PRIMARY PREVENTION OF CONGENITAL ANOMALIES

EUROCAT (European Surveillance of Congenital Anomalies) and EUROPLAN (European Project for Rare Diseases National Plans Development)

Recommendations on policies to be considered for the primary prevention of congenital anomalies in National Plans and Strategies on Rare Diseases

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Purpose of the recommendations

Most congenital anomalies are rare and form an important group of Rare Diseases, for which EU Member States are developing National Plans. Primary prevention of congenital anomalies was identified as an important action in the field of Rare Diseases in the Communication from the Commission to the European Parliament, the Council, the European economic and social committee and the committee of the regions of 11th November 2008. However, it has not been included in the Council Recommendation on an action in the field of rare diseases of 8th June 2009. This document aims at providing an outline of evidence-based policy actions for primary prevention of congenital anomalies. It does not seek to recommend specific policy options, rather to indicate the areas that Member States could target in their strategies for Primary Prevention of congenital anomalies. EUROPLAN(1) will support and facilitate Member States to incorporate the recommendations specified here in their National Plans, and will facilitate exchange of experience among Member States, in collaboration with EUROCAT(2).

The causes of congenital anomalies can be environmental, genetic or an interaction involving both genes and environment(3). Within the scope of this document, primary prevention includes any evidence-based action aimed at reducing environmental risk factors for congenital anomalies and increasing protective environmental factors. Such factors act in the periconceptional period, most often before the pregnancy has been confirmed. Whereas actions based on the precautionary principle fall mainly outside the scope of this document, in some cases precautionary actions have been quoted when may bear significant public health and/or social benefits. Primary prevention also includes preconceptional counselling concerning genetic risk, but does not include preimplantation diagnosis.

Primary prevention of congenital anomalies includes factors that are common to other diseases as well as factors specific to congenital anomalies. Policies aimed at promoting safer foods and environment, healthy dietary habits and lifestyles as well as reducing the health impact of chronic diseases are expected to reduce the prevalence of congenital anomalies as well as many other diseases. However, elaboration of these policies needs to pay special attention to their relevance in the pre- and periconceptional period.

Rather than pinpointing specific actions, which may have a limited impact in isolation, it is advisable that Member States would integrate the different recommendations within a strategy for Primary Prevention.
The scope of policy actions needed for primary prevention of congenital anomalies

In the field of medicinal drugs
- to advise women taking medication to seek medical advice before trying to get pregnant\(^4\);
- to ensure that guidelines are, or are going to be, made available for physicians regarding risk-benefit balance for use of medications in pregnancy, particularly those medications used for treating chronic diseases\(^5\);
- to provide a teratogen information service where specialized advice can be sought by women and professionals\(^6\);
- to conduct postmarketing pharmacovigilance to detect any risk of congenital anomalies associated with use of medications, with the support of population-based congenital anomaly registries\(^7\).

In the field of food/nutrition and lifestyle
- to improve folate status through periconceptional supplementation with folic acid, promotion of the consumption of foods rich in natural folates, and the appropriate use of fortified foods\(^8\);
- to prevent overweight/obesity and underweight\(^9-11\);
- to promote effective information on diet and nutrition in women at childbearing age, minimizing the risks of deficiency and/or overdosing of vitamins and essential trace elements\(^12\);
- further to the implementation of EU food safety strategies, to prevent food contamination by recognized developmental toxicants\(^13\);
- to reduce active and passive smoking\(^14\);
- to promote alcohol avoidance in women who are pregnant or wishing to get pregnant\(^15-18\);
- to pay special attention to diet and lifestyles in communities with low socio-economic status or of recent immigrants.

In the field of health services
- to make available preconceptional care including genetic testing and counselling for families at risk\(^19\);
- to ensure that women with diabetes, epilepsy and other chronic diseases receive preconceptional care in order to minimize the risk of congenital anomalies\(^20\);
- to ensure evidence based vaccination policies to ensure women are protected against infectious diseases associated with congenital anomalies and avoid contraindicated vaccinations during pregnancy\(^21\);
- to include in school educational programs the awareness that congenital anomalies may be caused very early in pregnancy, often before the pregnancy is confirmed, and hence healthy practices should start preconceptionally;
- to include consideration of specific pregnancy-related actions in public health action plans on all the major health determinants.

In the field of environmental pollution including the workplace
- Further to the implementation of EU policies on high-concern chemicals, to ensure both regulatory actions and risk communication towards citizens in order to minimize exposure to pollutants identified as teratogens\(^22\),
to ensure a suitable surveillance system where environmental risks can be identified through the integration of congenital anomaly registers with developments in biomonitoring;\(^{(23)}\)

- to minimize exposure of pregnant workers in their workplace to risk factors for congenital anomalies (chemical, physical and biological)\(^{(24)}\).

**Types of primary preventive actions and their effectiveness**

A number of types of primary preventive action can be identified:

1. Advice to future parents by health professionals during individual preconceptional and early pregnancy consultations, tailored for high and “low” (average population) risk couples.
2. Health education campaigns targeted to potential future parents.
3. EU-based and/or national regulatory actions which affect risk factors at source such as medicines, chemicals, infectious agents, foods, tobacco and alcohol and other recreational drugs.
4. Surveillance, research and evaluation generating evidence for the initiation or updating of primary preventive measures. This includes also the establishment of expert committees to review evidence.

The effectiveness of targeted actions towards primary prevention of congenital anomalies is expected to be markedly improved by:

- an integrated primary prevention plan involving all relevant health professionals, thus avoiding isolated and/or uncoordinated actions/recommendations;
- Implementation and refinement of EU food and environmental control programs providing special attention to congenital anomaly risk factors;
- proper evaluation and integration of new scientific knowledge into public health actions;
- ensuring preconception health care in local public health programs\(^{(25-29)}\), while recognizing that many pregnancies are unplanned;
- availability of epidemiological surveillance data from population-based congenital anomaly registers, to monitor the effectiveness of services and interventions to build a sound evidence base for policy development planning and action;
- to ensure sustainability through national and international funding.

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These footnotes are intended as a brief guide to the scientific evidence and its main messages for policy, not as an exhaustive review of the evidence.

(1) European Project for Rare Diseases national Plans (EUROPLAN) - website http://www.europlanproject.eu

(2) European Surveillance of Congenital Anomalies (EUROCAT) - website http://www.eurocat-network.eu/

(3). In the context of these Primary Prevention recommendations, “environmental” is used in its broadest sense as non-genetic (although interacting with genetic factors), encompassing physical, chemical, biological and social factors, concentrating on factors which are potentially modifiable. This broad definition follows that of the US National Institute of Environmental Health Sciences which defines environmental exposure broadly to include not just chemical environmental pollutants, but also diet, pharmaceuticals, stress, pre-existing disease, and use of addictive substances.


   d) Martinez-Frias, M-L (2010). Can our understanding of epigenetics assist with primary prevention of congenital defects? 47: (2). 73-80 (Available at: http://jmg.bmj.com/content/47/2/73.full.pdf+html)


(5) Medications of particular concern include antiepileptics, folate antimetabolites, antiblastic agents, warfarin and related anticoagulants, retinoic acid derivatives, ACE-inhibitors and AT1 receptor antagonists.


However, information on the human teratogenicity of most medications is limited.


There is extensive literature investigating the relative teratogenicity of different antiepileptic medication (Available at: http://www.eurocat-network.eu/preventionandriskfactors/medicationduringpregnancy/medicationpublications)

For antiasthmatics and antidepressants, national guidelines need to take into account the growing evidence base.

Medication During Pregnancy pages of EUROCAT (Available at: http://www.eurocat-network.eu/preventionandriskfactors/medicationduringpregnancy/medicationintroduction)

(6) European Network of Teratology Information Services - website http://www.entis-org.com/

(7) EUROmediCAT Project - website http://euromedicat.eu/whatiseuromedicat
Strong scientific evidence showed folate rich diet and periconceptional supplementation with folic acid (the synthetic form) is effective in reducing the prevalence of Neural Tube Defects (NTD) and other congenital malformations, and an adequate folate status in women before pregnancy is a protective factor toward these pathologies. In 2009 EUROCAT published a special report highlighting that the majority of women in Europe were still not taking folic acid preconceptionally and/or were beginning to take it too late to prevent congenital anomalies after their pregnancy had been confirmed. As a result, the impact of policy on the rate of NTD in the population was minimal, and socioeconomic inequalities widen due to differences in knowledge. Furthermore the dietary intake of folates may not be sufficient to protect vulnerable women. Many non-European countries, such as U.S.A. and Canada, have instituted mandatory food (flour) fortification with folic acid as a way forward, with a positive impact in reducing NTD prevalence. However, fortification also raises concerns about the possible “side effects” of high folic acid intake in non-target population groups, which might be related to increased cancer promotion. In 2009 the scientific committee organised by EFSA concluded “There are currently insufficient data to allow a full quantitative risk assessment of folic acid and cancer or to determine whether there is a dose-response relationship or a threshold level of folic acid intake associated with potential colorectal cancer risk. The current evidence does not show an association between high folic acid intakes and cancer risk but neither do they confidently exclude a risk. The uncertainties in relation to cancer risk highlight the importance of ensuring monitoring systems are set up for assessment of folic acid intake and status and NTD and cancer incidence in countries that decide to introduce mandatory fortification.”

c) EFSA (European Food Safety Authority), 2009. ESCO report prepared by the EFSA Scientific Cooperation Working Group on Analysis of Risks and Benefits of Fortification of Food with Folic Acid. (Available at: http://www.efsa.europa.eu/en/scdocs/scdoc/3e.htm)


Particular attention should be given to:
- deficiency of Vitamin B12 and B6, since they are needed for proper metabolism of folates;
- Zinc deficiency as a risk factor for neural tube defects in communities from developing Countries.

In addition pregnant women should avoid an excessive exposure to vitamin A associated to liver consumption and taking supplements containing vitamin A.

(13) A recognized example of a food contaminant highly relevant to the safety of the unborn child is methyl mercury in certain fish groups.


b) US Food and Drug Administration:
   - http://www.fda.gov/Food/ResourcesForYou/HealthEducators/ucm081877.htm (7/03/2012)
   - http://www.fda.gov/Food/ResourcesForYou/HealthEducators/ucm083324.htm (7/03/2012)

The developmental hazards (especially urogenital malformations) from dietary exposure to endocrine disrupters also deserve consideration, see also below Environment.


(14) Active Smoking is a risk factor for congenital anomalies.


The evidence regarding passive smoking is more difficult to establish, but is considered to be biologically plausible


(19) Preconception health refers to the health of women and men during their reproductive years. It focuses on steps that women, men, and health professionals can take to reduce risks, promote healthy lifestyles, and increase readiness for pregnancy.


Proposed Recommendations from published research and recommendations from the Centers for Disease Control and Prevention (CDC):

1. Individual Responsibility Across the Life Span - Each woman, man, and couple should be encouraged to have a reproductive life plan. Individuals identified as having a family history of
developmental delays, congenital anomalies, or other genetic disorders should be offered a referral to an appropriate specialist to better quantify the risk to a potential pregnancy.

2. **Health Professionals' responsibility** - The challenge for health professionals is to reach women and men with these interventions at the time they will be most effective in reducing risks. Suspected genetic disorders might require further workup prior to conception. Known or discovered genetic conditions should be managed optimally before and after conception. As a part of primary care visits, provide risk assessment and educational and health promotion counselling to all women of childbearing age to reduce reproductive risk and improve pregnancy outcomes.

3. **Consumer Awareness** - Increase public awareness of the importance of preconception health behaviours and preconception care services by using information and tools appropriate across various ages; literacy, including health literacy; and cultural/linguistic contexts.

4. **Research** - Increase the evidence base and promote the use of evidence to improve preconception health.

5. **Monitoring improvements** - Maximize public health surveillance and related research mechanisms to monitor preconception health.

**Pearls for Practice**

- Women should also be informed that preconception care can improve health outcomes for both mother and baby. First, ask every woman of reproductive age whether she intends to become pregnant in the next year. Asking every woman about her reproductive intentions promotes the idea that pregnancies should be intended. Second, inform women that health conditions and medications can affect pregnancy outcomes. J Am Board Fam Med. 2007; 20:81-84.

- During preconception screening visits, clinicians should focus on issues such as folate supplementation, hypothyroidism management, obesity control, hepatitis B vaccination for at risk women, and rubella vaccination among previously unvaccinated women.

(20) Maternal Diabetes is a well established risk factor for congenital anomalies, but the excess risk can be almost eliminated with good glycaemic control. Health services must be organized to ensure that all women with diabetes have preconceptional care to achieve optimal glycaemic control.


(21) Vaccination against maternal rubella is a core element of any primary preventive strategy as rubella during pregnancy is a strong teratogen. Countries should consider their coverage of women, whether immigrant women are offered vaccination, and whether women found at first pregnancy not to be immune are offered vaccinations to protect them in subsequent pregnancies. Other vaccinations should also be considered. Vaccination during the first trimester should only be given where there is evidence of safety or evidence of a favourable benefit-risk balance.


(22) The “environment” as used here is all the physical, chemical and biological factors external to the human host, and all related behaviours, but excluding those natural environments that cannot reasonably be modified. This definition excludes behaviour not related to environment, as well as behaviour related to the social and cultural environment, genetics, and parts of the natural environment.


In the field of the environmental causes of congenital anomalies evidence is still limited and inadequate to show a causal association; however, the biological plausibility and special vulnerability of the fetus supports precautionary actions (Communication from the European Commission on the precautionary principle. Brussels - 2000). In particular, reduction of the level of exposure to hazards acting on a large-scale, such as air pollutants, byproducts of drinking water disinfection and pesticides should be recommended.


Endocrine disrupters are recognized risk factors for reproductive disorders during puberty and adulthood; however, evidence indicates that higher exposure levels may increase the incidence of urogenital malformations such as cryptorchidism and hypospadias.


(23) There is a general consensus that further elucidation of the links between environmental exposures and congenital anomalies must come through linking biomarkers and congenital anomaly surveillance approaches.


(24) Pregnant women at work must be protected from teratogenic exposures. The challenge is to do this in early pregnancy, often before the pregnancy has been confirmed or employers are made aware. This issue should be addressed in occupational health policies. Occupational exposures of concern include pesticides, any endocrine disrupting exposure and organic solvents.


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