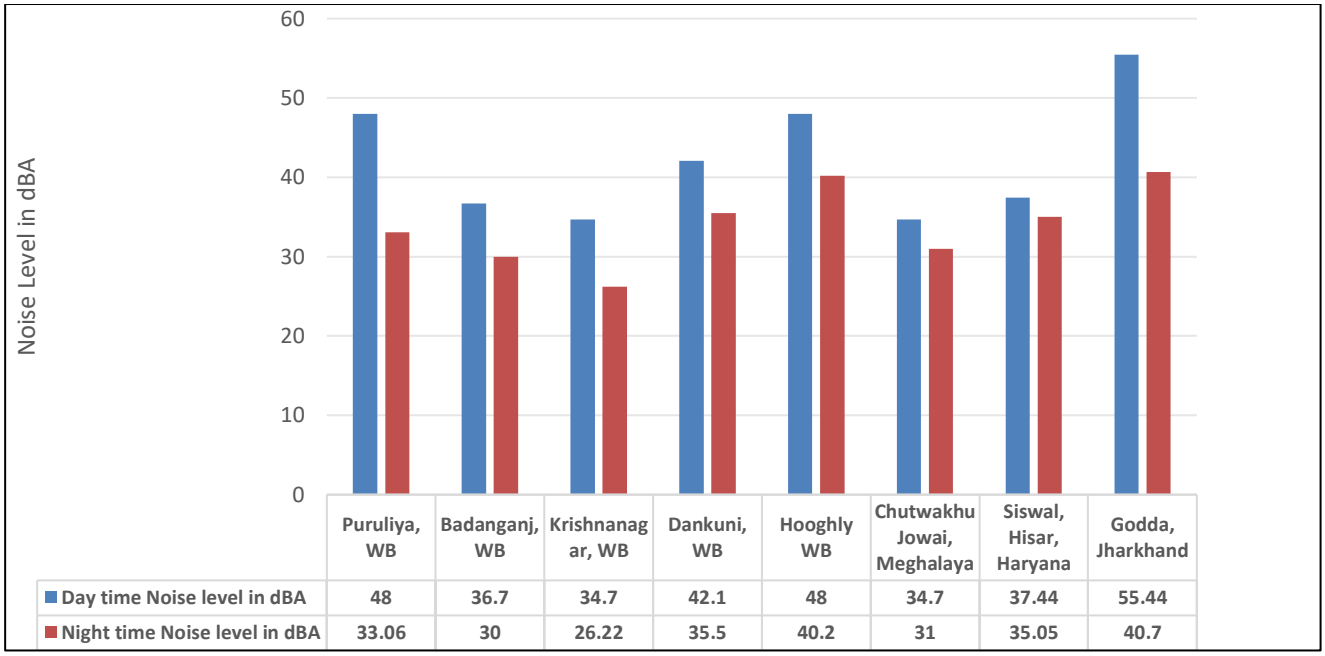

Figure 2: Noise across different rural areas in India

Many studies conducted in India to measure noise in different zone which were used as reference to compare the current findings. The findings in the present study revealed considerable lower noise levels during lockdown than usual days. Researchers measured the noise levels in regions of Tamil Nadu and revealed that the silent zone had 52.5dB-86.4dB, commercial zone had 72.3-88.5 dB, residential zone had 55.9 dB and traffic zone had 68.6dB during daytime respectively.[6] Mangalekar surveyed average noise level during the night time in Kolhapur city 71.18 dB, 57.42 dB, 55.40 dB and 46.07 dB for industrial zone, commercial zone, residential zone, silent zone.[7]

Data compiled by the Uttar Pradesh pollution control board (2020) found that there was significant decrease in noise anywhere between 2.3 decibels and 29 decibels (day time data) in the four zones of residential, commercial, silent and industrial during the month of April as compared to the month of February which was in the concurrence of the present study which revealed lower noise levels in the lockdown due to Corona virus.[8]

In a scientific study conducted by national environmental engineering research institute (2020) the noise levels dropped by 10 dB (A) and 11.3 dB (A) during day time and night time respectively in various parts of the country during the lockdown and are collateral to the findings of the present study.[9]

Further impact of noise during the lockdown that came into action during corona virus should be explored, as limited numbers of studies are present in this context. The findings revealed in this study are due to restricted work and human activities leading to noise pollution which is emphasizing on the importance of future strategies to reduce noise pollution.

CONCLUSION

The research paper elucidates the average level of community noise pollution in various areas of the country amidst lockdown. The noise levels are different at different times of day and night. During lockdown due to Corona virus, human activity is ceased along with interrupted industrial load the average noise level is explored to be lower when compared to the earlier literature for noise permissible limits. The noise limits have sinked below the silent zone noise levels even when measured in urban areas or rural areas. Although variation have been observed in few regions due to the variable restrictions in the lockdown across the different regions in the country.

These noticeable changes in the noise levels have given a future scope of managing the noise levels by proper ordering of the activities accustomed to cause noise pollution and noise induced hearing loss also. As the literature supports promising evidence of hazardous daily level of noise which has surpassed the permissible noise levels which is already published in literature.

Thus, this should be our responsibility to check for the daily noise pollution that we cause at the daily basis and should maintain it in such a way so as to give positive results even in future, in order to help our community to be free from all the negative impacts of the excessive noise.

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REFERENCES

1. Blomberg LD. Noise pollution in the 21st century. J Acoustical Society Am. 2014;135(4):2271.
2. World Health Organization. Burden of disease from environmental noise: Quantification of healthy life years lost in Europe. InBurden of disease from environmental noise: Quantification of healthy life years lost in Europe 2011. Available at: https://www.who.int/publications/i/item/burden-of-disease-from-environmental-noise-quantification-of-healthy-life-years-lost-in-europe. Accessed on 17 May 2024.
3. Jamir L, Nongkynrih B, Gupta SK. Community noise pollution in urban India: Need for public health action. Indian J Community Med. 2014;39(1):8-12.
4. Medic G, Wille M, Hemels ME. Short-and long-term health consequences of sleep disruption. Nature Sci Sleep. 2017;9:151-61.
5. Ramachandran S, Devadas MD, Pillai GS. Assessment of Noise Pollution in the City of Chennai. Rev Argent Clín Psicol. 2023;32(1):40-54.
6. Moses AA, Ravichandran C, Sagila JC, Sangeetha R, Srinivasan K, Andrews J, et al. Noise pollution assessment in Chidambaram, Erode and Thanjavur towns in Tamil Nadu. Indian J Environmental Protect. 2000;20(12):881-4.
7. Mangalekar SB, Jadhav AS, Raut PD. Study of noise pollution in Kolhapur city, Maharashtra, India. Sleep. 2012;35(16):5.
8. Central pollution control board, New Delhi, India.
9. Fredianelli L, Lercher P, Licitra G. New indicators for the assessment and prevention of noise nuisance. Int J Environm Res Publ Heal. 2020;5;19(19):12724.

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