

Gürültülü Ortamda Çalışan İşçilerde Magnezyum ve Kortizol Düzeylerinin Karşılaştırılması

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Özet

Bu çalışmanın amacı gürültünün psikolojik ve biyolojik etkilerini araştırmaktır. Bu amaçla farklı gürültülü ortamlarda çalışan iki grup işçide Hamilton Anksiyete ölçeği skorları, magnezyum ve kortizol düzeyleri çalışıldı. İki farklı gürültü seviyesinde çalışan işçilerde kan kortizol düzeyleri ve Hamilton anksiyete skorları farklı bulundu. Ancak kan magnezyum ve anksiyete skorları arasında ilişki bulunmadı. Sonuçlar literatür ışığı altında tartışıldı.

Anahtar Kelimeler: Anksiyete, Magnezyum, Kortizol.

Comparison of Magnesium and Cortisol Levels in Different Anxiety Degrass in Workers At Noisy Environmet

Abstract

The aim of this study was to investigate some psychological and biological effects of noise. Hamilton Anxiety Rating Scale (HARS) scores, magnesium and cortisol lwvels were studied in two groups of workers at different noisy compartments. It was found that the blood cortiso, magnesium and HARS levels of two compartments with different noise levles were significantly different. Although there was no correlation between blood magnesium levels and HARS acores. Results were discussed under the light of literature.

Key Words: Anxiety, Magnesium, Cortisol.

Magnesium (Mg) ions have a well-established depressant effect on the central nervous system(1) and on neuromuscular transmission(2). Magnesium deficit is the commonest cause of the tetanic syndrome. These tetanic manifestations in healthy subjects is called "spasmorhythmia". Individuals with spasmorhythmia differed from individuals without spasmorhythmia in having a slightly lower plasma Mg concentration adn a greater tendency to emotional lability, anxiety, depression, crying spells, metnal anguish and phobias elicited on blinded psychiatric interview by two different observers (3).

Experimental support for a relationship between Mg status and sensorineural hearing loss comes from the work of Ising et al(4). The effect of Mg status on hearing loss is complicated by teh effect of noise stress on Mg metabolism(5). Erythrocyte Mg levels are inversely proptrtional to some effects of noise stress in humans and animals. Erythrocyte Mg is negatively correlated with self-reported noise sensitivity with noise-induced

emotional lability and with noise-induced feelings of tenseness in human volunteers(6). In rats, chronic noise stress causes and increase in serum magnesium and a decrease in erythrocyte and myocardial Mg(7).

In summary, noise exposure caused an increased excretion of catecholamines and a shift of Mg from the intracellular to extracellular space with a resulting increase in Mg excretion. This effect on Mg metabolism in initially protective; the relatively high serum Mg level of acute stress in thought to buffer the physiologic response to stress. Prolonged noise exposure causes a gradual Mg depletion (8).

The functions of the human pituitary-adrenal axis and the adrenal medulla during occupational noise exposure have been investigated both in laboratory and field studies. In these studies it was reported that neither occupational noise nor working process has significantly affected the neuroendocrine patterns of the exposed workers(7,9,10).

In this study we aimed to investigate the possible effect of noise exposure on serum Mg and cortisol levels and Hamilton Anxiety Rating Scale(HARS) scores (11).

In the recent studies the effect of noise on human mental health which were recognised by annoyance and emotional distress was investigated. We determined noise-induced psychological changes with HARS and in addition we determined biological parameters such as Mg and cortisol. We believe that this study may bring objectivity on this field.

Materials and Methods

This study was performed on 48 male who were exposed to noise levels above the recommendation

of Turkish Statute of Labor Security (TSLS) (under 80 dB, 7.5 hours) in preparation, spinning and ring sections of yarn factory. Exclusion criterias were as follows:

a)Corresponding to any DSM IV diagnosis criteria (one of the workers had DSM IV major depressive disorder and two of the workers had DSM IV generalized anxiety disorder).

b)Workers with noise-induced hearing loss (11 workers).

c) Workers with ear protecting devices (17 workers).

Noise levels in these three sections and TSLS recommendations are given in Table 1.

Table 1: Noise evels of work places of subjects.

| Section | Noise levels (dB) and status |
|--------------|--|
| Preparation | 74-81, intermittent noise, 8 hours |
| Spinning | 88-91, continuous noise, 8 hours |
| Ring | 84-94, continuous noise, 8 hours |
| TSLS Standar | 80-below, continuous noise, max. 7.5 hours |

Mental status measurements were performed with Hamilton Anxiety Ragting Scale. HARS was performed in a quite room at the end of working hours. Investigators who performed HARS hasn't got any information about noise levels of compartments.

Workers were divided into two groups as ring+spinning group and preparation group according to noise continuity and severity.

Demographic features of ring+spinning and preparation groups are given in Table II.

As shown in Table II, the age, sex and workig durations of the workers matched in two groups. The socio-cultural and economical status of the workers were accepted as similar because of tehir approximately similar salaries, and primary educations.

Table II: Demographic features of ring+spinning and preparation groups.

| Demographic Features | Groups | | t | p |
|---------------------------|--------------------|------------------|-----|-------|
| | Ring+spinning n=32 | Preparation n=16 | | |
| Age±SD(year) | 26.6±4.79 | 26.50±5.71 | | >0.05 |
| Working Duration±SD(year) | 4.18±1.85 | 3.37±1.85 | 1.4 | >0.05 |
| Sex(Male) | 32 | 16 | | |

Venous blood samples for mesurements of Mg and cortisol levels were drawn after 10-12 h fasting period. Cortisol was determined by an Enzyme Linked Fluorescent Assay (ELFA) technique with bio-Merieux® VIDAS analyser. Mge levels were determined by colorimetric calmagate method with Merck® Vitalab Selectra Autoanalyser. HARS scores, Mg and Cortisol levels were compared between two groups. Relationships between Mg and HARS points, Cortisol and HARS points,

HARS points and Cortisol and Mg levels were statistically tested.

Student's t, Mann Whitney U and Correlation tests were used for statistical anlysis.

Results

Comparison of HARS points, mg and cortisol levels of ring+spinning and preparation groups are given in Table III.

Table III: Comparison of HARS points, Mg and Cortisol levels in ring spinning and preparation groups.

| Groups | n | x±SD | t | P ¹ | u | z | p ² |
|-----------------|------|--------------|-------|-------------------|------|------|--------------------|
| Cortisol | | | | | | | |
| Ring+spinning | | 118.03±44.38 | -1.58 | 0.059 | 33.6 | 0.04 | <0.05 ^S |
| Preparation | 3216 | 139.78±45.63 | | | | | |
| Mg | | | | | | | |
| Ring+spinning | 32 | 2.28±0.58 | 0.49 | 0.3 ^{NS} | 263 | 0.35 | >0.05 ^N |
| Preparation | 16 | 2.19±0.53 | | | | | |
| HARS | | | | | | | |
| Ring+spinning | 32 | 6.4±4.3 | 0.5 | 0.3 ^{NS} | 279 | 0.3 | >0.05 ^N |
| Preparation | 16 | 5.7±4.8 | | | | | |

1: According to Student's t test

2: According to Mann Whitney U test

^S: Significant

^{NS}: Nonsignificant

Differences between Cortisol levels of two groups were statistically significant. This difference was established with Mann Whitney U test while this was rather limited with Student's t test (u:336, z:0.04, p<0.05; t:1.58, p<0.059 respectively). Differences between Mg levels of two groups were not significant with both Student's t test and Mann Whitney U test (t:0.49, u:263, z:0.3 respectively). Also the difference between HARS points of two groups was not significant (t:0.5, u:279, z:0.3, respectively).

Relationship between cortisol and Mg levels and HARS scores of two groups is given in Table IV

Table IV: Relationship between Mg levels, cortisol levels and HARS scores of two groups.

| | x±SD | T | r | F | p |
|----------|------------|------|-------|-------|--------------------|
| Mg | 2.25±0.56 | 1.08 | 0.16 | 0.58 | 0.6 ^{NS} |
| HARS | 6.18±4.23 | | | | |
| Mg | 2.25±0.56 | 8.48 | 0.784 | 35.98 | 0.001 ^S |
| Cortisol | 125.3±45.5 | | | | |
| Cortisol | 125.3±45.5 | 8.48 | 0.787 | 36.63 | 0.001 ^S |
| HARS | 6.18±4.23 | | | | |

Test: Correlation analysis

^S: Significant

^{NS}: Nonsignificant

As shown in table IV there was a significantly positive correlation between Mg and Cortisol levels (T:8.48, r:0.784, F:36.0, p>0.001). There was no significant correlation between Mg levels and HARS scores (T:1.08, r:0.16, F:0.58, p:0.56). Correlation between cortisol levels and HARS scores was significantly positive (T:8.48, r:0.787, F:36.6, p:0.001).

Discussion

The present study has shown that, severe and continuous noise levels activate hypothalamic-pituitary-adrenal (HPA) axis. Additionally, a significantly positive relationship between anxiety scores and HPA axis activation is found.

In this study it was found that there was a correlation between cortisol and Mg levels. This may show that Mg is a biologic response parameter

to stress as well as cortisol or serum Mg increment accompanies with cortisol increase. The type A or "coronary prone" behavior in humans is characterised by time urgency, impatience, extreme competitiveness and hostility when compared to its opposite or type B pattern (13). When stressed physiologically, type A individuals show significantly greater increases in plasma and urinary catecholamines and cortisol than type B individuals (14). Rats injected with direct and indirect acting sympathomimetic amines similarly develop intracellular Mg depletion, adrenergic activity appears to mediate the impact of stress on Mg metabolism (15).

Another result of this study is that, minor differences of noise may not cause different anxiety scores. However in our previous study performed with much more subjects, we

demonstrated that, HARS scores differs with these noise levels. This conflict may be related to less amount of subjects in current study and less difference between noise levels of two groups. For example the difference between noise level of the points near the door in preparation compartment (81 dB) and some points in ring compartment (84dB) is very little (3dB). Also as the workers are not fixed to certain points, they are exposed to different noise levels.

There are well documented associations between noise exposure and changes in performance, sleep disturbances and emotional reactions such as annoyance. Moreover, annoyance is associated with both environmental noise level and psychological and physical symptoms, psychiatric disorders and use of health services. It seems likely that existing psychiatric disorder contributes to high level of annoyance. However, there is also the possibility that tendency to annoyance may be a risk factor for psychiatric morbidity. Although noise level explains a significant proportion of the variance in annoyance, the other major factor is subjective sensitivity to noise. Noise sensitivity is also related to psychiatric disorders(17).

The result obtained in this study indicate that industrial noise has significantly affected the neuroendocrine pattern of the noise exposed workers. Beljevic et al (1990) investigated the endocrine response to industrial noise. They found that anterior pituitary hormones and cortisol levels has not been affected from noise(7).

In our study we determined that the difference of cortisol levels between two groups was statistically significant (U:336, z:0.04, p<0.05).

Adren et al (1981) didn't found any statistically significant difference between cortisol levels of two groups of workers that exposed to 40 dB and 95 dB noise levels. The hormonal changes in animals such as increments of serum corticosteron induced by noise are transient and disappear in a few weeks in spite of persisting noise stimulation(10). In our study, the venous blood samples were drawn in first hour after the workers left from their noisy environment. We determined that the cortisol levels of ring-spinning group were higher than preparation group. This may show that noise stimulated HPA activity is going on. Brendenberger et al(18), however, found no increase in plasma cortisol levels during stimulation by noise.

In our study we have found that there was a correlation between cortisol levels and HARS scores (T:8.48, r:0.787, p:0.001, F:36.63). This correlation shows, as seen in some other studies, that cortisol levels are affected from unexpected noise stimulation and chronic exposure to noise. Our findings which showed no difference in Mg levels between preparation and ring-spinning group are in contrast with some other reports (4,5,8). High Mg levels in these studies may be due to sudden and limited noise stimulations and our results may be due to bluntness of response secondary to long lasting noise stimulation.

It's very difficult to comment that while there was a correlation between Mg and cortisol levels, and between cortisol levels and HARS scores, there wasn't any correlation between Mg levels and HARS score. In order to obtain more clarifying findings about the biologic and psychologic effects of noise, new studies must be performed with more subjects and sudden and controllable noise levels, other psychiatric determination scales and hormonal parameters.

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