

Fundamentals of nursing care in primary care for riverside pregnant women affected by the dumping of mercury in bodies of water

Fundamentos del cuidado de enfermería en la atención primaria a la gestante ribereña afectada por el vertimiento de mercurio en cuerpos de agua

Fundamentos da assistência de enfermagem na atenção primária às gestantes ribeirinhas afetadas pelo despejo de mercúrio em corpos d'água

Mildred Ferreira Medeiros^{1*}

ORCID: 0000-0003-1624-3077

Gabriela Cesar Valadares Batista¹

ORCID: 0000-0002-8862-9756

João Vitor da Silva Cordova²

ORCID: 0000-0001-6038-3072

Larissa Soriano Santos²

ORCID: 0000-0002-7511-1296

Roberta Maria de Lima²

ORCID: 0000-0001-6992-6539

Marcus Vinicius Villarinho de Sousa³

ORCID: 0000-0001-5031-2772

¹Universidade Veiga de Almeida. Rio de Janeiro, Brazil.

²Universidade Estácio de Sá. Rio de Janeiro, Brazil.

³Universidade Federal do Rio de Janeiro. Rio de Janeiro, Brazil

*Corresponding author: E-mail: mildred.medeiros@uva.br

Abstract

The aim was to present a proposal for a protocol for nursing care for the health of pregnant women living in riverside communities exposed to the risk of mercury poisoning irregularly dumped in water bodies where fish is the primary food source of the local population. To achieve the proposed objective, it was decided to collect the data that guided the elaboration of the proposed research protocol through a bibliographic survey on the platforms and virtual databases of the Virtual Health Library, LILACS and SciELO, with a period between 2013 and 2020. Mercury has a cumulative effect on the body, therefore, exposure can cause changes at systemic levels, and affect gestational development. The role of nursing in this context is important because such educational-prophylactic measures constitute care based on the principles of the National Primary Care Policy, focused on the individualities of a population (social, economic and cultural activities) and on the risks to which the health of this population can be exposed. It is concluded that the adequate orientation of the community in relation to the risks of contamination of the body by mercury is a competence of nursing and that a protocol for nursing care is important to guide primary health care.

Descriptors: Women's Health; Pregnancy; Mercury Poisoning; Teratogenesis; Nursing Care.

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Resumén

El objetivo fue presentar una propuesta de protocolo de atención de enfermería a la salud de las gestantes que viven en comunidades ribereñas expuestas al riesgo de intoxicación por mercurio vertido irregularmente en cuerpos de agua donde el pescado es la principal fuente de alimentación de la población local. Para lograr el objetivo propuesto, se decidió recolectar los datos que guiaron la elaboración del protocolo de investigación propuesto a través de un levantamiento bibliográfico en las plataformas y bases de datos virtuales de la Biblioteca Virtual en Salud, LILACS y SciELO, con un horizonte temporal entre 2013 y 2020. El mercurio tiene un efecto acumulativo en el cuerpo, por lo tanto, la exposición puede causar cambios a niveles sistémicos y afectar el desarrollo gestacional. El papel de la enfermería en este contexto es importante porque tales medidas educativo-profilácticas constituyen cuidados basados en los principios de la Política Nacional de Atención Primaria, enfocados en las individualidades de una población (actividades sociales, económicas y culturales) y en los riesgos a los que se enfrentan. La salud de esta población puede estar expuesta. Se concluye que la adecuada orientación de la comunidad en relación a los riesgos de contaminación del cuerpo por mercurio es competencia de enfermería y que es importante un protocolo de atención de enfermería para orientar la atención primaria de salud.

Descriptor: Salud de la Mujer; Embarazo; Intoxicación por Mercurio; Teratogénesis; Atención de Enfermería.

Resumo

Objetivou-se apresentar uma proposta de protocolo de assistência de enfermagem à saúde das mulheres gestantes residentes em comunidades ribeirinhas expostas ao risco de intoxicação por mercúrio despejado irregularmente nos corpos d'água dos quais o pescado é a fonte alimentar primária da população local. Para alcançar o objetivo proposto, optou-se por realizar a coleta dos dados que nortearam a elaboração do protocolo de pesquisa proposto através de levantamento bibliográfico nas plataformas e bases de dados virtuais da Biblioteca Virtual de Saúde, LILACS e SciELO, com recorte temporal entre 2013 e 2020. O mercúrio possui efeito cumulativo no organismo, portanto, a exposição pode ocasionar alterações a níveis sistêmicos, e afeta o desenvolvimento gestacional. O papel da enfermagem nesse contexto se faz importante pois tais medidas de caráter educativo-profilático constituem um cuidado baseado nos princípios da Política Nacional de Atenção Básica, focado nas individualidades de uma população (atividades sociais, econômicas e culturais) e nos riscos aos quais a saúde dessa população pode ser exposta. Conclui-se que a adequada orientação da comunidade em relação aos riscos da contaminação do corpo por mercúrio é competência da enfermagem e que um protocolo para assistência de enfermagem é importante para nortear a atenção básica em saúde.

Descritores: Saúde da Mulher; Gravidez; Intoxicação por Mercúrio; Teratogênese; Cuidados de Enfermagem.

Introduction

Used in various economic activities, with emphasis on gold mining, mercury is a volatile and odorless heavy metal found in three forms: metallic mercury, inorganic mercury salts and organic mercury (methyl mercury). The difference between these three states is based on the toxicity presented in clinical pictures of intoxicated patients¹.

Despite its usefulness, its toxic potential to the environment and human health have been known for decades and health impacts have already been described in the scientific literature after the environmental disaster occurred in Minamata, Japan, in 1956. The accident was caused by the dumping of mercury tailings, resulting in contamination of the bay and alteration of the local marine fauna and, consequently, human intoxication, leading to the death of hundreds of residents of the region. Since then, Minamata has become a landmark in the struggle for recognition of the harm caused by the use of mercury in economic activities².

Mercury has a cumulative effect on the body, so exposure can cause changes at systemic levels. Occupational exposure to the metallic form of mercury cannot be seen as

a single problem, since the entire population of the place used for extractive activities or mining is linked to contaminated sources, through fish and water richly present in the diet of residents³.

Studies indicate that exposure to metallic mercury is highly linked to neurological conditions, such as insomnia, irritability, apathy and cognitive difficulties, while exposure to mercury in its organic form can bring maternal and fetal complications, as the chemical compound in question is considered teratogenic and its presence could be detected in breast milk and placenta of contaminated pregnant women⁴.

Since 2019, the Brazilian federal government has been trying to pass bills that aim to allow mining and extractive activities on indigenous lands located mostly in the Amazon. Approved or not, the bills focus on making activities such as mining more flexible. Such flexibilities can bring socio-environmental impacts to the population and one of these impacts involves the release of ore tailings into rivers, however, the bills have not included any description of environmental impact analyzes and human health⁵. Such a discussion is necessary, as many riverside communities use



bodies of water for consumption and for fishing, as these components are contaminated by mercury, there will be a compromise to human health, especially for pregnant women.

In view of the above, the discussion about the deleterious maternal-fetal effects resulting from the consumption of fish and water contaminated by mercury is of great importance, since the education of the population constitutes a public health action, aiming at the collective good of the affected communities. Information about the toxicity of mercury and its possible presence in the food consumed needs to be disseminated and must be present in public health programs specifically for pregnant women and women of childbearing age, so that there is a popular understanding about the genotoxicity of mercury and the harmful effects of intoxication.

In summary, the present study is justified due to the increasing exposure of Brazilian riverside communities to toxic residues of mercury and derivatives discarded in the environment during the activities of illegal extraction and gold mining or due to the dumping of industrial residues containing such chemical compounds. The present research, then, becomes relevant as it intends to disseminate the use of preventive care protocols for professional use in the management of the populations in focus. The role of nursing in this context is important, as such educational-prophylactic measures constitute care based on the principles of the National Primary Care Policy, focused on the individualities of a population (social, economic and cultural activities) and on the risks to which the health of this population can be exposed.

The objective was to formulate a proposal for a care protocol for pregnant women from different riverside populations affected by the dumping of mercury in bodies of water.

Methodology

This is a literature review, based on the search for articles published between 2013 and 2020. The databases and data platform used will be Latin American and Caribbean Center for Health Sciences Information (BIREME) Virtual Health Library (BVS); Latin American and Caribbean Literature on Health Sciences (LILACS) and Scientific Electronic Library Online (SciELO). The descriptors used for the search were Women's Health; Congenital Malformations; Mercury intoxication; Teratogenesis; Pregnancy; Health education; Embryonic and Fetal Development. The inclusion criteria used will be: articles that answered the project methodology question, and the exclusion criteria were: editorials, literature review articles and articles that did not answer the question of other methodologies proposed by this study.

Thus, according to a study, research is a set of systematic procedures, based on logical reasoning, which aims to find solutions to proposed problems, through the use of scientific methods. Therefore, regarding the objectives, the research is divided into exploratory, descriptive and explanatory.

Analyzing the research objectives, exploratory and descriptive research will be used. Research can be classified under three aspects: in terms of objectives, in terms of approaching the problem and in terms of procedures. Regarding its objectives, the research that generated this text was characterized as being of an exploratory and descriptive nature. Exploratory research aims to show more context with the problem, thus making it more explicit or building hypotheses, so these researches have the main objective of improving ideas⁶⁻⁸.

The type of study is a literature review, research of this type has the primary objective of exposing the attributes of a certain phenomenon or statement among its variables. Thus, it is recommended that it present characteristics such as: analyzing the atmosphere as a direct source of data and the researcher as a switching instrument; not to use statistical devices and methods, having as a greater apprehension the interpretation of phenomena and the imputation of results, the method must be the main focus for the approach and not the result or the fruit, the appreciation of the data must be achieved in a intuitively and inductively through the researcher⁸.

As for the study approach, taking into account the defined objectives, the adoption of a qualitative methodology was considered more appropriate. According to a study, it is shown that a qualitative methodology can describe the complexity of a given problem, analyze the interaction of certain variables, understand and classify dynamic processes experienced by social groups⁹.

According to the study, it is presented as documents: books, magazines, newspapers, Internet, yearbooks, statistics, monographs, maps, audiovisual documents, among other sources, which contain fundamental information about the proposal of the work. The possibilities of treatment and analysis of data after collected, the data will be analyzed and interpreted⁷.

Results and Discussion

Mercury and its chemical presentations and forms of release from the environment

Mercury exists in several forms: elemental (or metallic) and inorganic (to which people can be exposed through their occupation); and organic (eg, methyl mercury, which people can be exposed to through their diet). These forms of mercury differ in their degree of toxicity and in their effects on the nervous, digestive, and immune systems, and on the lungs, kidneys, skin, and eyes¹⁰.

Mercury occurs naturally in the Earth's crust. It is released into the environment by volcanic activity, rock weathering and as a result of human activity. Human activity is the main cause of mercury releases, in particular coal-fired power plants, the burning of residential coal for heating and cooking, industrial processes, waste incinerators and as a result of the mining of mercury, gold and other metals¹¹.

Once in the environment, mercury can be transformed by bacteria into methyl mercury. This then goes through the process of bioaccumulation in fish and crustaceans. Methyl mercury also biomagnifies. For example, large predatory fish are more likely to have high



levels of mercury as a result of eating many smaller fish that have acquired mercury through ingesting plankton¹.

People can be exposed to mercury in any of its forms under different circumstances. According to a study, however, exposure occurs mainly through the consumption of fish and crustaceans contaminated with methyl mercury and through the inhalation of elemental mercury vapors during industrial processes. Cooking does not eliminate mercury. Mercury is contained in many products, including: Batteries; measuring devices such as thermometers and barometers; electrical switches and relays in equipment; lamps (including some types of lamps); dental amalgam (for dental fillings); skin brightening products and other cosmetics; pharmaceutical products¹².

A number of actions are being taken to reduce mercury levels in products or to phase out products containing mercury. In healthcare, mercury-containing thermometers and sphygmomanometers are being replaced by alternative devices¹³.

Dental amalgam is used in almost all countries. A consultation of experts from the World Health Organization (WHO) in 2009 concluded that a short-term global ban on amalgam would be problematic for public health and the oral health sector, but a gradual reduction should be pursued through the promotion of prevention of amalgam diseases and alternatives to amalgam; research and development of economic alternatives; education of dental professionals and public awareness¹⁴.

Inorganic mercury is added to some skin lightening products in significant amounts. Many countries have banned skin lightening products that contain mercury because they are dangerous to human health. Elemental or metallic mercury is a shiny silvery white metal, historically known as mercury, and is liquid at room temperature. It is used in older thermometers, fluorescent lights and some electrical switches. When discarded, elemental mercury breaks down into smaller droplets that can pass through tiny cracks or become strongly adhered to certain materials. At room temperature, exposed elemental mercury can evaporate to a toxic, odorless vapor¹.

In its inorganic form, mercury occurs abundantly in the environment, mainly as the minerals cinnabar and Metacinnabar, and as impurities in other minerals. Mercury can readily combine with chlorine, sulfur and other elements and subsequently to form inorganic salts. Inorganic salts of mercury can be transported in water and occur in soil. Dust containing these salts can enter the air from mining deposits of ores that contain mercury. Inorganic mercury can also enter water or soil due to weathering from rocks that contain inorganic mercury salts and from factories or water treatment facilities that release mercury-contaminated water¹⁵.

Although the use of mercury salts in consumer products such as medicines has been discontinued, inorganic mercury compounds are still widely used in soaps and skin lightening creams. Mercury chloride is used in photography and as a topical antiseptic and disinfectant, wood preservative, and fungicide. In the past, mercurous chloride was widely used in medicinal products, including laxatives,

worm remedies, and teething powders. It has since been replaced by safer and more effective agents. Mercury sulfide is used to color inks and is one of the red dyes used in tattoo dyes².

Human exposure to inorganic mercury salts can occur in both occupational and environmental environments. Occupations most at risk of exposure to mercury and its salts include mining, electrical equipment manufacturing, and chemical and metal processing in which mercury is used².

In the general population, exposure to mercuric chloride can occur through the skin with the use of soaps and creams or topical antiseptics and disinfectants. Another, less documented, source of exposure to inorganic mercury salts among the general population is its use in religious, ethnic, magical and ritualistic practices and in herbal remedies².

When inorganic salts of mercury can bind to airborne particles. Rain and snow deposit these particles on the earth. Even after mercury has been deposited on earth, it often returns to the atmosphere, either as a gas or associated with particles, and then redeposits elsewhere¹.

As it circulates between the atmosphere, land and water, mercury undergoes a series of complex chemical and physical transformations, many of which are not fully understood. Microscopic organisms can combine mercury with carbon, thus converting it from inorganic to organic form. Methyl mercury is the most common organic mercury compound found in the environment and is highly toxic¹⁶.

Exposure of workers and the population to mercury

All humans are exposed to some level of mercury. Most people are exposed to low levels of mercury, often from chronic exposure (long-term continuous or intermittent contact). However, some people are exposed to high levels of mercury, including acute exposure (exposure that occurs over a short period, usually less than a day). An example of acute exposure would be mercury exposure due to an industrial accident⁴.

The main way people are exposed to mercury is through eating seafood, which generally has some level of methyl mercury in their tissues. A less common way that people are exposed to mercury is by breathing in mercury vapor. This can happen when mercury is released from a container or a product or device that breaks down¹⁰.

The determining factors for the damage to health are the type of mercury; the dose; the age or developmental stage of the exposed person (the fetus is most susceptible); the duration of exposure; the route of exposure (inhalation, ingestion or dermal contact)¹¹.

Generally, two groups are most sensitive to the effects of mercury. Fetuses are more susceptible to the developmental effects of mercury. Exposure to methyl mercury in the womb can result from the mother's consumption of fish and shellfish. It can negatively affect the growing baby's brain and nervous system. The main health effect of methyl mercury is impairment of neurological development. Therefore, cognitive thinking, memory, attention, language, and visual fine motor and spatial skills



may be affected in children who were exposed to methyl mercury as fetuses¹.

The second group is made up of people regularly exposed (chronic exposure) to high levels of mercury (such as populations that depend on subsistence fishing or people who are occupationally exposed). Among selected subsistence fishing populations, between 1.5/1000 and 17/1000 children had cognitive impairment (mild mental retardation) caused by consuming mercury-containing fish. These included populations in Brazil, Canada, China, Colombia, and Greenland¹³.

For many years, no one noticed that the fish were contaminated with mercury, and that it was causing a strange disease in the local community and other neighborhoods. At least 50,000 people have been affected to some extent and more than 2,000 cases of Minamata disease have been certified. Minamata disease reached its peak in the 1950s, with severe cases suffering from brain damage, paralysis, incoherent speech and delirium¹.

Neurological and behavioral disorders can be observed after inhalation, ingestion or cutaneous exposure of different mercury compounds. Symptoms include tremors, insomnia, memory loss, neuromuscular effects, headaches, and cognitive and motor dysfunction. Mild and subclinical signs of central nervous system toxicity may be seen in workers exposed to an airborne elemental mercury level of 20 µg per cubic meter or more for several years. Renal effects have been reported, ranging from increased protein in the urine to renal failure.

Dumping of ore tailings containing mercury in water bodies and socio-environmental impacts

Perhaps the most significant impact of a mining project is its effects on water quality and availability of water resources within the area boundary. Key issues are whether surface and groundwater supplies will remain suitable for consumption, and whether water quality in the project area will remain adequate to support native aquatic life and terrestrial life¹.

The answer will determine whether a proposed mining project is environmentally acceptable. The potential for drainage of acidic substances becomes the big project in certain areas of environmental risk. When mined materials are excavated and exposed to oxygen and water, acid can form if iron sulfide minerals are abundant. There is an insufficient amount of neutralizing material to neutralize acid formation which can circumvent the problem¹³.

Acid mine drainage is a concern in many metal mines because metals such as gold, copper, silver and molybdenum are often found in rocks with sulfide minerals. When sulfides in rock are excavated and exposed to water and air during mining, they form sulfuric acid. This acidic water can dissolve other harmful metals in the surrounding rock. Left unchecked, acid drainage can run off into streams or rivers or leach into groundwater².

Acid drainage and contaminant leaching is the most important source of water quality impacts related to metallic ore. Acid mine drainage also dissolves toxic metals, such as copper, aluminum, cadmium, arsenic, lead, and mercury,

from the surrounding rock. These metals, particularly iron, can coat the creek bottom with a reddish-orange slime called yellowboy¹⁴.

Even in small amounts, metals can be toxic to humans and wildlife. Carried in water, metals can travel far, contaminating streams and groundwater for great distances. Impacts on aquatic life can range from immediate fish deaths to less lethal impacts that affect their growth, behavior or ability to reproduce¹⁰.

The impacts of wet tailings dam facilities, residual rock, pile leaching and dump leaching on water quality can be severe. These impacts include contamination of groundwater below these facilities and surface water. Toxic substances can leak from these facilities, seep in especially if the bottom of these facilities is not equipped with a waterproof lining¹³.

Health problems caused by exposure to or ingestion of mercury in its various forms

Mine water is produced when the water table is higher than the underground mine operation or the depth of an open pit mine. When this occurs, the water must be pumped out of the mine. Alternatively, water can be pumped from wells around the mine to create a cone of depression in the groundwater table, thereby reducing seepage².

When the mine is active, water must be continually being removed from the mine to facilitate ore removal. However, once mining ends, mine water removal and management often ends, resulting in possible build-up of rock fractures, pits, tunnels, and open pits and uncontrolled releases to the environment¹⁴.

Mercury is commonly present in gold ore. Although concentrations vary substantially even within a specific ore deposit, mercury is found in gold ore and associated waste materials. If the mercury content in a gold ore is 10 mg/kg and one million tons of ore are processed in a particular mine, 10 tons of mercury is potentially released into the reservoir and must be controlled¹⁰.

In some gold mining projects, ore is crushed and, if necessary, heated and oxidized in roasters or autoclaves to remove sulfur and carbonaceous material that affects the recovery gold. The mercury that is present in the ore is vaporized, mainly in roasters, which are some of the biggest sources of mercury emitted into the atmosphere¹³.

After roasting or sterilization, the ore is mixed with water and reacted with a cyanide solution and the gold and mercury are dissolved and the solids removed by filtration. The purified solution is sent to an electrolytic separation process, where the gold is recovered. In this process, mercury must also be recovered and collected. If not collected by air pollution control devices, this mercury can be released into the atmosphere¹.

The WHO defines health as a state of complete health, involving the mental, physical, social and environmental aspects. The term hazardous substances is broad and includes all substances that can be harmful to people and/or the environment².



Proposal for a protocol for nursing care through educational-preventive actions for populations exposed to different chemical presentations of mercury

Although humans cannot create or destroy mercury, most mercury found in the environment today is the direct result of human activity. Industrial processes such as coal-fired power plants and waste incinerators release elemental mercury into the air, water and soil. Once mercury enters rivers and oceans, it becomes organic mercury or methyl mercury¹³.

According to studies, small fish feed on plant sediment that contains methyl mercury. These small fish are eaten by larger fish, which are eventually eaten by humans^{1,14}.

Most people in countries like Australia and New Zealand can still eat fish with higher levels of mercury, but dietary standards recommend that they be eaten less often than fish species with lower levels of mercury. People in high risk groups like pregnant women, children and people with kidney disease should check the recommendations before eating these fish¹⁴.

Recommendations for the amounts of fish that can be consumed are different for pregnant women and children compared to the rest of the adult population. Pregnant women, nursing mothers, women planning to become pregnant, and children under the age of six should avoid fish that are high in mercury¹³.

Many people take fish oil supplements to increase their intake of omega-3 fats. While it's best to get your omega-3 fats from fish rather than supplements, when using fish oil capsules, make sure the product has been tested for mercury levels¹.

Exposure to mercury can occur when breathing contaminated air, ingesting contaminated water and food, having dental and medical treatments, and engaging in rituals or hobbies that include mercury. Except in work environments where elemental mercury is used, most of the health risk from mercury exposure is due to ingesting methyl mercury when eating contaminated fish¹⁴.

Alternative materials for tooth-colored fillings do not contain mercury, but are not as strong as amalgam. Amalgam fillings can be replaced with modern mercury-free dental materials. Some people are advised to avoid getting new amalgam fillings and to prevent existing amalgam from being removed or replaced¹⁴.

While there is currently no scientific evidence directly linking amalgam to ill health or birth defects, these recommendations were made for precautionary reasons. At very high exposure levels, mercury can cause damage to the brain, kidneys and lungs. It can also cause irritability, personality changes, depression, nervousness, difficulty concentrating, tremors, changes in vision or hearing, and memory problems. Fetuses, infants and children are potentially at greater risk because their nervous systems are still developing¹³.

The best way to limit mercury exposure from seafood is to be aware of warnings about wildlife and fish in your area, limit fish intake to recommended amounts, and avoid fish known to be contaminated with mercury. This is

Hazardous substances can (1) cause or contribute to an increase in mortality, disabling disease; or (2) pose a danger to human health or the environment when treated, stored, transported, disposed of or managed in an inefficient manner. Frequent public health problems related to mining activities include: surface and groundwater contaminated with metals and elements; microbiological contamination of sewage and waste from camps and mines in workers' residential areas; exposure to high concentrations of sulfur dioxide, heavy materials including lead, mercury and cadmium; and deposition of toxic elements from the burning of waste¹⁴.

Mining activities can suddenly affect the quality of life and the physical, mental and social well-being of local communities. Makeshift towns around extraction mines pose a risk to the population of these towns. Indirect effects of mining on public health may include increased incidence of tuberculosis, asthma, chronic bronchitis and gastrointestinal diseases¹³.

Maternal-fetal effects of exposure to the chemical presentations of mercury

Pre and postnatal mercury exposures often occur in many ways. Pediatricians, nurses and other healthcare professionals must understand the problems of mercury exposures and the health effects of children and be prepared to deal with mercury exposures in medical practice.

Knowledge about the extreme vulnerability of the fetus to methyl mercury began with the experience in Minamata Bay, Japan. High exposure to methyl mercury occurred in Minamata. A chemical company released mercury into Minamata Bay and heavily polluted the bay for decades. Mercury accumulated in the aquatic food chain has been methylated in the aquatic food chain, leading to high levels of mercury in fish. The local fish was very rich in methyl mercury and the local population consumed large amounts of the fish. Thus, by feeding on the fish, pregnant mothers not only burdened themselves, but the methyl mercury was transferred in the uterus to the fetus. This exposure to mercury promoted deformities in the neurological development of the fetuses. Although mothers generally did not show symptoms of mercury poisoning, newborns had severe microcephaly damage severely damaged by microcephaly¹⁰. Depending on the dose and time of exposure during pregnancy, the effects may be severe and immediately or less apparent. Neurological symptoms include mental retardation, ataxia and cerebral palsy, seizures, vision and hearing loss, developmental delays, language disorders, and problems with motor function, visual spatial skills, and memory¹.

The most recent findings from long-term cohort studies suggest that the cardiovascular system is also at risk with increased incidence of hypertension and decreased heart rate variability as exposure to methyl mercury increases. The full expression of these health effects of methyl mercury can be delayed and deficits are often irreversible¹³.



particularly important for developing children, pregnant and lactating women, and women who may become pregnant. Other ways to avoid mercury exposure include careful handling and disposal of any product that contains mercury, including thermometers, fluorescent lights, and older medications that contain mercury¹.

In accordance with the results of the research, a care protocol was prepared for the aforementioned public. The protocol is based on the Basic Care Policy (PNAB), so the nursing care in this care suggestion will aim at educational-prophylactic measures.

During the nursing consultation of pregnant women living in a riverside community exposed to the risk of mercury poisoning, the following procedures must be performed: anamnesis with data collection; power profile;

origin of water used for consumption and personal hygiene; inquiry and annotation on signs and symptoms of possible mercury poisoning; health education aimed at patient guidance on the prevention of mercury poisoning.

Item 1 – Anamnesis: in this item, the nursing professional will start the service with the anamnesis form used in their workplace, adding the following questionnaire aiming at simple answers with “YES” or “NO”, in case of suspicion of mercury intoxication. Patient is pregnant? Do you intend to get pregnant? Do you have a regular menstrual cycle? Are you of childbearing age? Do you usually eat fish obtained in the region? Do you consume treated (filtered) water? Do you know the damage caused by contact with fish and water contaminated by mercury? Do you have the symptoms listed?

Chart 1. Symptoms of mercury poisoning. Rio de Janeiro, RJ, Brazil, 2020

Neurological symptoms	Other symptoms (bioaccumulation)
Insomnia	Metallic taste
Irritability	Diarrhea
Headaches	Nausea
Cognitive difficulties	Vomiting
Tremors	Fever and Oral Ulcerations

Does any family member living in your household report any of the symptom(s) listed above? Item 2 - Nursing procedures and health guidelines: at this point, after data collection, the professional must establish a care plan based also on the systematization of nursing care, aiming at the delimitation of the patient's situational diagnosis (nursing diagnosis) , planning and implementation of private procedures for the nursing team and evaluation of results. Such systematization should take into account the following guidelines:

Educate the patient about the risks to the health of the pregnant woman and the baby due to the ingestion of water contaminated with mercury. Educate the patient about the risks to the health of the pregnant woman and the baby caused by exposure to mercury vapors. Educate the patient about the risks of exposure to mercury dumped in the water and contaminants in the fish they consume, advising on safe options for their food. Note: if there is availability of a nutritionist in the multidisciplinary team in the region, refer the patient for nutritional care, mentioning the need for food alternatives due to the risk of mercury poisoning.

Item 3 – Possíveis diagnósticos de enfermagem related to the care of pregnant patients intoxicated by mercury: in this item, a search was used in the NANDA-I nursing diagnoses, in order to guide and enable nursing care for the protocol in question. The nursing diagnosis is an instrument that helps the nursing professional in the clinical judgment processes and, in addition, helps to understand the needs of a group or community. Such diagnoses are structured in: defining characteristics (observable symptoms); related factors (environmental influences that contribute to the defining characteristic); risk factors (factors that increase an individual's vulnerability and susceptibility to an unhealthy event)^{17,18}.

So according to the North American Nursing Diagnosis Association (NANDA) in 2020, we can select subdivided diagnoses to guide nursing care, which are:

Item 3.1 – Diagnosis related to health promotion: Poor community health related to insufficient access to health care providers, characterized by a health problem experienced by groups or populations – in this case, mercury poisoning in communities. Willingness for improved health literacy characterized by understanding of health information.

Item 3.2 - Nutrition-related diagnosis: Interrupted breastfeeding, related to the need to wean abruptly, characterized by non-exclusive breastfeeding - in this case, the diagnosis is present because there may be a contraindication to breastfeeding, due to evidence of organic mercury in the milk.

Item 3.3 – Diagnosis related to growth or development: Risk of delayed development, related to exposure to natural disaster, congenital disorder.

Item 3.4 – Diagnosis related to sexuality (reproduction): Risk of impaired mother-fetus binomial, related to gestational complication. Risk of ineffective perinatalogical process related to inadequate maternal nutrition. Ineffective perinatologic process, characterized by ineffective control of unpleasant symptoms in pregnancy, related to inadequate maternal nutrition.

Final Considerations

WHO publishes evidence on the health impacts of different forms of mercury, guidance on identifying populations at risk of mercury exposure, tools to reduce mercury exposure, and guidance on replacing mercury-containing thermometers and pressure measuring devices. blood pressure in the health area. WHO leads projects to promote the proper management and disposal of healthcare



waste and has facilitated the development of an affordable, validated, mercury-free blood pressure measuring device.

Mercury can pass from mother to baby through the placenta during pregnancy and, in small amounts, through breast milk after birth. Exposure to mercury can affect a

baby's brain and nervous system development during pregnancy and after birth.

Although mercury occurs naturally throughout the environment, the mother's diet is the main source of mercury exposure for most breastfed babies before they are introduced to complementary foods.

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