

CHRONIC INSOMNIA IN WORKERS POISONED BY INORGANIC MERCURY

PSYCHOLOGICAL AND ADAPTIVE ASPECTS

*SUELI REGINA G. ROSSINI**, *RUBENS REIMÃO***,
*BEATRIZ H. LEFÈVRE****, *MARCÍLIA A. MEDRADO-FARIA*****

ABSTRACT - Insomnia is one of the symptoms of inorganic mercury poisoning (IMP). The objective of this study is to analyze the chief psychological aspects in the adjustment of workers with chronic insomnia associated with IMP. For this purpose the Preventive Clinical Interview and the Ryad Simon Operational Adaptive Diagnostic Scale (Escala Diagnóstica Adaptativa Operacionalizada-EDAO) were utilized. Fifteen subjects with mean age of 40 years (10 males and 5 females) were studied. Nine were diagnosed with High Adaptive Inefficacy, five with Moderate Inefficient Adaptation and only one with Mild Inefficient Adaptation. Impairment occurred in four adaptive sectors: affective relationship, social-cultural, productivity and organic. Adaptive efficiency indicated that in all the 15 subjects studied the adaptive solutions were frustrating and led to psychic suffering and/or environmental conflict confirming the severity of the involvement in chronic IMP.

KEY WORDS: mercury exposure, industrial poisoning, mercury intoxication, sleep, sleep disorders, Operational Adaptive Diagnostic Scale.

Insônia crônica em trabalhadores contaminados por mercúrio inorgânico: aspectos psicológicos e adaptativos.

RESUMO - Insônia é um dos sintomas da contaminação por mercúrio inorgânico. O objetivo desta pesquisa foi avaliar os principais aspectos psicológicos presentes na organização adaptativa de trabalhadores com insônia crônica associada à contaminação por mercúrio inorgânico. Utilizaram a Entrevista Clínica Preventiva e a Escala Diagnóstica Adaptativa Operacionalizada (EDAO) de Ryad Simon. Foram estudadas 15 pessoas, com média de idade de 40 anos (10M; 5 F). Nove foram diagnosticadas como tendo Adaptação Ineficaz Severa; cinco, Adaptação Ineficaz Moderada; e somente um, Adaptação Ineficaz Leve. O comprometimento na adaptação ocorreu nos quatro setores adaptativos: afetivo-emocional, sócio-cultural, da produtividade e orgânico. A eficácia adaptativa indicou que em todos as 15 pessoas estudadas, as soluções adaptativas encontradas foram frustrantes e levaram a sofrimento psíquico e/ou atritos ambientais, evidenciando a severidade de comprometimento na intoxicação crônica por mercúrio inorgânico.

PALAVRAS-CHAVE: mercúrio, contaminação, intoxicação, insônia, distúrbios do sono, sono, EDAO.

Clinical symptoms of poisoning by inorganic mercury (IMP) vapors occur in urban areas from exposure in plants using chlorine-alkalis, fluorescent lamps, and medical equipment¹⁻³.

Divisão de Psicologia e Divisão de Clínica Neurológica do Hospital das Clínicas (HC) da Faculdade de Medicina (FM) da Universidade de São Paulo (USP): *Psicóloga, Doutoranda em Psicologia Clínica do Instituto de Psicologia da USP; **Médico-Assistente da Divisão de Clínica Neurológica do HC/FMUSP; ***Psicóloga do Serviço de Neuropsicologia da Clínica Neurológica do HC/FMUSP; ****Professora da FMUSP, Coordenadora da Disciplina de Medicina Social e do Trabalho. Diretora do Serviço de Saúde Ocupacional do HC/FMUSP. Aceite: 7-outubro-1999.

Dr. Rubens Reimão - Rua Glicíneas 128 - 04048-050 São Paulo SP - Brasil.

Additionally, intoxication occurs among health workers mainly in sterilization of mercury tensiometers used in surgery and in handling mixtures used in odontology^{4,7}. Insomnia is recognized among the symptoms of chronic mercury contamination⁸⁻¹², since the classic description by Freeman in 1860¹³, and Gowers in 1893¹⁴. From the onset, insomnia is accompanied by irritability, difficulty in concentration, loss of memory, apathy and low self-esteem.

This clinical mental picture is classically described¹⁵⁻¹⁷ as followed by apendicular ataxia, axial ataxia, and scanning speech. In the final stages the basal ganglia are affected resulting in rigidity, tremors at rest and myoclonic movements. In advanced cases the inferior motor neuron will to be involved.

It is believed that alterations in sleep and sleep-wake cycle can be explained by the severe neuropathological impairment, including multiple neural circuits, associated with the absorption and action of mercury by the central nervous system¹⁸⁻²². These changes in sleep are recognized and listed in the International Classification of Sleep Disturbances as extrinsic symptoms due to poisoning²³.

Chronic insomnia is one of the symptoms that contaminated persons must confront together with other disturbances of the nervous system, involvement of other organs, impairment of self-esteem and changes in personal identity. All these modifications will determine an extreme deficit in life quality and require adjustment to the new situation.

The present research is part of a multi-disciplinary study on Occupational Hydrargyrisms coordinated by the Division of Social and Industrial Medicine, University of São Paulo Medical Center (FMUSP); with the scope of investigating the main aspects of IMP and sleep impairment. Other data of this research will be published elsewhere.

The objective of this study was to examine the main aspects in adaptation to chronic insomnia due to chronic IMP, i.e., and efficiency of the individual's solutions to adjust to such adverse situation.

METHOD

Among the subjects submitted to occupational-clinical assistance on the Occupational Health Service of the "Hospital das Clínicas" (HC), FMUSP, 15 persons were chosen. They all had a history of occupational exposure and symptoms of chronic IMP with complaints of insomnia obtained from a standardized interview²⁴, in the Sleep Disorders Clinic, HC, FMUSP.

The majority (13) were employed in the fluorescent lamps industry, as specialized operators (2) and the remainder as production and machine operators. At the time, two women worked as nurses aides in a private hospital in São Paulo.

Among this group were ten males ranging in age from 29 to 48 years (mean 41). The ages of five women ranged from 36 to 52.

The social-economic level included 12 in the low-middle income and three were in the low-income group. Four of the five women had gone to school for five years and one for four years. Four of the men had had four years of education, one five years, one six, two seven, one nine and one eleven years.

All had been examined by the board of experts of the National Institute for Social Security (INSS) and were put on medical leave with the diagnosis of professional "Hydrargyrisms". Currently, twelve receive compensation from the INSS (two retirement, three accident-support and seven for illness-support). Among those not receiving benefits, two are unemployed and one is employed as an electrician elsewhere.

Psychological Clinical Interview for Prevention²⁵ and the the Ryad Simon^{26,27} Operational Adaptive Diagnostic Scale, a semi-directed interview, was used to obtain information about the individual's behavior regarding four adaptive processes^{25,28}.

A) Affective relationship sector: refers to the person's feelings, attitudes and actions regarding himself and his personal relationships.

B) Productivity sector: includes feelings, attitudes and actions relative to any productive activity, such as work and studies, even artistic, religious and philosophical ones.

C) Social-cultural Sector: the individual's attitudes, actions and feelings regarding social norms, values and rules including social institutions.

D) Organic Sector: the individual's affective relationship and actions with his body, the function and anatomic state of his organism, hygiene and clothing.

Studies have confirmed the diagnostic value of the EDAO Scale^{26,27}. It is a clinical tool that permits a diagnosis of the subject's adaptation. The social-cultural and organic sectors are evaluated qualitatively²⁷. Simon^{26,27} concluded that when these two sectors were very impaired, the affective-relationship and productivity will be inadequate because of the impact on them.

Adaptation can be classified according to the degree of its effectiveness^{26,27}. The analysis of the individual's answers, that is, adequacy is based on three criteria. The response is evaluated as follows: first, if it solves the problem; second, if it brings some degree of satisfaction and lastly, if it comes with some degree of intrapsychic or environmental conflict. For example, "an adequate response is the one which solves the problem, is pleasurable and maintains or raises self-esteem, without provoking legal or cultural conflict"²⁶. With this concept of adequate response, as defined by Simon^{25,26}, each item approved receives a plus (+). The following possibilities vary from (+) to (+++):

A) *An adequate response* (+++) - 1) solves the problem, 2) gives pleasure, i.e., is satisfactory, 3) does not result in any intrapsychic or environmental conflict.

B) *A slightly adequate response* - 1) solves the problem, 2) is satisfactory but creates some type of conflict; or 3) solves the problem, is not pleasurable, but, does not create conflict.

C) *A very slightly adequate response* solves the problem without satisfaction and with some type of conflict.

For each adaptive sector the predominant unit of responses analyzes the degree of adjustment. Thus, a sectorial evaluation is obtained with the same nomenclature: adequate, slightly adequate and very slightly adequate. Each individual will then be evaluated by the type of adequacy in each sector of adaptation.

Additionally, the person may be experiencing a period of crisis which was evaluated by the data obtained from the semi-directed interview²⁵⁻²⁷. The crisis may result from the gain, loss or expectation of an object or situation, leading respectively to a sudden increase or reduction in the subject's vital space^{25,26}. According to Simon^{25,26} definition, a person in crisis is "one who is wrapped up with a vital problem, which he cannot solve over the short term".

Hence, it is understandable that subjects with IMP who are then forced to deal with many losses, starting with the loss of a healthy body, are in crisis. Each subject was evaluated by type of adequacy for each sector and for overall adaptation.

RESULTS

1 - Clinical Interview

The subjects reported difficulty in falling and staying asleep and they complained about waking up early; but chiefly they described numerous periods of waking up during the night. On the following day, fatigue and intense irritability accompanied this condition. These symptoms occurring during many years are characteristic of chronic insomnia²⁹.

When the individuals managed to sleep, they reported a sensation of not having dreamt or of having dreamt all night being unable to remember anything on the following day. Some mention spending nights "raving", i.e., many things come to mind during the night, as though they were parts of meaningless dreams and which they are unable to recall upon awakening. Some also mention oniric images of persecution and marked sensations of fear during their dreams.

Because it is an open tool, the Clinical Psychological Interview for Prevention permits us to gather data regarding the attitude and especially the feelings of the person faced with the diagnosis of poisoning and the resulting changes.

Those working with mercury lamps were unaware of the danger of exposure to mercury and therefore they heated their lunch on the mercury vapor, played with the metal and used very little safety equipment. They all claimed that they received no guidelines from the company and they were neither supplied with nor required to use safety equipment. They also mentioned that although

Table 1. Global diagnostic adaptation by gender.

Type of adaptation	Female	Male	Total
Mild ineffective		1	1
Moderate ineffective	1	4	5
High adaptive inefficacy	4	5	9

Table 2. Type of adaptation in affective-relationship and productivity sectors.

Response	Affective-Relationship		Productivity	
	Female	Male	Female	Male
Adequate (+++)		1		
Inadequate (++)	2	7	4	8
Very inadequate (+)	3	2	1	2

they displayed symptoms, they attributed them to other factors. These subjects also described coworkers with confirmed diagnosis of mercury poisoning that continued working and avoided seeking treatment with significant impairment to their health.

2 - EDAO - Global Diagnosis

Regarding the analysis of the Global Adaptation of the 15 individuals, nine were diagnosed with High Adaptive Inefficacy, five with Moderate and only one with Mild Inefficient Adaptation (Table 1). None displayed Efficient Adaptation and none Severe Inefficient Adaptation.

3 - EDAO - Evaluation of the Sectors

Affective relationship Sector - The women showed a tendency to present very slightly adequate answers, i.e., the answers did not solve the problems, provoked some type of intrapsychic or environmental conflict and were unsatisfactory (Table 2). The women also reported slightly adequate solutions, i.e., they solved the problem and provided satisfaction although promoting some type of conflict; or solutions that solved the problem, did not result in any conflict but without pleasure. Regarding the men, the answers to the problems were classified within the slightly adequate type as previously described. In the productivity sector, both genders displayed a greater frequency of slightly adequate solutions. Although the patients knew their compromised health for some years, it was noticeable that they were still in a state of crisis resulting from a sense of loss.

Qualitative Evaluation of Sectors

Affective relationship Sector - The subjects reported that before the diagnosis of chronic IMP, their family relationships were quite impaired, because of their irritability, indisposition for social contacts and impulsive aggressive reactions. With much psychological pain, they reported episodes of family quarrels and disagreements that under other circumstances could be overlooked but at that time, seemed to be severe and frequent. Many of the married individuals considered breaking down their marriage. They also isolated themselves from friends and relatives. They mentioned impatience with their children, avoiding them in order to spare them from their aggressive impulses and behavior. They felt rejected and often humiliated by their "uncontaminated" colleagues.

Productivity Sector - They lost their employment either by being fired, retired for illness or being placed on medical-leave. From the interviews it was noted that the women spent their time

with routine household chores, with restrictions imposed by the illness. On some days they were able to carry out routine tasks but on others, they were unable to do anything because of severe pain in their arms and legs. Those men, who were able to carry out some activity, attempted to help their mate with household chores and with the children. They felt impotent, worthless, old and ruined without conditions for any productive activity. Even the individuals who returned to their job in another position felt humiliated as they had been below their previous position. Those who were involved in a productive activity also felt unappreciated and limited. They belittled their new occupations and their performance. The men who possessed automobiles were no longer driving for fear of accidents provoked by difficulties in concentration, memory and degree of alertness. The chronic insomnia and the medications they were using could also affect their alertness.

Social-cultural Sector - Many feelings of intolerance and rejection surfaced. They were outraged with the company, but also with the government institutions involved with support and help to the worker. They felt abandoned and misunderstood. They reported they felt treated with little consideration and often with disrespect at the various health institutions. Their negative feelings often turned them away from these institutions. Deeply hurt, they felt betrayed by the company to which they had dedicated their lives and that had taken away their health. On the other hand, some individuals were engaged in creating and organizing an association for IMP workers.

Organic Sector - The most common feeling was of helplessness and complete rejection of this contaminated and limited body^{12,15-17}. The relationship with their body was subject to the influence of the symptoms which accompanied them daily. The complications resulting from these feelings were visible. While waiting in the reception room they always kept their head down and when called they walked with difficulty, dragging their body, with a downcast and sad appearance. Many entered the office complaining of pain, a badly slept night, memory lapses, difficulty in moving arms and legs due to pain and constant feelings of fatigue. Living in outlying neighborhoods or cities requiring 90 minutes to get to the hospital, they arrived exhausted and mentioned that the next day trip would take its toll. Their memory was very impaired confirmed by their answers to simple questions of identification, even forgetting their telephone number, or even unable to recollect the names of their parents or children or their age.

During the interview issues regarding the effect on sexual behavior gradually appeared. Females reported reduction and even loss of sexual desire and satisfaction. When they engaged in sex, it was merely to satisfy their partner. The men reported a reduction in drive and premature ejaculation. Few of them sought medical help for this. These changes further intensified their feelings of worthlessness and in some cases increased their problems with their spouses, who complained of the quality and lack of sexual activity.

DISCUSSION

The major difficulty of this group of patients with chronic hydrargyresis and insomnia was maintaining sleep. This was probably linked to neuropathological changes and the pain caused by the chronic clinical picture^{8-10,12}.

Even though in some cases years had gone by, these fifteen subjects were still maintaining a state of crisis, according to Simon^{25,26} definition - for the search continues for a more dignified occupational situation and familial and social adaptation.

The moment of crisis is the time when the individual can improve or worsen his adaptive efficiency. If he can deal with the crisis and obtain some advantage from the situation, he can improve his adjustment. However, if he accepts the situation his adaptive efficiency will certainly be impaired.

According to Simon²⁵⁻²⁷, this type of crisis leads to feelings of depression and guilt, with resulting risks of self-aggression and outward projection of guilt, in this case, among others, the

company, the immediate superior, company physician etc. One of the objectives regarding psychological support for these persons would be to help them accept their losses, to renew their interest in their personal surroundings and put them in touch with their feelings, thereby avoiding the damage originating from the crisis.

When outside tests (according to them the company concealed the real results), confirmed the diagnosis they reported feelings, of denial, self-pity, rebellion, and especially of despair. "Its as though I had died", or "I thought I would die", or even "I thought of running away from my family". Faced with the diagnosis, they needed to seek some solution in order to adapt and survive. However, we can also understand that the attempt to search for a solution to their crisis and the lack of gratifying productive activities hampered their ability to relax and the possibility of an adequate quality of sleep.

The presence of marked signs of depression was also noticeable, i.e., low self-esteem, feelings of worthlessness, severe fatigue and belittlement. Consequently, we can hypothesize that there was a relationship between depression, stress and their insomnia³⁰. They were shaping their personal, family and financial life when the mercury poisoning interrupted forcing them to suddenly change their plans. The adaptive ability of these subjects when resulting in severe inefficient adaptation indicated that it was realized with frustrating solutions leading to psychic suffering and environmental friction.

CONCLUSION

The present study indicates that the adaptation of this group of workers with chronic insomnia associated with chronic IMP was severely affected in all the four sectors analyzed: affective-emotional, productivity, social-cultural and organic. Hence, they are workers that were in a poorly adequate state of adaptation for solutions to their problems and involved in a crisis state, which made their personal and social development even more difficult.

REFERENCES

1. Clarkson TW. Mercury: major issues in environmental health. *Environm Hlth Perspect* 1993;100:31-38.
2. Ehrenberg RL, Vogt RL, Smith AB, et al. . Effects of elemental mercury exposure at a thermometer plant. *Am J Indust Med* 1991;19:495-507.
3. Hirsch JB, Clarkson TW, Miles EF, Goldsmith LA. Percutaneous absorption of mercury vapor by man. *Arch Environm Hlth* 1989;44:120-127.
4. Eley BM. The future of dental amalgam: a review of the literature. Part 4. Mercury exposure hazard and risk assessment. *Br Dent J* 1997;182:373-381.
5. Fung YK, Molvar MP. Toxicity of mercury from dental environmental and from amalgam restorations. *Clin Toxicol* 1992;30:59-61.
6. Hanson M, Pleva Y. The dental amalgam issue: a review. *Experientia (Basel)* 1991;47:9-22.
7. Mackert R Jr, Berglund A. Mercury exposure from dental amalgam fillings: absorbed dose and the potential for adverse health effects. *Crit Rev Oral Biol Med* 1997;8:410-436.
8. Albers JW, Kallenbach LR, Fine LLJ, et al. . Mercury Workers Study Group: neurological abnormalities associated with remote occupational elemental mercury exposure. *Ann Neurol* 1998;24:651-659.
9. Buckell M, Hunter D, Milton R, Perry LM. Chronic mercury poisoning. *Br J Inter Med* 1993;50:97-106.
10. Elligsen D, Morland T, Anderson A, Huus H. Nervous system effects associated with previous exposure to inorganic mercury. *Neurotoxicology* 1991;12:808-810.
11. Klark RAP. Clinical and neurochemical aspects of inorganic mercury intoxication. In De Wolf FA (ed.). *Handbook of clinical neurology. Vol 20(64). Intoxications of the nervous system. Part I.* New York; Elsevier, 1994:367-411.
12. Rapaport DS. Exposure to mercury vapor endangers workers' mental and physical health. *Occup Safety Hlth* 1989;58:47-50.
13. Freeman JA. Mercurial disease among hatters. *Trans Med Soc NJ* 1860:61-64. In Klark RAP. *Clinical and neurochemical aspects of inorganic mercury intoxication.* De Wolf FA (ed). *Handbook of clinical neurology, Vol 20(64). Intoxications of the nervous system: Part I.* New York; Elsevier, 1994:370.
14. Gowers WR. Mercurial poisoning. In Gowers WR. *A manual of disease of the nervous system, Vol 2.* 2Ed. London; J and A Churchill, 1893:968-970. In Klark RAP. *Clinical and neurochemical aspects of inorganic mercury intoxication.* De Wolf FA (ed). *Handbook of clinical neurology, Vol. 20(64). Intoxications of the nervous system: Part I.* New York; Elsevier Science, 1994:402.
15. Pagala CE, Wigg CL. Psychiatric manifestations of mercury poisoning. *J Am Acad Child Adolesc Psychiatry* 1992;31:306-311.
16. Piviki L, Hanninen H, Matelin T, Mantere P. Psychological performance and long-term exposure to mercury vapors. *Scand J Work Environm Hlth* 1984;10:25-41.
17. Soleo L, Urbano ML, Petrerá V, Ambrosi L. Effects of low exposure to inorganic mercury on psychological performance. *Br J Industr Med* 1990;47:105-109.

18. Cavanagh JB. Long-term persistence of mercury in the brain. *Br J Industr Med* 1998;45:649-651.
19. Clarkson TW. The toxicology of mercury. *Crit Rev Clin Lab Sci* 1997;34:369-403.
20. Kishi R, Doi R, Fukuchi Y, et al. . Subjective symptoms and neurobehavioral performances of ex-mercury miners at an average 18 years after cessation of chronic exposure to mercury vapor. Mercury Workers Study Group. *Environm Res* 1993;62:289-302.
21. Langvorth S, Almkvist O, Sonderman E, Wilkestrom BA. Effects of occupational exposure to mercury vapor on the central nervous system. *Br J Industr Med* 1992;49:545-555.
22. Llang YX, Sun RR, Sun Y, Chen ZQ, Li LH. Psychological effects of low exposure to mercury vapor: application of a computer-administered neurobehavioral evaluation system. *Environm Res* 1993;60:320-327.
23. American Sleep Disorders Association. International classification of sleep disorders, revised: Diagnostic and coding manual. Rochester, Minnesota; American Sleep Disorders Association, 1997:114-116.
24. Giglio SDB. Estudo da ocorrência de queixas de insônia, de sonolência diurna e das relativas às parassonias na população adulta da cidade de São Paulo. Tese de Doutorado, Escola Paulista de Medicina, São Paulo, 1988.
25. Simon R. Psicologia clínica preventiva: novos fundamentos. São Paulo: EPU, 1989.
26. Simon R. Escala diagnóstica operacionalizada em psicologia clínica preventiva. São Paulo: Mudanças-São Paulo, 1995:13-33.
27. Simon R. Proposta de redefinição da EDAO: II Encontro de técnicas de exame psicológico do IPUSP. São Paulo; Instituto de Psicologia da Universidade de São Paulo, 1996.
28. Rotemberg L. Trabalhando de noite e dormindo de dia: regularidade do sono e adaptação psicológica de operários do turno noturno. Tese de Doutorado, Instituto de Psicologia da Universidade de São Paulo: São Paulo, 1997.
29. Reimão R. Glossário de termos utilizados em relação ao sono. In Reimão R (ed). Sono: estudo abrangente. 2Ed. São Paulo: Atheneu, 1996:419-431.
30. Paprocki J, Rocha FL. Tratamento da insônia na depressão. In Reimão R (ed). Sono: estudo abrangente. 2Ed. São Paulo; Atheneu, 1996:246-263.