ISSN: 2348 9510
International Journal Of Core Engineering & Management (IJCEM)
Volume 1, Issue 10, January 2015

A Study of Hospital Noise Pollution, Its Prolonged Effects on the Recovery of the Patients and Passive Noise Control Measures

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Abstract: The study to estimate the health hazards due to noise pollution was carried out in different wards of Allied Hospital, Faisalabad, and the noise levels were measured using digital sound level meter DT-8850. The average, maximum and minimum noise level were found to be 73.5, 90.6 and 52.5 dB(A), respectively, in Surgical and Oncology ward. The max and min values of systolic and diastolic blood pressures were 150.9/110.9 mmHg and 86.72/81.08 mmHg in Medical and Pediatric ward correspondingly. Similar trend was found to be in case of other biomedical parameters like pulse rate and oxygen demand and the results were confirmed through sociological survey. The observed noise levels in the Allied Hospital exceeded the recommended standards for hospitals and affected adversely the biomedical parameters of the patients hence delaying their recovery time. Passive noise control technique was developed using the novel idea of close box systems and the suitable absorbers available in the market were recommended for the hot spots in different wards of the hospital.

Key words: Noise pattern, noise contributors, biomedical parameters, questionnaire analysis psychosomatic disorders, remedial measures

1-INTRODUCTION

This study presents a comprehensive passive noise control program following the best practicable and economical options (BPEO) for implementations in different hospitals of Faisalabad for reducing annoyance and its ill effects on the patients, their relatives, medical and paramedical staff. It reviews potential application of noise control absorbers easily available in the market for the reduction of hospital noise and presents a simple solution as per requirement of technique for order of preference by similarity to an ideal solution approach (TOPSIS) for selection of appropriate sound absorbers on behalf of their absorption coefficient. The word "noise" is derived from the Latin word" nausea", has meaning sea-sickness or any similar sensation of disapproval, annoyance, or discomfort. Noise from different sources can cause annoyance, disturb sleep and effect health. Thus sound is potentially serious pollutant and threat to environmental health (Hanini and Abdel-Rahim 2002; Dix, 1981).

Nature has created everything according to its own status. Creation of things like water, plants, animals and lands was inevitable for the survival of human life. These things combine together to constitute an environment, the phrase which has complex meaning. Any disturbance among these things creates an ecological imbalance. This imbalance may give rise to an environmental pollution. The WHO (World health organization) classifies noise as the leading element of stressor that affects the well-being of the patients in hospitals. Sound is a symbol of life and a fundamental means of communication among the human beings. But when it becomes un-wanted, undesired and irritate the listener it happened to be noise, and when it tempers the environment it becomes environmental pollution. It is a known fact from the relevant studies that noise pollution has been affecting the

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human health from the early days of industrial revolution.

Studies revealed that high level of sound have negative physical and psychological effects, disrupting sleep, increasing stress and decreasing patient's confidence in the competence of their care givers.

Hospitals are considered to be quite zones, like schools, to heal and get well. But now a days the hospital are noisy and the problem of noise pollution still exists even in new construction. The layers of sound proof and insulating materials are less thick in hospitals than in houses because of presence of bacteria in the hospitals. High noise levels in hospitals contribute to stress and lapses in hospital staff, reduced speed of patient's recovery, and there are evidences that hospital noise can negatively affect the communication and performance of the hospital staff. The situation has been worsening steadily. The World Health Organization has recommended different noise levels for day and night time that are commensurate with health promotion. In addition, there is remarkably little variation throughout the world for noise levels in different types of hospitals. This suggests that the problem of hospital noise is universally threatening, and that noise control strategies and techniques should be adopted broadly.

There are many sources of noise in hospitals including air conditioning systems, medical devices such as respirators, and occupant sounds such as conversations Impulsive noises, or very loud, short duration events are also common in hospitals. There are many other sources of noise which cannot be excluded like beeping, blaring, rattling, crashing noise that interrupt their sleep and they do not get proper rest to heal.

Intensive care unit or ICU is the major sources of noise in hospital, because there are many types of equipment, essentials in order to alert physicians and nurses about changes in patient's conditions, and also malfunction of equipment.

Since 1960, hospital noise level goes on increasing. These days, noise levels in hospitals have increased from 57 dB(A) in 1960 to 72 dB(A) during day time and from 42 dB(A) in 1960 to 60 dB(A) during night time (Busch, et al., 2005). However, according to human hearing, a 10 dB(A) increase would seem to be as an approximate doubling of loudness. Accordingly, a 60 dB(A) sound seems to be four times as loud as a 40 dB(A) sound, despite having a pressure level 100 times higher. Further, many studies indicate that the highest noise level in hospitals mostly greater than 85 dB(A) to 90 dB(A) [1,2,8,13,14,18,19,21,24,26,27,30,32,35,40] Noises from certain equipment that exceed 90 dB(A) (for example, portable X-ray machine) are same as walking next to a busy highway. Federal workplace safety standards mentioned 85 dB(A) as the limit of safe noise level for a whole shift without ear protection (National Institute for Occupational Safety and Health 1998).

Now a days it is an experimental fact that noise exposure is in fact a biological stressor which disturbs sensation of hearing psychologically and physiologically through human Ear, this disturbance then shifted to brain and affect the automatic nervous system by triggering a series of biomedical reactions, in glandular, cardiovascular, gastrointestinal and muscular systems interlinked with each other. The patients possess less ability to overcome stresses so affected adversely. Continuous noise may alter a patient's memory, increases anger and decrease patience.

2- OBJECTIVES OF STUDY

This study was conducted to evaluate the noise level in different wards of the Allied hospital, Faisalabad and to investigate the changes in some biomedical parameters. On behalf of this noise level, heart pulse rate, blood pressure and oxygen concentration level of the patients from the selected observational site along with their impact on some selected parameters like, blood pressure, headache, sleep disturbance, stress, annoyance, depression and anxiety; using questionnaire method designed for that purpose and to find the co relationship between noise level and these biomedical parameters. Absorption coefficients of different absorbers having different thickness easily available in the market were also calculated using the idea of isolated box system and recommendations were made for the suitable absorber at the suitable site for the reduction of sound level in the noisiest wards of the hospitals.

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3- MATERIALS

The following materials were used for the present study: A digital sound level meter model DT-8850 (having an accuracy of 1.4dB), Which can measure noise levels produced both near the source and the operator's level covering a range of 40-120dB with a selectable A/flat frequency characteristic. Fast slow time constants along with impulsive response. Noise level measurements were taken on slow/response. A network was used in the present studies which approximate the human response. There is a similarity between the sound level meter and human ear in the way of responding to sound. In the sound level meter the small signal sound is converted to identical electric signal by a high quality microphone. That signal is then amplified to be high enough to derive an ammeter. Since it is a precision instrument it has to be calibrated. Therefore provision made to calibrate it for accurate results by placing a portable acoustic calibrator directly over the microphone.

A digital stop watch, 3 feet high iron stand, A meter rod, A digital blood pressure apparatus (BM-1004), A digital pulse oximeter or finger oximeter (CMS-50D), A questionnaire designed to check the psychosocial effects of noise on patients, Different absorbing materials available in the market (details are available in the relavent table), audio generator and a wooden box with a hole in one wall to insert the absorbers. To reduce the noise level up to optimum level a specially designed isolated box with dimensions 4′x8′ sheet of 1′ or thicker particle board, build a box within a box with sound isolation foam in between, the outer box is about 4′x4′x8′ (beware of symmetry resonance) double layer window to see inner view. Light arrangement in side cable insertion and absorber's fitting, calibrated rod for position adjustment, put entire box of 3″ sheet of sound reduction foam with 6″ of toe space at front was designed which is to be used by most of the hospitals throughout the world for extra noise absorption. The room was devised in a special manner to allow only human noise of needed to reach the human ear of the observer filtering absorbing all other unwanted sounds having frequencies outside the human audible frequency range and will absorb the undesired noise with human audible range.

4- METHODS

Noise levels were measured from 8:00am to 20:00pm during Jan, 2011 to Apr, 2012, at the various selected sites in Surgical, Medical, Oncology, Pediatric, Urology and Orthopedic wards of the Allied hospital, Faisalabad, Pakistan. The readings were taken after every two hours. All measurements were made on weighting scale and sound level meter was switched to slow response position. Readings from sound level meter was taken in every first 5 minutes of an hour. Noise level meter was placed at a height of 3 feet from the ground on an iron stand. All observations were made at center of the ward. The number of patients admitted in different wards of the hospital was also measured. Average noise level for 5 minutes was calculated using the formula

$$L_{eq} = 20 \log (1/N) \sum 10^{L_j/20} \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

Where, N= number of observations

and L_j = jth noise level

The biomedical parameters such as blood pressure, pulse rate and blood oxygen concentration were also measured. Two or three readings were taken each about two minute apart and then the average was worked out (only whole numbers were taken and decimals were rounded off). The oxygen concentration in the blood for each patient was measured using a digital pulse oximeter. The data was analyzed using SPSS program. Analysis of variance (ANOVA) test was used to detect the effects of sound pressure level on both blood pressure and heart pulse rate, obvious influence of sound level on blood pressure as well as heart pulse rate was observed for that purpose multiple compositions was carried out. The patients were personally reviewed by scholar keeping in view the cross section of different groups, sex, age, geography, educational level and income status etc. on behalf of whom they can be treated as true representative for such type of studies. For health hazards analysis the work sheets were prepared for all types of effects following the WHO criteria and significant and non-significant data was worked out. The obtained data was analyzed and the

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interpreted under the guidance of ENT specialist and psychiatrist of DHQ Faisalabad.

Different absorbing materials, available in the local market, were also tested using a high frequency audio generator in order to check their absorbing capacity using the idea of absorption coefficient as a passive noise control technique. Absorption coefficients recommended to control noise pollution in hospitals were also calculated and found to be correct as per standard given in the literature [7,15,22,25]. Audio frequency generator was inserted into a wooden box with hole in one wall and high frequency sound was adjusted as per standard found in the literature and its sound level was measured using sound level meter and was calibrated accordingly. Different absorbing materials were inserted into the box one by one and sound level were measured for each and the change in sound level was worked out. The absorption coefficients were calculated for each absorbing material and compared with the standard values given in the literature. The diagrammatical sketch of the closed box system was shown below.

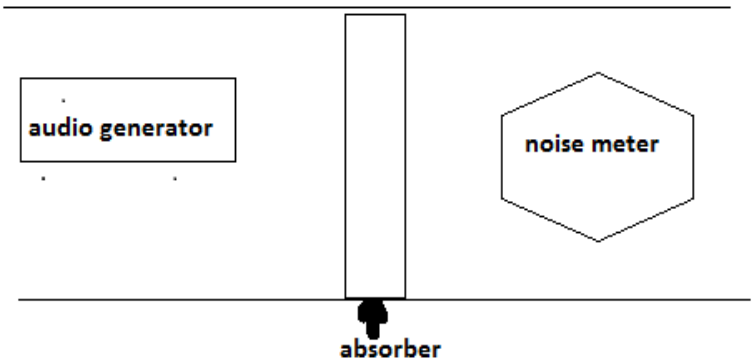

Figure 1: Schematic diagram of isolated box method

RESULTS AND DISCUSSION

Total number of beds in different wards of Allied Hospital is 150. The number of beds was 30, 40, 30, 40, 40, 40 in Surgical, Medical, Oncology,Urology, Orthopedic and Pediatric wards respectively.

Noise levels in Allied Hospital

The result of the analysis of noise levels is shown in the figure 2.

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The maximum noise level was measured in Surgical ward (90.6 dB(A)) while the minimum noise level was measured in Oncology ward (52.5 dB(A)). The medical, surgical, emergency and Urology wards were found to be at risk because the values of noise levels exceeded the WHO standards. The average value of noise level in Allied hospital was 73.5 dB(A). The noise level of Surgical ward was found to be maximum (78.4 dB(A)). The
noise pattern followed by the Allied Hospital wards was
Surgical>Medical>Emergency/Pediatric>Urology>Orthopedic>Oncology respectively, as depicted in the following figure.

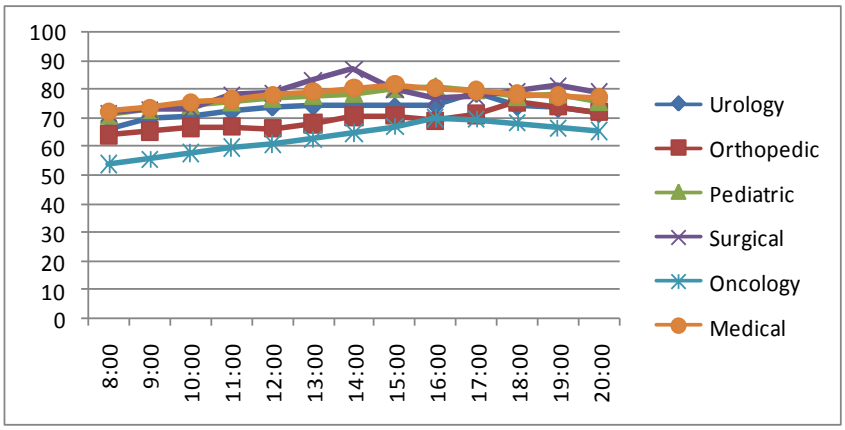

Figure 2: Average noise level versus time in different wards of Allied Hospital

BIOMEDICAL PARAMETERS IN ALLIED HOSPITAL

Biomedical parameters like systolic and diastolic blood pressure, heart pulse rate, and oxygen saturation were also measured and their average values were shown in table 2.

It was concluded from the table 2 that the maximum average value of systolic blood pressure was found in the Medical ward of the hospital (150.9 mmHg). Minimum systolic blood pressure was found in Pediatric ward of the hospital (110.9 mmHg).
The average value of diastolic blood pressure in Allied hospital was found to be 86.7 mmHg. The average value of systolic blood pressure as measured in the Allied hospital was 144.3 mmHg. Average heart pulse rate found in Allied hospital was 85.9 beats per minutes. The number of persons who had heart pulse rate greater than the normal value of HPR is 16 (20.2%) of which 7 (56.3%) were female patients and 9 (43.8%) were male patients. The maximum heart pulse rate (124 beats per minutes) was measured in the Emergency ward. The oxygen saturation level was also checked in the patients of allied hospitals the average value of oxygen concentration was 96.4% [1-, 3-6, 9-12, 16, 17, 20, 23, 28, 29, 31, 33, 36, 37, 39, 41].

QUESTIONNAIRE ANALYSIS

Table 3: Psychosocial effects of noise pollution on Human Health

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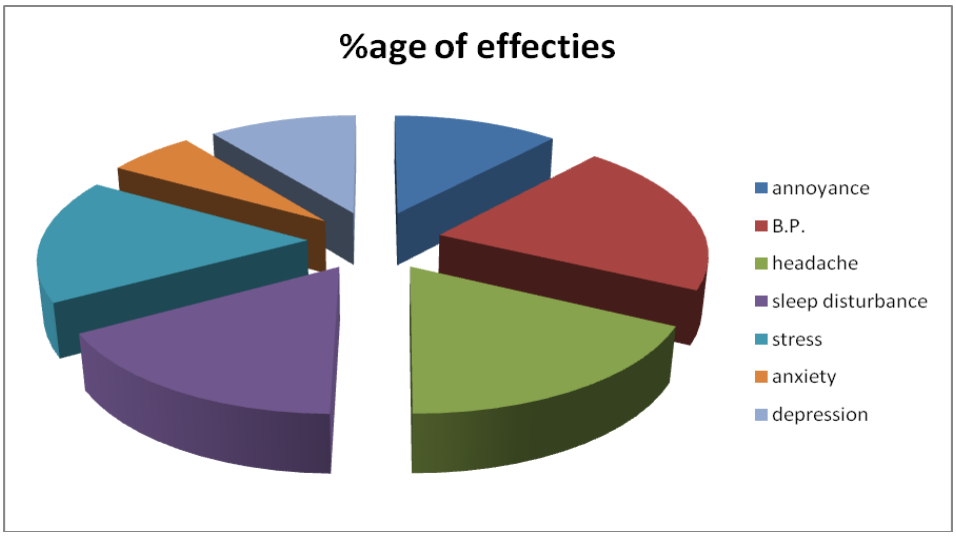

Figure 3: Psychosocial effects of noise pollution in Allied hospital

The questionnaire analysis was made to point out the percentage of Effectees of different disturbances which were 20.73, 17.9, 16.7, 16.7, 11.7, 10.9 and 6.2% for blood pressure, headache, sleep disturbance, stress, annoyance, depression and anxiety likewise.

ABSORPTION COEFFICIENTS USING ISOLATED BOX SYSTEM

The absorption coefficient of different absorbers available in the market, of varying thickness, were calculated using Beer-Lambert's law and compared with the standard values of absorption coefficients found in the literature. Luckily, the values of absorption coefficients for most of the materials were found to be agreed with the standard values. Three materials Formica, woolen clothes and Carpets having absorption coefficients (μ); $1.7m^{-1}$ (**A**), $1.5m^{-1}$ (**B**) and $0.8m^{-1}$ (**C**) respectively were used and hence were recommended as ideal noise absorbers within the hospital environment. The porous absorbers were used due to their high quality sound absorption. When the sound wave strikes on the porous absorber, the absorber material sit in to vibrations being resisted by viscous forces near the surfaces of the fibers resulting the transformation of the sound energy in heat depending upon the porosity of the material. The maximum absorption will occur when the thickness of the absorber equals on fourth of the wavelength not the incident sound, the attempt has been made to fulfill this condition during this study; furthermore the absorbers were covered with thin plastic sheet not only to prevent them from contamination and spilling but also to enhance the absorption coefficient. The detail for using these materials as noise absorbers is given in the table 5.

Table 4: Absorption coefficients of absorbers using isolated box system

Max. Sound level measured in hospitals = 90 dB (A)
Frequency of sound level at 90 dB (A) = 40,000Hz (Calibration used in this study)

L_o = 90dB (A)

Table 5: Absorption coefficients/Categories recommended for specially selected sites

CONCLUSIONS

Noise pollution in hospitals being a serious issue and is linked with a spectrum of negative impacts on the recovery of patients. The co-relationship between SPL, HPR, DBP, SBP was found to be positive and all parameters have shown increasing trend which means that noise pollution is the main

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cause of increase in bio-physical parameters i.e. human health.

The actual cause is still unknown but some hypothesis based information is available in literature. Sleeping plays key role in recovery of patient's health. Alertness, mood, behavior, coping abilities, respiratory muscle function, ventilatory control, healing time and duration of stay in the hospital are the few factors responsible for sleep disturbance or deprivation. Stress exhausts the biological resources available to combat the diseases and enhances the patient's recovery time. From this study, it was concluded that using sound proof materials and absorbents while constructing buildings of hospitals for different wards for example using fiber glass has shown good insulation as compared with gypsum.

It was observed that if these absorbers were mixed into a one package their absorption coefficient will become 1.03 times more efficient; therefore, it will be possible to formulate a tool kit capable to achieve zero (background) noise level not only for buildings but also for other infrastructure used in the rooms.

But the conclusions drawn by the authors are limited due to limited subject population, lack of acoustic knowledge, controversies in the literature, and limited research work on the subject. The important contributors to noise level in the wards were conversation among patients and para-medical staff, overcrowding of patients relatives, medical and power supply instruments, especially, generators during load shedding hours and screaming of children's. However, noise pollution was not only the main cause of such disturbance but air pollution, water pollution, etc were also contributing a lot. Hence, need of noise monitoring for an optimal hospital environment along with its negative impact on the quality of the health care practices and the performance of the staff (medical and para medical both) is strongly recommended. For comprehensive study more research is needed [34].

FUTURE RECOMMENDATIONS

The future work should include measuring HPR, DBP, SBP, first in control environment for several hours and then repeated in hospital environment keeping in view the standards of SPL. Long term and short term noise effects on patient's health were observed in different wards of the hospital, on behalf of these observations some precautions have to be considered to reduce the noise effect as a result this study the following recommendations are suggested to improve the hospital environment.

There must be a specific goal oriented research for identification. The ways to improve acoustic environment, like room shape, equipment installation at proper places, use of absorbers at specially recommended sites, strides can be made in filling the holes in the research chain and providing a healthier atmosphere for the patients, staff and visitors. Combined administrative and design strategies are needed to combat the issue like behavioral changes, silence zones, modification in sound systems, modification in architectural design and rigorous use of porous absorbing materials because such effects have shown the results in reducing noise level and shortening in patients recovery time.

ACKNOWLEDGEMENTS

Special thanks to Dr. Khalid Maqbool, M.S. Allied Hospital, Faisalabad, Pakistan, along with on duty medical and paramedical staff for allowing us to conduct our research work as per requirement of the project, their expert opinion when and where needed to accomplish this task within shortest possible time. Moreover, their non technical staff is also duly acknowledged for providing friendly environment to conduct this research work.

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Table 1: Average noise levels in different wards of Allied Hospital, Faisalabad

Time	Urology	Orthopedic	Emergency/ Pediatric	Surgical	Oncology	Medical	Average noise leve dB(A)
8:00	66.075	64.05	71.0175	71.775	53.925	72.25	66.18994
9:00	70.05	65.55	72.975	72.925	55.575	73.475	68.12188
10:00	70.425	66.725	74.475	73.325	57.7	75.35	69.26875
11:00	72.3	66.9	75.6	78.4	59.675	76.375	70.975
12:00	73.975	66.3	76.85	78.6	61.1	77.95	71.96406
13:00	74.225	67.9325	77.9	83.1	62.6	79.05	73.98363
14:00	74.325	70.4	78.625	87.2	64.65	80.25	76.00938
15:00	74.175	70.7	80.275	80.175	66.925	81.525	75.93188
16:00	74.525	68.925	81.1	76.875	69.925	80.325	75.70235
17:00	78.725	71.2	79.875	77.3	69.45	79.4	76.88125
18:00	74.15	75.675	77.45	79.25	68.2	78.075	75.74463
19:00	73.453	73.825	78.35	81.3	66.425	77.45	75.741
20:00	71.675	72.0375	75.75	79.125	65.225	77.05	74.29031
	72.9290769	69.24769	76.94173077	78.41154	63.18269231	77.57885	73.13877

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Table 2: Average values of biomedical parameters in Allied Hospital, Faisalabad, Pakistan

Time	Noise Level dB (A)	Systolic Blood Pressure (mm Hg)	Diastolic Blood Pressure (mm Hg)	Heart Pulse Rate (bpm)	%age of Oxygen Concentration
8:00	66.2	131.9	81.08888	80.827779	99.456
9:00	68.1	134.0	82.32415	81.598949	95.5
10:00	69.3	140.7	83.89504	82.840962	97.25
11:00	70.9	138.8	85.35788	84.01817	99.75
12:00	71.9	141.5	87.04731	85.389955	91.5
13:00	73.9	144.2016	88.26429	86.503331	97.25
14:00	76.0	146.7808	89.94049	87.720772	94.5
15:00	75.9	147.7115	90.49767	88.168237	98.25
16:00	75.7	147.6108	90.65217	88.592948	96.15
17:00	76.8	149.5595	89.98273	87.884482	96.75
18:00	75.7	144.3412	88.07346	86.011673	98
19:00	75.741	142.2367	86.17555	84.270276	93.75
20:00	74.29031	139.3836	84.04791	82.142928	95.25
Average	73.13877	142.2149	86.71904	85.074651	96.412

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Table 3: Psychosocial effects of noise pollution on Human Health

Psychosocial effects of noise pollution	%age of effectees
Annoyance	11.73
B.P.	20.73
Headache	17.9
Sleep disturbance	16.67
Stress	16.67
Anxiety	6.17
Depression	10.49

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Name of material	Sound level (dB)	Thickness of material (mm)	Absorption coefficient $\mu = \frac{(L_o - L)}{10x}$	Standard absorption coefficient μ_0 $(mm)^{-1}$	Difference $\mu_0 - \mu$
Polystyrene	81.8	22.69	0.036	0.03	-0.006
hard board sheet	77.8	4.49	0.27	0.3	0.03
Chip board	75	7.17	0.209	0.2-0.3	0.041
Formica	74	0.93	1.72	N.A.	N.A.
Plaster of Paris sheet	88	10.46	0.0191	0.07-0.6	0.3159
Woolen cloth	75	0.99	1.515	1.03	-0.485
Cotton cloth	90	0.87	0	N.A.	N.A.
Rubber sheet	73.9	1.9	0.847	0.4-0.8	-0.247
Tile	76.7	7.07	0.1881	0.1-0.2	-0.0381
Carpet	72.7	7.37	0.2347	0.65	0.4553

Table 4: Absorption coefficients of absorbers using isolated box system

Max. Sound level measured in hospitals = 90 dB(A)
Frequency of sound level at 90 dB(A) = 40,000Hz (Calibration used in this study)
L_o = 90dB(A)

ISSN: 2348 9510
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Name of material	Sound level (dB)	Thickness of material (mm)	Absorption coefficient $\mu = \frac{(L_o - L)}{10x}$	Standard absorption coefficient $(mm)^{-1}$ μ_0	Difference $(\mu_0 - \mu)$/ Noise reduction %age	Recommended sites
Formica (A)	74	0.93	1.72	N.A.	(0.00)/100%	Furniture items, patient's beds and walls and roofs of the wards
Woolen cloth (B)	75	0.99	1.515	1.03	(-0.485)/53%	Medical and paramedical staff along with Patients should make pure woolen or woolen mix cloths as a compulsory part of dress
Carpet (C)	72.7	7.37	0.2347	0.65	(0.455)/30%	Pieces of carpets for in between heavy machinery parts and the parts of patient's bed along with floor

Table 5: Absorption coefficients/Categories recommended for specially selected sites

Brief Resume of Dr. Muhammad Attique Khan Shahid

As for as my brief resume is concerned I have received my M.Phil Degree in Solid State Physics from CSSP (PU) Lahore Pakistan with research project entitled "**Radioactive Pollution and its Health Hazards, a Study by SSNTDs and XRD analysis"**and Master Degree in Physics with specialization in "**Advance Electronics**" from G.T.I.College (new Campus) Rabwah, affiliated with PU, Lahore. Recently has completed my PhD Degree with project in Solid State Physics entitled "**A Comprehensive Investigation of Solid Aerosols Using XRD and ASS Techniques"**. I have completed other relevant Post graduate training courses as participant, presenter and as a faculty member in my areas of specialization from PINUM, NIAB, PNRA, NIFA, EPD etc the well reputed institutions of Pakistan Atomic Energy Commission and Environmental Protection Department along with my Professional in service training. Recently I am working as Associate Professor of Physics in the Department of Physics GCU (UDC/CC) Faisalabad. As for as my research Experience is concerned it is multidimensional, I have more than 30 years of academic and research experiences at graduation and post graduation level, my areas of interest are Solid state Physics, Surface Physics, Aerosol Physics, Thin Film Technology, Crystal Growth, Cloud Nucleation Theory, Nano Physics Atomic and Nuclear Physics, Health and Medical Physics, Radiation Physics, Radiography and Medical Imaging Geo Physics, Soil Physics, Climatology and Meteorology, X-ray Crystallography etc. More than 95 research Project have been completed under my supervision with breakup as Atomic and Environmental Physics (33), Health and Medical Physics (12), Radiation Physics and Dosimetry (33), Solid State Physics " Electronics and Electrical Instrumentation (09), Soil and Geo Physics (05), Laser and Plasma Physics (03) respectively and have 70 research publications along with 20 manuscripts are in progress and expected to be published very soon in well reputed journals in my credit, Ex. Pakistan Nuclear Regularity Authority (PNRA) certified Health Physicist RPO, RSO (PAEC) as attachment with atomic and Nuclear Physics research lab. Active member of Editorial Committee and reviewer/ referee in above said areas of interest for the Journal of Basic and Applied Sciences (JBAS). Recently working as Executive Editor (Physics Section) for the Journal of Basic and Applied Sciences (JBAS), Associate Editor for journal of Basic and Applied and Scientific research, Editor Peak Journal of Medicine and Medical Science (PJMMS), Editor Peak Journal of Physical and Environmental Science Research (PJPESR), Editor for online journal of Physical and Environmental Science Research (OJPESR), Associate Editor of Peak Journal Public Health and Management (PJPHM) along with member editorial board for the journal of Applied Environmental and Biological Sciences, Global Advanced Research Journal of Geology and Mining Research (GAJMR), International Journal of Chemistry and Material Science, International Journal of Physical Sciences (IJPS), International Journal of Medicine and Medical Science Research (IJMMSR) and member editorial/ advisory

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board for International Journal of Environmental Science, management and engineering, for International Journal of Environmental science technology and engineering Research, Member technical review board panel for (IJESTER) International journal of informative and futuristic research (IJIFR), Member Editorial/ Associate Advisory board for journal of applicable chemistry (JOAC) etc. I have also worked as an Associate Editor for the journal of Natural Sciences, GCU Faisalabad. Author of Hand book of Physics (9^{th}, 10^{th}) objective type/ subjective type, objective and subjective Physics along with up to date notes for F.Sc (Part I, II), Experimental Physics Manuals (F.Sc part I, II), every day science for all competitive examinations like CSS, PCS etc, M.A Punjabi guides (Complete set) and supervised the Book on "The Secret of Gravity in the Light Of Quran and Science". Member of PIP, Aerosol Physics society and PASTIC. Established and upgraded graduation, post graduation level labs in the department of Physics GCU Faisalabad, played key role in launching B.S (H), M.Sc Physics and M.Phil Physics programs, rectified loopholes in their curriculum as chairman department of Physics through BOS, BOF and academic council meetings to bring them at par with other national/ international universities of the world. I also have very strong management and administrative background being the pioneer of R&D culture at department of Physics GCU Faisalabad, worked as Chairperson Department of Physics, Chairperson academy of letters for sciences, Chairperson Curriculum Revision Committee (CRC), Project Director for Space Sciences, Health and Medical Physics and Telecommunication, Prof in charge SAAP, Atomic and Nuclear Physics Lab, Atmospheric and Environmental Physics Lab, Health and Medical Physics Lab. Currently working as regular faculty member NIAB for graduate, post graduate level courses for atomic energy commission's scientists working in different organizations along with R and D activities in my areas of interest since 1994 to 1998 as technical expert while fro 1999 to up till now as consultant and regular faculty member and contributing a lot for scientific community through open talks, healthy discussion, lab demonstration and contributing a lot for scientific community through open talks, healthy discussion, lab demonstrations and lecture cum presentations as a resource person in their training courses as joint venture with PINUM, NOORI, NIAB, SKCH etc. in this way high official, technical and non technical staff members of all most all the institutions of Pakistan Atomic Energy Commission working with radiations and safety measures along with relevant departments of Graduate and Post Graduate Male and female (both) colleges and Universities are indirectly benefiting from me and my department. I feel proud to mention above said contributions being the only one University/ College professor's community and record holder of Pakistan Atomic Energy Commission at Graduate and Post Graduate level courses. Internship of B.Sc (Hon) and M.Sc Physics students in Radiation and Health Medical Physics related disciplines are the additional privilege of services rendered by me for the scientific community as joint venture with NIAB. The above said R&D experience resulted in the creation of a team of Physicists and young scientists not only serving the parent department but also enjoying leading positions in various academic institutions and research organizations throughout Pakistan and Modern World. It is my ultimate desire to motivate young Physicists, scholars and scientists to achieve academic excellence in higher education in active areas of Physics which is the need of the day for national up gradation through individual and institutional growth.

I hope the said brief resume along with my recent photograph will meet the pre requisite demand for your kind consideration.

Hoping the best from your side very soon.