Effects of Noise Pollution on Anxiety Level in Rat

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Abstract-- Studies show that there is an association between noise pollution and psychological diseases in crowded areas. The main aim of this study was to determine the effects of noise pollution on anxiety levels in rat. In our study, male Wistar rats were randomly divided into control and groups exposed to 1 h and 2 h/day noise pollution of 5 rats each. Anxiety level was measured in animals using elevated plus maze. Data were statistically analyzed and compared between groups using ANOVA. The results indicated that anxiety level was increased in rats exposed to noise pollution for 2 h/day compared to control rats. Our findings show that noise pollution can enhance anxiety level.

Keywords-- Noise Pollution, Anxiety, Rat

I. INTRODUCTION

Noise pollution can be defined as unwanted sound that can cause ear problems, disturbing the relaxation, or even permanent deafness, especially to older people [1]. Studies show that noise pollution can cause annoyance and aggression, hypertension, high stress levels, hearing loss, sleep disturbances, and other harmful effects [2,3]. There is also a significant association between high noise exposure and trace element levels in plasma and brain areas of rats [4]. Also, exposure to noise stress can alter brain serotonergic and dopaminergic activity and psychiatric disorders [5]. On the other hand, studies show that environmental noise may produce potent stress-like effects in developing subjects that can persist into adulthood, affecting spatial learning abilities [6]. In contrast to these findings there are some other studies indicating no association between road traffic noise and psychiatric disorder, even after adjustment for socio-demographic factors and baseline psychiatric disorder [7].

According to conflicting data relating to effects of noise pollution on psychiatric disorders this study was performed to determine the effects of noise pollution on anxiety levels in rats.

II. MATERIAL AND METHODS

A. Animals

Adult Wistar rats weighting 200±30 g were purchased and raised in our colony from an original stock of Pasteur institute (Tehran, Iran). The temperature was at 23±2 °C and animals kept under a schedule of 12 h light:12 h darkness (light on at: 08:00 a.m.) with free access to water and standard laboratory chow. Care was taken to examine the animals for general pathological symptoms. Food was withheld for 12-14 h before death. This study was performed according to ethical guidelines relating to working with laboratory animals [8].

B. Protocol of Study

Male Wistar rats were randomly divided into control animals, and rats exposed to noise pollution for 1 hour and 2 h/day. The animals were placed in elevated plus maze after exposing to noise pollution. Control rats also were placed in the maze as same as other animals. The test was performed for 300 sec for each rat and was repeated twice at 5-day interval. High levels of anxiety were measured by decreased length of time for the animal to emerge into the open area of the apparatus. All animal experiments were carried out in accordance with the guidelines of Institutional Animal Ethics Committee.

C. Statistical Analysis

Statistical significance was evaluated by one-way analysis of variance (ANOVA) using SPSS 19. Significance was measured using Fisher’s least significant for the exact P values and significant differences are noted in the results. Differences with P<0.05 were considered significant.

III. RESULTS

Table I shows the mean time in dark and closed and open middle of the maze area that animals spent in different groups.

| The Mean time in dark and closed, open and middle of the maze area that rats spent in each group |
|---|---|---|---|---|
| Group | Time in dark and closed area (sec) | P | Time in open area (sec) | P | Time in Middle of the maze area (sec) | P |
| Control | 125.02±8.46 | 0.01 | 45.91±14.33 | 0.01 | 88.44±16.57 | 0.01 |
| Noise pollution (1h) | 233.18±27.58 | 0.01 | 31.71±24.24 | 0.01 | 35.02±13.96 | 0.01 |
| Noise pollution (2h) | 217.95±20.65 | 0.01 | 19.52±16.44 | 0.01 | 62.43±22.24 | 0.01 |

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Our results show that the time spent by rats exposed to 2h/day noise pollution in open area was decreased compared to control rats (P<0.01).

IV. DISCUSSION

Our study indicated that noise pollution results in enhanced anxiety levels. In line with our finding other research findings also indicate that noise can result in anxiety-like behaviors in mice [11]. According to reports, the results showed that with noise reduction the stress hormones, especially norepinephrine significantly decreases [12]. The noise pollution also may have adverse effects on hearing function, cardiovascular health, prevalence of hypertension and mental health [13],[14]. Noise disturbs activities and communication, causing annoyance and in some cases, annoyance may lead to stress responses, then symptoms and possibly illness [15]. Exposure to noise may lead to anxiety and depressive disorders [16]. Acoustic shock injury (ASI) has the potential to provide insight into the neurophysiological and psychological development and high levels of emotional trauma and anxiety [17]. It seems that noise pollution can trigger stress pathway which in turn may cause to increased anxiety level.

V. CONCLUSION

We have shown that exposure to noise pollution can bring about enhanced anxiety level, according to which it is pivotal to avoid noise pollution exposure to maintain good mental health.

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REFERENCES