

Main sources of exposure to environmental risks in pregnant women from Kinil, Yucatan, Mexico

Principales fuentes de exposición a riesgos ambientales en embarazadas de Kinil, Yucatán, México

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Abstract

Objective. To identify main environmental hazards to which pregnant women in Kinil, Yucatan are exposed. **Methodology.** Cross-sectional study consisting of two parts: 1) review of clinical archives of women who received prenatal care from 2015 to 2017, registered in the Pregnancy Census of the Kinil Health Center, to obtain prenatal medical records, data on babies and perinatal conditions of their births; 2) the patients were visited in their homes to explain the objective of the study and request the pertinent permits with informed consent, as well as the caregivers in the case of minors. The frequency of major diseases during pregnancy was determined, as well as the prevalence of adverse perinatal outcomes. **Contribution.** Approach to environmental diagnosis, identify potential sources of risks of disease, characterize positive or negative situations to detect groups in vulnerable situations

Potential source, Risks, Pregnant women

Resumen

Objetivo. Identificar principales peligros ambientales a los que están expuestas las mujeres embarazadas de Kinil, Yucatán. **Metodología.** Estudio transversal constituido en dos partes: 1) revisión de expedientes de mujeres que recibieron atención prenatal del 2015 al 2017, registradas en el Censo de Embarazadas del Centro de Salud de Kinil, para obtener las historias clínicas prenatales, datos de los bebés y condiciones perinatales de sus nacimientos; 2) se visitaron a las pacientes en sus hogares para explicar el objetivo del estudio y solicitar los permisos pertinentes con los consentimientos informados, así como a los tutores en caso de menores de edad. Se determinó la frecuencia de las principales enfermedades durante el embarazo, así como la prevalencia de los resultados adversos perinatales. **Contribución.** Aproximación del diagnóstico ambiental, identifica fuentes potenciales de riesgos de enfermedad, caracteriza situaciones positivas o negativas para detectar a grupos en situación de vulnerabilidad.

Fuentes potenciales, Riesgos, Mujeres embarazadas

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Introduction

Environmental health is the area of public health dedicated to the evaluation of health risks and damages caused by environmental degradation and pollution, as well as to the design of programmes and strategies for their reduction (Pan American Health Organization. Area of Sustainable Development and Environmental Health; 2003).

From Alma Ata in 1978 to the Millennium Declaration in 2005, there have been numerous global meetings expressing proposals to improve environmental health (Bulacio, J., De Grandis, S., Fernández, R., Gomila, A., Sfaello, I., Sosa-Boye, I., et al; 2006).

The World Health Organisation (WHO) has defined the environment as one of the most decisive factors influencing the global toll of ten million child deaths per year and a very important one for the health and well-being of mothers (Pan American Health Organisation; 2003).

Similarly, the WHO points out that high rates of mortality and disability worldwide are a consequence of fetal developmental disorders. Optimal foetal development requires that the mother enjoys good physical and emotional health before and during pregnancy, as her ability to meet the needs of foetal development is related to her diet and depends on her lifestyle, and exposure to toxins has an impact on the health of mother and child. Exposure to environmental pollution facilitates the incorporation of toxic agents, which move easily into the blood, brain and other tissues of the developing foetus (Pan American Health Organization; 2017).

In the last 20 years, studies have been conducted worldwide to assess the consequences of prenatal exposure to environmental pollutants and their effects on the resolution of pregnancy and subsequent development of the infant to determine the level of pre- and post-natal impact of the environment on the health of individuals (Pan American Health Organization; 2017), (Kim, B., Ha, M., Park, H., Lee, B, Kim, Y. J., & Hong, Y.; 2009).

In the Region of the Americas there is inequality in environmental health, areas in different states of development have been characterised, so that groups with greater vulnerability have been identified. Some of these inequalities are observed in rural areas with relatively preserved ecosystems, where indigenous populations live, or in more developed areas with agricultural populations. In urban areas, there is inequality between marginalised groups which tend to be closer to polluted areas or working populations in industrialised sectors (Pan American Health Organization; 2009).

In a study carried out in 2009 in Yucatan, it was determined that due to its geohydrological characteristics it has a high vulnerability to water contamination, and almost 4000 potential sources of hazardous waste were found, of which 73.4% were concentrated in the municipality of Merida and the ten most populated municipalities in the state. Polanco et al. 2014, demonstrated the presence of organochlorine pesticide residues in water from 20 cenotes in the so-called "ring of cenotes" (Polanco, A., Navarro, J., Solorio, J., Mena, G., Marrufo, J., & Del Valls, T.; 2014).

Even with the evidence of exposure to environmental hazards, no studies have been conducted in Yucatan to determine their impact on maternal and perinatal health in rural areas.

Therefore, we pose the following question: What is the situation of maternal and perinatal environmental health, as well as what are the main potential sources of environmental risk faced by pregnant women in the commissariat of Kinil, Yucatan?

General objective

To determine the situation of maternal and perinatal health, as well as the main potential sources of environmental risks to which pregnant women in Kinil, Yucatan are exposed.

Specific objectives

- To describe the main maternal and perinatal health problems such as: abortion, premature birth, low birth weight products.

- To describe the characteristics of pregnant women's environment.
- To identify the main sources of exposure of pregnant women to environmental risks such as exposure to biomass, pesticides and contaminated water.

Type and general design of the study

Observational, descriptive, cross-sectional

Definition of the universe

All women who attended prenatal care at the Rural Health Centre of Kinil, Yucatan, during the period 2015-2017.

Selection and sample size

A survey was conducted among 64 women who were the total population of pregnant women registered according to the Pregnancy Census of the Rural Health Centre of Kinil, who attended prenatal control during the period from 2015 to 2017 and who concluded their gestational period.

Conceptual definition of variables

- Age: Years and months of life since birth, at the time of pregnancy.
- Gestational age: Weeks and days calculated from the onset of conception to the time of delivery, according to the birth record.
- Low birth weight: Product of conception with a body weight at birth of less than 2,500 grams, regardless of gestational age, according to the record.
- Preterm: Product of conception from 28 weeks to 37 weeks of gestation, which is equivalent to a product from 1,000 grams to less than 2,500 grams according to the file.
- Illnesses suffered during pregnancy: Illnesses recorded in the maternal medical record during the prenatal check-up visit.

- Suspected cases of vector-borne disease during pregnancy: Patients with the following signs and symptoms during pregnancy: fever greater than 39°C with no other source, with any of the following: Irritability, arthralgia, headache, arthralgia, myalgia or oral intolerance.

- Overcrowding: The presence of 2.5 or more persons per room within the dwelling.

- Household construction material: The material of which the pregnant woman's dwelling is constructed.

- Person assigned to cook the food: Person who performs daily food preparation.

- Location of the kitchen: Space intended for the location of the kitchen.

- Fuel used for cooking: Resource used for cooking food.

- Water used for drinking: Water intended for consumption by the pregnant woman.

- Exposure to pests: Presence of animals carrying diseases that may affect the pregnant woman.

- Presence of pets in the home: Animals that are in contact with the pregnant woman during her pregnancy.

- Use of pesticides: Contact with chemicals used to treat pests.

- Presence of agricultural activity near the dwelling: Farm or orchard that is less than 5 minutes away from the pregnant woman's dwelling.

Methodology

The research work consisted of two parts: The first was the review of the files of women who received prenatal care during the years 2015 to 2017 and who had completed their gestational period and were registered in the Pregnancy Census of the Kinil Health Centre. Prenatal medical records were obtained from these files, as well as data on the babies and perinatal conditions of their births.

In the second part, the homes of the registered patients were visited and the patients were given an explanation of the purpose of the research study, the aims of the study and the potential benefits of the study results as feedback for their participation. Subsequently, the pertinent permissions were requested with the signing of the informed consent forms, as well as from the caregivers in the case of a minor patient. After obtaining acceptance to participate, the surveys were administered; the estimated duration was 20 minutes.

The variables referring to the gynaecological-obstetric data, as well as the follow-up of prenatal control and product data, were obtained from the file, while the variables referring to the environmental conditions were collected from the surveys applied to the mothers.

Measuring instrument

For the elaboration of the maternal environmental clinical history, an instrument was used whose parts are made up of two instruments in turn: the Maternal Clinical History for Prenatal Control of the Yucatan Ministry of Health, and the questionnaire "Evaluation of the maternal environment" belonging to the INTERBIO 21st study protocol, which has been applied in homogeneous populations in 8 countries. This questionnaire can be used to identify subpopulations for further analysis to identify areas requiring intervention, education or policy change such as environmental health (Valls-Llobet, C.; 2010). The frequency of the main diseases during pregnancy was determined, as well as the prevalence of adverse perinatal outcomes in patients.

The data obtained were collected in tables in the Office Excel programme version 2016, and then entered into the Epi Info programme version 7.0.1.0 for statistical analysis.

For quantitative variables, mean and standard deviation were calculated, and for qualitative variables, percentages were calculated.

Permission for the study was requested from the authorities of the Rural Health Centre of Kinil, Yucatan.

Information provided to and obtained from patients was treated in strict confidence. Participants, as well as caregivers of minor patients, were given a letter of informed consent detailing the benefits and objectives of the study.

Results

The age range of the women surveyed was from 15 to 34 years, with a mean of 24.03 years and a standard deviation of 5.11. Out of a total of 58 births, 8 (13.79%) were preterm and 19 (32.76%) were low birth weight (Table 1).

Gestational age	Number	Porcentaje
Mature	50	86.21
Premature	8	13.79
TOTAL	58	100
Birth weight		
Normal	39	67.24
Low birth weight	19	32.76
TOTAL	58	100

Table 1 Percentage of adverse gestational events by gestational age and birth weight

According to the medical records and medical histories reviewed, it was determined that 46 (79.31%) of the women in this study suffered from at least one illness during their pregnancy and the majority of this percentage had two or more illnesses during gestation; on the other hand, none of the women surveyed had eclampsia, mild or severe pre-eclampsia (Table 2).

	Number	Percentage (%) *
Urinary tract infection	35	60.34
Vaginal infection	24	41.38
Upper airway infection	34	58.62
Disease diarrheal disease	23	39.66
Threat of abortion	1	1.72
* Each in relation to the total number of pregnant women n=58		

Table 2 Most frequent illnesses during pregnancy

The environmental setting of the pregnant women was defined, where only 12.07% lived in overcrowded conditions according to CONEVAL parameters. The main sources of exposure to environmental risks were also identified, the main pest detected was mosquitoes (77.59%), for which periodic nebulisations have been carried out, most of the women were in contact with animals (75.86%), with dogs being the main ones (41.38%) (Table 3).

Pests		
Mosquitoes	45	77.59
None	9	15.52
Other	4	6.90
Total	58	100
Presence of animals		
No	14	24.14
Yes	44	75.86
Total	58	100
Type of animals		
Poultry	15	25.86
Cats	5	8.62
None	14	41.38
Dogs	24	41.38
Total	58	100

Table 3 Environmental setting of the dwellings

It was also observed that most of the women bought bottled water (62.07%), cooked with firewood (60.34%), lived near crops (58.63%) and did not use agro-industrial pesticides (77.59%) as sources of environmental exposure (Table 4).

Water consumption	Number	Percentage
Well	22	37.93
Bottled	36	62.07
Total	58	100
Fuels used for cooking	Number	Percentage
Gas	23	39.66
Firewood	35	60.34
Total	58	100
Housing next to crops	Number	Percentage
No	28	41.37
Yes	30	58.63
Total	58	100
Pesticide use	Number	Percentage
No	45	77.59
Yes	13	22.41
Total	58	100

Table 4 Main sources of exposure to environmental risks

Discussion

In Mexico, environmental and perinatal risk factors have been studied in paediatric cancer patients (Martínez, M., Talavera, G., Benítez, M. L., Noguera, J., & Mesquita, M. 2022). In Yucatan, environmental problems have been detected without adequate intervention by governmental public health programmes to solve them. This exploratory study aims to describe the main maternal and perinatal health problems.

According to the national average of teenage pregnancies, it was found that Kinil is below since according to figures from the National Institute of Statistics and Geography (INEGI), the national percentage of teenage pregnancies in 2016 was 17.08%. In Mexico, there are reports of association of preterm birth with vehicular emissions of PM10 and CO in pregnant women (González, D., & Aristizabal, B. H. 2022).

The percentage of preterm births was 13.9%, in contrast to the percentage recorded from 2007 to 2012 in Yucatan of 7.2%, likewise the percentage of children with low birth weight recorded in Kinil was 32.76% compared to the percentage recorded by INEGI in the state in 2014 which was 11.5%.

The main health problems were Urinary tract infection (60.34%), upper airway infection (58.62%) and vaginal infection (41.38%) compared to those recorded by the National Survey of Demographic Dynamics (ENADID), which mentions that the main illnesses during pregnancy are pre-eclampsia/eclampsia, which occurs between 2% and 10% of pregnancies and urinary tract infection, particularly asymptomatic, which is observed between 17% and 20% of pregnant women. In terms of housing construction quality, most women reside in houses built with recycled material, and the percentage of overcrowding found was 12.07%, below the state average recorded in 2016 in Yucatan by the National Council for the Evaluation of Social Development Policy (CONEVAL) of 15.8%. The information collected allowed an approximation towards an environmental diagnosis of the main sources of exposure to environmental risks in pregnant women in Kinil, Yucatan, both in their positive and negative factors, but only in a cross-sectional manner. It is therefore necessary to implement analytical studies that allow for the study of associations between risks and disease, in order to propose intervention strategies for their reduction and control.

Conclusions

The main maternal health problems are urinary tract infection (60.34%), upper airway infection (58.62%) and vaginal infection (41.38%).

The prevalence of low birth weight and prematurity were 32.76% and 13.79% respectively and no neonatal deaths were recorded.

The percentage of women living in overcrowded conditions is 12.07%, 37.93% are exposed to potentially contaminated sources, 60.34% use biomass as fuel and 22.41% of them were exposed to pesticides used in agriculture.

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