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**VIEWS OF GENERAL PRACTITIONERS ON INDOOR ENVIRONMENTAL
HEALTH RISKS IN THE PERINATAL PERIOD**

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ABSTRACT

Background

Home is generally perceived as a safety place, whereas the concentration of pollutants, influenced not only by external pollution, but also by human activities, the presence of domestic animals, construction and furniture materials, are sometimes greater than outside.

Objectives

The aim of this study is to determine the general practitioners' views on indoor environmental health risks in the perinatal period.

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Methods

Four semi-structured focus group with 31 general practitioners (GP) were conducted in two french departments in November 2009, February, March and April 2010. The focus group meetings were analysed using a general thematic analysis.

Results

Perinatal care is a special health issue and a time of privileged sensitisation. The attitude of health risks are well known in the case of "traditionally" toxic substances. In the case of "emerging" environmental exposure, these attitudes depend on the knowledge, beliefs and experience specific to each practitioner. GPs are acquiring a new role in the field of environmental health, whilst at the same time coming to grips with his own strengths and limitations. The implementation of prevention depends on factors which are specific to the practitioner, but also related to the parents and the organisation of the medical practice.

Conclusions

The sensitisation of GPs to environmental medicine, promotion of eco-citizen education, development of research, and the distribution of information, are some of the means which need to be implemented to prevent harmful exposure of the infant.

KEYWORDS

Primary care, prevention, respiratory diseases, family health, child and adolescent development, qualitative research / study

INTRODUCTION

The fetal programming hypothesis suggest that human health and development have their origin in early life^{1, 2}. Central to these hypotheses is the interdependence of developmental influences, either genetic or environmental. Pregnancy and the early postnatal period are times of great vulnerability.

Our way of life leads us to spend approximately 65% to 80% of our time inside various premises (domestic, work, public transportation, leisure, or public premises)^{3,4}. As opposed to external pollution, which is publicised by pollution peaks and is addressed by numerous laws and regulations, air pollution in the interior is relatively poorly understood by the public at large, and only a small number of guideline values are proposed, concerning the main forms of indoor pollution⁵⁻⁷. Ninety two percent of French citizens believe that the home is a place where one is protected, whereas the concentration of pollutants, influenced not only by external pollution, but also by human activities (do-it-yourself activities, housework, use of combustion appliances), the presence of domestic animals, construction and furniture materials, are sometimes greater⁸⁻¹⁰.

Several scientific studies have recently revealed the health consequences of indoor pollution, the effects of which are particularly conspicuous during perinatal period. The main effects described in the literature, for the foetus or the young child, were the occurrence of slow intra-uterine growth, preterm birth, bronchiolitis, allergies and asthma in infants, ear-nose-and-throat symptoms (chronic coughing, rhinitis, etc.) or neuro-behavioural disorders in older children¹¹⁻¹⁸. In parallel, the associations between low socioeconomic status (SES) and adverse pregnancy outcomes are well documented in perinatal research¹⁹. Adverse effects of environmental exposure can act through oxidative stress, inflammation, and/or endocrine disruption to promote developmental toxicity and adverse perinatal health²⁰.

General practitioners' views on indoor environmental health risks

The views of public health actors, such as general practitioners (GPs) on indoor environmental health risks in the perinatal period, remain unexplored. This analysis is interesting for several reasons: on the one hand, these actors regularly monitor infants and pregnant women²¹, on the other hand they have an important role in the screening, diagnosis, and monitoring of environmental pathologies²²⁻²⁴. The main purpose of the present study is thus to explore these views. Secondary objectives included the way in which they assume their role in terms of environmental health and the identification of factors affecting the implementation of prevention in physician's offices.

METHODS

Type of study and data collection

This study was made on the basis of a qualitative observational study. The focus group method was retained in order to explore doctors' opinions, beliefs, concerns and ensure interactivity²⁵⁻²⁷. Four focus groups took place in two french departments (75 -Paris- and 95 -Val d'Oise-) in November 2009, February, March and April 2010. Each focus group comprised 7 to 8 general practitioners and lasted approximately 120 minutes. A doctor volunteer (JZ) compiled a list of various physicians who worked in the two departments (randomly selected using the telephone book). The doctor volunteer contacted by phone each person listed and sought their voluntary participation. A snowball approach was then employed to expand the list of potential participants²⁸. The groups were hosted by a moderator and an observer. All of the focus group discussions were recorded, after having obtained written consent from the participants. A third person took care of all secretarial activities. Focus groups were maintained until theoretical data saturation. As described by Glaser and Strauss, it was reached when coding of the last transcript provided no new useful data to elaborate on the theory.

Interview guide

The interview guide was created from a review of the literature based on MEDLINE data, using the following keywords, combined in groups of 2 or 3 words: "Attitude"; "Perception"; "Opinion"; "Health attitude"; "Environment"; "Physicians family"; "Qualitative research" and "Focus group".

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Following this search, an initial interview guide was prepared, then discussed and tested during the course of several working meetings, in order to achieve a final consensual version (Appendix).

Data analysis

The verbatim of each sitting was individualised, rendered anonymous and fully transcribed. Two independent researchers prepared a syntactic and progressive written analysis following each interview. The verbatim was decomposed into words, sentences, expressions or text extracts which, initially, expressed one single, identical concept: the MSU (Minimal Significance Units). These were classed, grouped into sub-categories, and then later into categories and themes. Several corrections of the verbatim were required in order to obtain a relevant and homogeneous coding, by means of an inductive approach through a thematic content analysis²⁹⁻³². All the ideas of the focus groups were analysed in order to construct a controlled analysis grid with the highest possible degree of reproducibility.

Reliability of the results

Source triangulation (written, audio and video material) and the analysis strategy were ensured by continuously comparing the data collected by two different researchers. In addition, the results were retrospectively sent to all of the participants in order to include any possible corrections, and obtain an analysed validation of the contents. For this research, no ethical approval was obtained because this study was only observational and all data were anonymous³³.

RESULTS

Four focus groups were needed in order to achieve data saturation. Out of 50 doctors who were approached, a total of 31 agreed to take part in the study. The characteristics of the participants are described in Table 1. All GPs provided health care for children and women during pregnancy. Eight of them had a public practice in “child and maternal protection centers” or “family planning”. Only two

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of them (6%) had specific training about environmental health issues. In the analysis, three research themes were established: Perinatal care, between vulnerability and a time of privileged sensitisation; sources of information, from profane perception to scientific expertise; and the role of the general practitioner in environmental healthcare. For each of these themes, MSU extracts, sub-categories and categories have been summarised in Tables 2 to 4.

Perinatal care: between vulnerability and a time of privileged sensitisation

The psycho-socio-affective, sensorial and nutritional environments of the infant have been described as potential sources of vulnerability. The habitat was the image of a fragile cocoon. More generally, living spaces were assimilated with bubbles of well-being and threat. Indeed, the general practitioners evoked the paradox of a healthy habitat, a place of refuge, but also a place leading to multiple forms of exposure. Being on the one hand conscious of the vulnerability of pregnant women and infants, and on the other hand solicited by the patients' questions, general practitioners have observed a growing interest in pollution of the interior.

GPs observed a change in the perception of risks during pregnancy, and noticed behavioural changes in the interests of the infant's well-being. The term "fusion" between mother and child was used. Parents were "more receptive" to preventive messages. In addition, the doctors noticed a growing interest in environmental subjects, and pollution of the interior in particular (skin creams, plastic baby bottles, construction work in the child's bedroom, etc.). This period thus appeared as "favourable in terms of prevention" and represented a likely "issue in terms of public health".

Concerning indoor air pollutants, their harmful effects on the health of a child were commonly admitted for tobacco, alcohol, carbon monoxide and lead. However, pollutants related to emerging environmental medical issues were more frequently debated (volatile organic compounds, mould, formaldehyde, particles, mites, etc.). There was a tendency for younger doctors to give more credit to these "new pollutants" than older doctors. The common attitudes of pathologies were dominated mainly by allergic, respiratory and skin pathologies. However, their multi-factorial origin, dose-dependent factors, unknown duration of exposure, and delay until any deleterious effects can be

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detected, were cited as some of the numerous obstacles confronting the evaluation of risk. Occasionally, the participants discussed their uncertainties with respect to the reality of risk, and were mainly concerned by fashionable ideas (electromagnetic fields from telephones or microwave devices, high voltage lines, etc.).

Sources of information: from profane perception to scientific expertise

From profane perception to scientific expertise, the general practitioners established a table of the advantages and drawbacks of sources of information such as media and mainstream press and compared them with more specialised sources of medial information.

Concerning these environmental issues, the press and media for the "public at large" represent widely used and appreciated sources of information, even though some reservations were expressed, mainly concerning the difficulty of managing information: speed of dissemination, strategies of dramatisation or understatement, and a guilt inflicting society. Indeed, all of the participants emphasised the excessive pressure of a guilt inflicting society, which projects the symbolic image of a perfect mother. The quest for absolute security and the extreme sensitivity to any breach of children's health were described as habits which lead to difficulties. Therefore, access to this type of information does not result from any specific research, but represents a "passive" measure corresponding to "scientific noise".

Scientific journals have remained the reference for health professionals, in particular in the case of "active" research on any particular health topic. However, doctors have remained critical with respect to this type of information, in view of scientific progress and the evolution of knowledge.

The role of the doctor in environmental health

Doctors (paediatricians, obstetricians, or general practitioners) have been described as the main actors in preventive environmental health. Despite the occasionally quoted presence of medical indoor environment counselor (MIEC), the lack of doctors specialised in environmental health has placed

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them at the heart of the prevention system. However, several difficulties such as the small number of home visits, the lack of means available for "risk evaluation", and prevention which was already "difficult" to implement during this period, inevitably limited the scope and contributed to a sentiment of powerlessness.

The main expectations were related to the follow-up of their actions by scientific representatives, social workers or the media, thereby favouring eco-citizen education. The reinforcement of professional medical training as well as the accessibility to "practical scientific information" were also quoted as being indispensable.

The implementation of prevention was found to depend on factors of risk acceptability specific to doctors, parents, and organisational factors. The factors related to doctors were their professional and personal beliefs and experiences. The factors related to the parents were their personality profile: "organic" or "anxious", as well as their socio-economic conditions (favouring exposure to indoor air pollution and limiting the actions required to improve the habitat). Finally, the time required and the need for a priority in the prevention messages were the organisationally limiting factors. From the "feeling of danger" to "preventive action", the confrontation of opinions and attitudes sometimes revealed divergences between the doctors' approach, as either a "citizen" or a "health professional". Some doctors spoke of the need to be "convinced" themselves of the potential effects of a certain type of pollution before entering into a discussion with their patients. Others, on the contrary, distinguished between their convictions and passed on preventive messages as soon as any suspicion was raised concerning a particular pollutant.

The concrete modalities for the implementation of prevention in the medical practice were finally debated: information available in the "waiting room" or addressed "during the consultation"; "individual" prevention when requested by patients, or "generalised" prevention. The premises where the information was supplied was one of themes discussed. In general, the doctors who were questioned preferred the lack of personalisation of the waiting room, but emphasised the strong risk of missing the target: patients exposed to a high level of pollution in the home could be socially disadvantaged and less inclined to read the dedicated prevention guides in the waiting room. They

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recommended the interactive and beneficial nature of the consultation in the doctor's office, but feared a saturation of preventive messages during pregnancy or the neonatal period, poorly perceived intrusion into the patient's privacy, or inappropriate anxiogenic reactions. Depending on the groups, adapted prevention could be carried out "individually" when requested by the parents, in the medical practice, or could be delivered in a more "generalised" fashion to a targeted population.

In conclusion, the general practitioners agreed on the idea of applying the paradigm of a reasonable principle of precaution. Indeed, they indicated their willingness to be pragmatic and apply their common sense.

DISCUSSION

Summary of results

Perinatal health is a specific sanitary issue, and a time of privileged sensitisation. Health risks for the infant and the foetus are well known for commonly recognised toxic substances. In the case of more recently discovered forms of environmental exposure, these depend on the doctor's own specific knowledge, culture and experience. The media and medical journals appeared to be the main sources of information. GPs are now adopting a new role in the field of environmental health, whilst at the same time remaining aware of his/her strengths and limitations. The implementation of prevention in the medical practice then depends on several factors specific to the doctor, and also on factors related to the parents and the organisation of healthcare. Improved accommodation of risk considerations in the medical practice will require further evaluation, accompanied by practical actions on the part of health authorities and learned societies.

The strength and limitations of the present study

To the best of our knowledge, no other studies have explored the views of doctors regarding environmental health risks during the perinatal period. The qualitative method was chosen in view of its capacity to bring out new ideas in terms of social attitudes, to evaluate expectations, and to explore the behaviour of populations. The diversity of general practitioners, in particular with respect to their

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difference in age, mode and the location of their practice, and personal and professional experience, was favourable for the development of fruitful exchanges. During the course of the interviews, an "opinion leader" sometimes stood out in each focus group, and was then contained by the moderator; another limiting effect was that of "giving a good impression", or responding to supposed expectations: the aspect of "social desirability" was difficult to avoid. It is possible that the participants sometimes gave a response which was expected, rather than that corresponding to their beliefs or personal convictions. This limitation is however partially taken into account by the focus group principle, which encouraged debate among the participants. Other limits are present in this study. Identification of GPs were not reported in the tables. These data could be of interest, for example to make some hypotheses regarding associations between individual characteristics and perceived role in environmental field. Moreover, it would be important to indicate if the GPs had a low, medium or high activity in pregnancy care or monitoring children because it could influence the involvement of physicians in this field. Few of them had a specific training about environmental health issues. Results concerning "sources of information" or "the role of the doctor in environmental health" could be different in other focus groups. Results of this study probably do not fully describe GPs' sensitisation about environmental health issues and perinatal issues. In two focus groups, some doctors were reluctant to confirm the reality of risk. Overall, focus group samples are usually small and purposively selected. They do not allow for generalization to larger populations. These aspects could be taken into account in further studies.

Comparison with data found in the literature

Most studies regarding the perception of environmental risks focused on physicians' views. Studies related to doctor's perceptions or attitudes of sanitary risk, such as atmospheric pollution, or that related to waste and incineration, have achieved results similar to those presented here^{34,36}. As in the present study, Medina P *et al.*, Attané *et al.* and Lhuilier *et al.* have emphasised the difficulty of establishing a definite link between pathologies and new environmental factors, and thus of evaluating their concrete impact on health. Globally, doctors were poorly informed about the health risks in

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question. Doctors considered the most common sources of information, such as the media and mainstream press, to be comparatively unreliable, and responsible for biases in the perception of health risks. Scientific information was then the only legitimate form of data, in the eyes of the doctors, even if they recognised that they were often unavailable or sometimes the subject of controversy. These similar results were also encountered in the study made by Antson *et al.* In addition, a lack of professional training has often been revealed, in particular by Rotily *et al.* in their quantitative study^{37,38}.

In the United States, Adams *et al.* examined the influence of two dimensions of the pollution exposure experience —the community context and the study's report-back process—on participants' perceptions of exposure³⁹. Participants talked extensively about outdoor pollution, but they were not well informed about indoor exposures. Authors found that participants in a low-income, largely minority community were as capable as the more-educated residents of learning from an intensive report-back study on household air and dust exposure. All participants were capable of understanding scientific ideas such as the notion of cumulative exposure. Altman *et al.* reported interviews conducted with women about environmental chemicals in body fluids and household air and dust⁴⁰. Participants were aware that they lived in a region with elevated rates of breast cancer, several sources of air and groundwater pollution, and a fragile ecosystem. The majority cited local contamination problems (a local military base and Superfund site, two power plants, one nuclear powered, and an extensive history of pesticide application to cranberry bogs, wetlands, and golf courses). Finally, C. Auffret *et al.* performed a french qualitative study to explore parents' perceptions about indoor environment⁴¹. Parents reported becoming increasingly aware of environmental risks during the perinatal period. Their behaviours changed during this period: they painted children's rooms, purchased new furnitures etc. Four profiles of parents have been identified from less sensitised to most pro-actives. Parents had a great trust in their GPs and they were willing to ask questions to them.

Perspectives

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Perinatal care is a special health issue because it is both a time of increased vulnerability and a time of privileged sensitisation. During the regular antenatal care consultations, practitioners should systematically consider social or environmental risk factors because they are as decisive as biomedical risk factors for perinatal health⁴². Social risk factors could include: couple situation during pregnancy, maternal employment, type of health insurance⁴³. Environmental risk factors could include: tobacco smoke, renovation works in the family home to welcome the future baby (paints in the baby's bedroom, new furnitures, other building materials such as carpets or ceiling tiles) as well as reported mold in the house. Specially, if parents or children are affected by some chronic conditions such as asthma, allergy, chronic cough, atopic dermatitis, it would be valuable to detect potentially harmful environmental exposures. Then, some recommendations could be provided by health professionals: Airing rooms regularly at home, reducing the humidity levels in the house (especially in the baby's bedroom), preferring renovation works in the 2d trimester of the pregnancy to minimise pollution to the newborn. Then, GPs are frequently grappling with patients' concerns about pollutants in housings. Recommendations could be to maintain potential exposures "as low as reasonably achievable" (ALARA principle), taking into account that effects are greater in case of a chronic exposition and in case of special vulnerability (perinatal health, chronic medical condition).

The present study allows the apprehension of social attitudes and the initiative of therapeutic education to be reconciled⁴⁴. According to Gaudreau, "taking social attitudes into account in the preparation of educative interventions would favour the development of more highly integrated health (...)"⁴⁵. Our study could thus contribute to the elaboration of research strategies and a health education campaign^{46,47}. One remaining priority is the development of research in order to reduce uncertainties, and to implement regulations. The other priority of environmental health prevention is to reduce social inequalities with respect to risks. The most disadvantaged populations are also the most exposed to environmental issues⁸. The harmonisation of rhetoric, consolidation of medical training for poorly informed doctors during their studies, and development of networks or means for environmental monitoring could become indispensable. The medical indoor environment counselor (MIEC), who are

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relatively poorly known, could make invaluable contributions^{48,49}. However their small number means that their territorial coverage is inadequate. The economic criterion is certainly a factor limiting their actions. Appropriate tools for the practice of urban medicine should be distributed to all doctors, in order to simplify screening or diagnoses. Finally, priority should be given to the practice of preventive medicine in the healthcare system, by promoting home visits, and providing eco-citizen education in order to promote an environmental culture. All of these proposals are designed to assist the general practitioner in taking a greater interest in environmental health.

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DECLARATION

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AUTHORS CONTRIBUTIONS

GI, JSC and AMM designed and managed all aspects of the research. JZ participated in the acquisition, and interpretation of data. GI and JZ wrote the first draft of the paper and contributed to later drafts. ML, CR commented on the paper. All authors read and approved the final manuscript.

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