

Risk Factors Associated with Congenital Malformations in Newborns: A Study of 40 Cases at the Mother and Children-Marrakech Hospital

Souad. EL Mouahid¹, Jihane. Chajie², Issam. Ait Zaka³, Mohammed. EL Brahmi³ and Youssef Ait Bahssain³

¹Teacher and Responsible of the research unit - Higher Institute of Nursing and Health Professions in Marrakesh, Morocco.

²Teacher and Midwife- Institute of Nursing and Health Professions in Marrakech, Morocco.

³Nursing students.

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ABSTRACT

The present study aimed to describe the risk factors of Congenital malformation recognizable at birth in newborns in Marrakech Hospital from March 1 to May 31, 2017 on a sample of 40 cases of CM. The results showed that the mothers of the malformed children are young from a socioeconomic and cultural background. The malformations found were Hypospadias (30%) and hydrocephalus (28%). The etiological factors found were consanguinity, heredity, consumption of fenugreek, self-medication, no intake of folic acid during pregnancy. Considerable means for the motivation of health professionals to cope with the means of prevention and the constraints of nursing care

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Introduction

Congenital malformations are present at birth, according to the WHO, a major cause of childhood morbidity and mortality in many countries, even though they are not a priority in the health policies of developing countries development, they often pose diagnostic and therapeutic problems and are associated with heavy mortality (WHO, 2010) [1]. They are also known as congenital disorders or congenital anomalies, and can be defined as structural or functional (for example metabolic disorders) that occur during intra uterine life and can be identified before birth, at birth, or later in life according to Ouail. BENZEROUALE in 2017 [2].

According to data from the World Health Organization in 2014, it is estimated that every year more than 7.9 million children, or 6% of the total number of births worldwide, are born with severe congenital disorder due to genetic or environmental causes. About 7% of all neonatal deaths in the world are due to congenital anomalies and 276000 newborns die before the age of 28 days due to congenital anomalies. In fact, three-quarters of newborn deaths occur during the first week of life (WHO, 2014) [3]. In Europe, in 1996, the infant mortality rate due to congenital malformations was estimated at 30% [1]. A hospital-based study in the United States found that birth defects and genetic abnormalities account for 34% of neonatal deaths, 16.7% of these congenital malformations were of chromosomal origin (Stevenson DA, Carey JC 2004) [4].

Like other countries, the situation in Morocco is similar. We have very little study on congenital malformations. A prevalence of 4% has been reported according to a study conducted by Omar BAYOUMI in 2015 [5]. The few data found in Côte d'Ivoire (Coulibaly-Zerbo and al., 1997) [6] and Congo Brazzaville (Mayanda and al., 1991) [7] attributes congenital malformations to a hospital frequency of 5%. A prospective study at University Clinics in Kinshasa resulted in an incidence of 2.5% of live births (Sengeyi and al., 1990

cited by Toni Kasole LUBALA, 2012) [8] and in a multicentre study conducted in Kinshasa in 2004 suggested an incidence of 0.57% (Tabu, 2004) [9]. The same year, in Lubumbashi, during a five-year retrospective study conducted in the main medical units of the city, 166 cases of congenital malformations were observed out of a total of 22538 births, is a prevalence of 0.74% (Kalwaba and al., 2004) [10].

According to several studies [1 and 2], there are major and minor malformations. Major malformations give the individual a very serious handicap even death and minor malformations for example brachydactyly have no serious consequences for the individual [1]. These malformations can be extremely varied and can affect any system: for example the skin (angioma), the cardiac system, the skull (microcephaly), the nervous system, the intestines, the genitals or limb malformations and others [2].

Congenital malformations according to the WHO in 2013 are a group of various disorders of prenatal origin that can be caused by single gene abnormalities, chromosomal disorders, multiple hereditary factors, teratogenic agents in the environment and micronutrient deficiencies (WHO, 2013) [11]. Some maternal infectious diseases, such as syphilis or rubella, are a major cause of congenital malformations in low- and middle-income countries. Maternal diseases, such as diabetes mellitus, certain medical conditions, such as iodine or folic acid deficiencies, and exposure to drugs and recreational drugs, including alcohol and tobacco, to certain chemicals in the environment and high dose radiation are other factors causing congenital malformation. According to the WHO report in 2010, for 50% of congenital anomalies, one cannot associate a specific cause, there are nevertheless well-known causes or risk factors [1].

In Morocco, congenital malformations are a major cause of morbidity and neonatal mortality. Indeed, according to the study of N. Sabiri A and al in 2013 [12], approximately three million children are born each year with major malformations and are responsible for 495000 deaths which can be for lack

of studies on the epidemiological plan, or by religious, economic, medico-legal and sociocultural constraints.

This problem can be a threat to the health of children. On the other hand, the birth of a malformed child is experienced in Moroccan society as a real tragedy and a problem of public health, given the social, economic, cultural and health considerations that constitute a real burden for families.

Few studies in Morocco address this health issue. In fact, according to a study carried out at the Rehabilitation Service level of the Ibn Tofail Hospital in Marrakech (S. El Mouahid and al., 2016), it has been shown that among the risk factors in children with Spina Bifida, non-pregnancy follow-up and non-use of folic acid during pregnancy with 73% of cases [13].

According to Toni Kasole Lubala in 2012 [8], the lack of birth defects registry in developing countries partly explains this ignorance and thus they are not a priority in their health policies, which has the consequent problems diagnosis and treatment with an increase in the mortality rate. Prenatal screening that is strictly a public health policy (strategy) and uses techniques that do not pose a risk for pregnancy is addressed to all couples [2, 14]: some examinations are compulsory (syphilis, toxoplasmosis, and rubella), the taking of folic acid medication, the monitoring of pregnancy and the respect of prenatal consultations. Other examinations are proposed (prenatal diagnosis) to couples whose increased risk of congenital anomalies has been identified by ultrasound and / or biological screening techniques are therefore carried out almost systematically (fetal ultrasound) or very largely (serum screening for trisomy 21) [14-17]. In parallel with this conduct, several specific actions are therefore proposed in the 2012-2016 sector strategy targeting the strengthening of maternal and child health at the national level, including the introduction of free biological tests of pregnant women; Setting up a visible circuit for the specialized care of high-risk pregnancies; Revision of preventive supplementation of pregnant women with iron and folic acid and other micronutrients; Reinforcement of the operationalization of the mini-analyzers of biological and hematological examinations; Strengthening the prenatal consultation package and increase the number of prenatal consultations (5 instead of 4)

Indeed, the etiology of these malformations is multifactorial, determined by a set of genetic, environmental and medicinal factors [2-3, 18]. On the other hand, knowledge of these risk factors would make it possible to act to reduce their incidence and consequently reduce the neonatal and infant mortality rate. In this sense, the present study tries to better know and identify the risk factors involved in the occurrence of congenital malformations in our context at the level of pediatric service at the Mother and children - Marrakech Hospital.

Materials and Methods

We conducted a quantitative descriptive study from March 1, 2017 to May 31, 2017 that took place at the Pediatric Department of the Mother and Child Hospital, CHU Mohammed VI - Marrakech. It involved all service-level nurses who used a structured questionnaire and also 40 mothers of malformed children selected by the accidental sampling method, which we used as an Interview guide with these mothers. The interview includes questions to identify the environmental, medical and personal factors. These two methods of data collection are therefore tested on a small sample in order to make corrections. The collected data will respect anonymity and confidentiality and will then be entered and analyzed by the Excel 2010 software

Results

1. Types of congenital malformations encountered

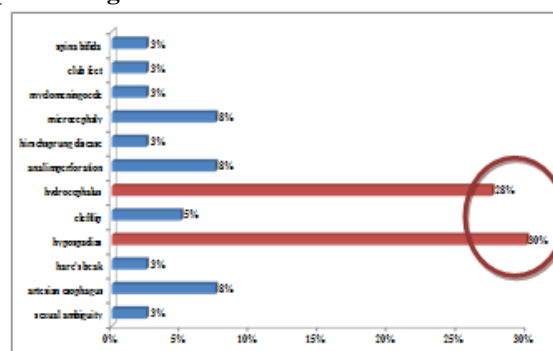


Figure 1. Distribution of congenital malformations by type of malformation.

The graph (Figure 1) shows that malformations of hypospadias and hydrocephalus are ranked first with 30% and 28% respectively followed by microcephaly and anal imperforation and atresia esophagus with 8% respectively. Spina bifida and clubfoot and sexual ambiguity represent only 3% of cases.

2. Congenital malformations and personal factors

The interpretation of the data collected by the interview guide from 40 mothers of malformed children has allowed decelerating personal, environmental and medical risk factors

a. Characteristics of mothers of malformed children

Table 1. Distribution of characteristics of mothers of malformed children.

characteristics of mothers	Effective %
According to the age group of the mothers	
Less than 20 years	23%
Between 20-40 years	65%
Over 40 years old	12%
According to the origin	
Urban	43%
Rural	57%
Distribution by socioeconomic level of mothers	
Low level	63%
Average level	32%
High level	5%
Distribution according to the profession of the mothers	
without profession	20%
with profession	80%
The level of education	
Illiterate	40%
Primary studies	23%
Secondary studies	32%
University studies	5%
Distribution according to the presence of a health insurance	
CNOPS	14%
CNSS	8%
RAMED	55%
Without	23%
Distribution by History of Malformed	
Distribution by History of Malformed Child	Non 72%
	Oui 28%
Distribution by history of malformations in father and / or mother	Non 30%
	Oui 70%

According to this table 1, we find that the age group of mothers of malformed children is between 20 and 40 years old with 65%. 57% of the mothers of malformed children are from rural origin and 43% come from urban origin.

As well as the low socioeconomic level is the most dominant with 63% followed with the average level (32%). Mothers of malformed children without a profession account for

80% of cases and only 20% have a job. The most dominant levels of education are illiterate (40%) and primary studies (23%). The majority of mothers present a scheme of medical assistance to the economically deprived (RAMED) with 55% followed by cases that have no health insurance (23%)

It is clear from the results presented that 72% of mothers of malformed children do not have a history of malformed children. However, 70% of them claim a history of parental malformations

b. According to parents' factors

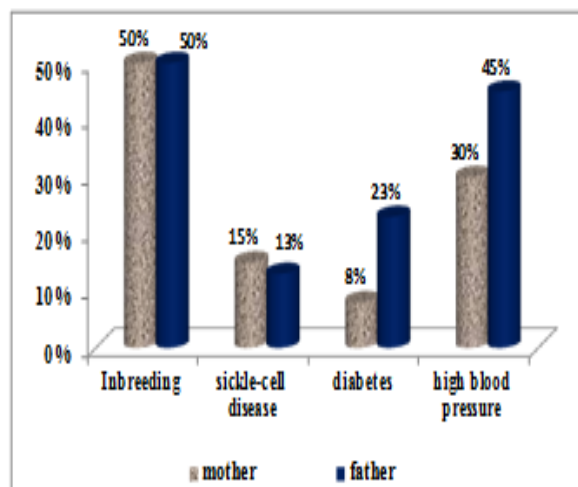


Figure 2. Distribution by parental factors.

Figure 2 shows a frequency of 50% consanguinity in fathers and mothers, 15% sickle cell disease in mums and 13% in fathers, 8% of diabetic mothers, and 23% of diabetic fathers, 30% and 45% of high blood pressure in mothers and fathers respectively.

c. Congenital malformations and pregnancy monitoring

Table 2. Distribution according to pregnancy monitoring.

Distribution according to pregnancy monitoring	
Yes	52%
No	48%
Distribution according to the achievement of pregnancy Test	
Yes	42%
No	58%
Distribution by type of unrealized Test	
Toxoplasmosis	53%
Rubella	53%
Complete Blood Count (CBC)	50%
Blood Grouping Test	50%
Distribution according to the presence of anemia	
Yes	80%
No	20%
Distribution by iron intake / folic acid	
Yes	27,5%
No	72,5%

Half of the mothers of malformed children did not follow their pregnancies during the prenatal period (48%). More than half of women (58%) have not completed specialized pregnancy Tests. According to our results, it is clear that 53% of the mothers did not carry out the analysis of the Rubella and toxoplasmosis and 50% did not carry out the analysis of Blood Count (CBC) and Blood Grouping Test. On the other hand, Table 2 shows that the majority of mothers of children malformed are anemic (80%) of cases and only 27.5% took their iron / folic acid during pregnancy on the total.

3. Congenital malformations and environmental factors

a. According to the contact with other environmental products

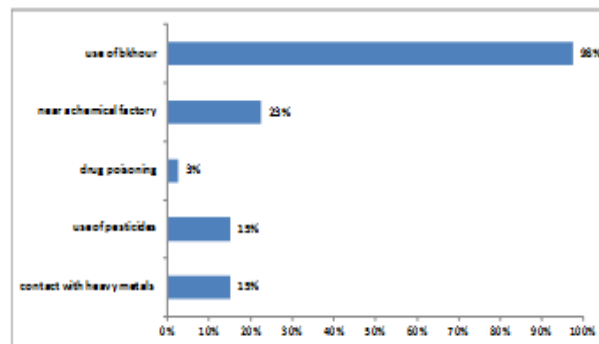


Figure 3. Distribution according to environmental factors.

We note from Figure 3 that 98% of moms use bkhour followed by 23% of these moms live near to chemical factory. Only 15% of cases use pesticides and contact with heavy metals

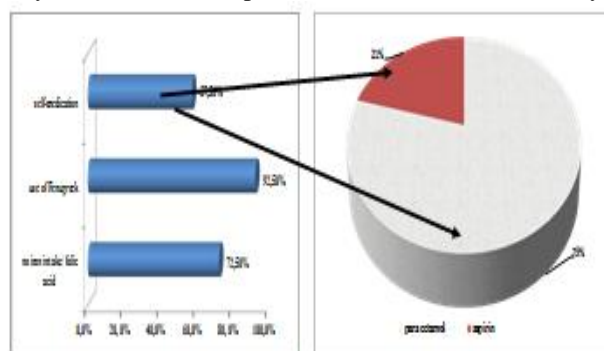


Figure 4: Distribution according to medication and

Figure 5. Distribution according to the drugs most used.

We note (Figure 4) that 92.5% of mothers consuming fenugreek, 72.5% of mothers did not taking iron / folic acid and 57.5% of mothers took non-prescription drugs (self-medication). Figure 5 reveals that paracetamol is the most used by mothers of malformed children (79%)

4. Nursing care of congenital malformations

The Questionnaire data for nurses is analyzed, interpreted and is presented below

i Distribution of congenital malformations according to risk factors identified by nurses

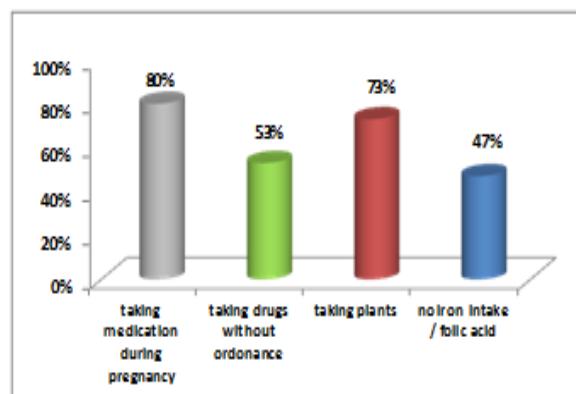


Figure 6. Distribution of Nurses' Responses by Drug and Other Factors.

According to the survey of 15 nurses we note from their estimated responses that 47% of moms do not take folic acid / iron, 53% take without prescription drugs, 73% take plants and 80% use drugs during their pregnancies.

ii. Management of congenital malformations encountered by nurses

Table 3. Nursing care of malformed children.

Nursing care of congenital malformations		
	Oui	Non
Difficultés of Nursing Care	53%	47%
Existence of Support Protocol	13%	87%
statement of congenital malformation to poison and pharmacovigilance center of Morocco	13%	87%

Table 3 clearly shows that 53% of nurses claim difficulties in taking care of malformed children. 87% of nurses say there is no nursing protocol and only 13% report malformation in CAPM

Discussion

1. The frequency of types of congenital malformations (CMs)

Malformations of hypospadias and hydrocephalus are classified in our study in the first place with 30% and 28% respectively. In the study by Sabiri and al, carried out at the Souissi maternity hospital in Rabat, Morocco [12], the cases of poly malformations are the most frequent, followed by cleft palates, spina bifida, anencephalias, hydrocephalic and imperforate anal. Similarly, the results reported by the Ouail. BENZEROUALE survey at the El IDRISI maternity hospital in Kenitra- Morocco that polymalform cases are the most frequent with a percentage of 35% followed by cases of anencephaly with 11.8% and then a percentage of 7.35% for each case of hydrocephalus, spina bifida, cleft palate. In fact, the percentage of types of malformations differs from one country to another as well as from one region of another in the same country. According to the American study [22], premature newborns had a higher prevalence of cardiac malformations, followed by genitourinary malformations and neurological malformations. On the other hand, according to the Nigerian study, the most frequently found malformations are cleft lip / cleft palate and neural tube defects (cited by Ouail BENZEROUALE in 2017).

2. Parental factors

Our study showed (Table 1) that women aged between 20 and 40 years have the highest prevalence rates of malformed children (65%). Indeed, our survey clearly showed that the risk of congenital malformation is therefore observed at a childbearing age (20 - 40 years) more than an age of less than 20 years (23%) and an age greater than 40 years (13%). These results corroborate with those obtained according to the study of Ouail. BENZEROUALE in 2017 which showed that the average maternal age of mothers of malformed children was 29.5 years with extremes ranging from 18 years old to 42 years old. According to several studies [19-21], congenital anomalies are more common at each reproductive age end.

The percentage of malformations is higher among families with a low socio-economic level (63%) and a very low level of education (40% illiterate and 23% of a primary studies). The economic, social and cultural situation clearly intervenes as risk factors and especially that more than half of the women (58%) do not realize their pregnancy tests requested during the period of pregnancy namely Toxoplasmosis with rubella (53%) and Complete Blood Count (CBC) with blood grouping test (50%). According to the WHO [3], CMs are more common in families where countries with limited resources. It is estimated that approximately 94% of severe CMs occur in low- and middle-income countries. The profession makes it possible to improve the economic situation which makes it possible to ensure a good follow-up of the pregnancies. In fact, our study found that 80% of mothers of children CMs have no profession.

So pregnancy monitoring through follow-up and prenatal check-ups are not practically performed by all women, and the majority of mothers do not benefit from health insurance which allows the reimbursement of the costs of analysis and medication. However, only 42% have completed pregnancy tests. The serology of toxoplasmosis and rubella was achieved by only 48% of mothers.

In the same reasoning, Mothers with low educational attainment were more likely to have congenital offspring than those with a Level of Education [2]. In addition, rural life was associated with malformed children regardless of paternal exposure. In fact, our study confirms that the origin of mothers is a risk factor. So 58% of mothers come from rural origin. These results are similar to those observed by Li X and al., in 2013 [23] whose this situation can be explained by the gap between the environments in terms of education and the notion of pesticide exposure.

Periconceptional maternal nutrition is an important determinant of pregnancy outcomes because the availability and supply of essential nutrients to the developing fetus depends on maternal nutritional status. Indeed, diet supplements with iron and folic acid tablets are part of the wellness program of the Department of Health and Family. Unfortunately, consumption is low especially shown by our study that 80% of cases are anemic and only 27.5% took their iron associated with folic acid during pregnancy. These results have been widely confirmed among professionals providing care for malformed children and according to the study by S. EL MOUAHID and al (2017) [24]. The lack of iron associated with folic acid in the daily diet is a high risk. Some studies [25-27] have shown that prenatal folic acid and other multivitamin supplementation significantly decrease the birth prevalence of some CM.

Indeed, before any treatment or any biological explorations, the first intervention must be prevention. Nutritional counseling should be given to patients. In case of difficulties, referral to a dietician is quite possible. According to Thierry Harvey in 2015 [28], taking 400ug / day of folic acid before and during early pregnancy can significantly reduce the incidence of neural tube defects such as Spina Bifida.

Heredity is a risk factor for the occurrence of congenital malformations. According to our results, 70% of CM cases have parents with a history of malformation. These results were observed by the study at the Souissi Rabat maternity level (Sabrina et al, 2013), which the rate was 48.7% [12]. Other than heredity, similar to Ouail BENZEROUALE study, Inbreeding has been described as the main factor related to the occurrence of congenital malformations whose the rate was 50%. The diabetes factor and High blood pressure were observed as risk factors in our study. These results were confirmed by Sheffield JS and al in 2002 [29] who showed that type 1 and 2 diabetes mellitus was associated with an increased risk of CD. These are 3 to 4 times more frequent than in the general population.

3. Medication and other factors

During pregnancy, 57.5% of mothers did self-medication. 80% of nurses providing care confirmed the taking of drugs during pregnancy and according to them 53% have self-medication. The majority of medications taken by moms are paracetamols with 79%. A team of scientists associating French, Danish and Finnish researchers has just published a study suggesting that there is an association between the simultaneous use of several pain medications (ibuprofen, aspirin, paracetamol) during pregnancy and risks of malformation of the genital tract in boys. The risk is particularly high in the second trimester of pregnancy [30]. In our context, mothers of malformed children consumed fenugreek (the medicinal plants of Arabic name

HELBA) with 92.5%. In Morocco, a study in 2006 was targeted on ingestion of fenugreek during pregnancy confirmed the occurrence of congenital malformations of type hydrocephalus and Spina bifida and biopalatin due to probably abnormal proliferations of neurons and cells with severe stunting (Skalli S. 2006) [31]. Thus, the seeds of fenugreek would be widely used in Morocco in folk medicine: against sterility, anemia and jaundice, to stimulate appetite, treat dysentery and dyspepsia and control blood sugar. The plant is considered a real remedy. A very exhaustive search of the literature has shown that fenugreek seeds are discouraged during pregnancy. Several cases of anencephaly, hydrocephalus and spina bifida have been observed after ingestion of fenugreek during pregnancy [2, 12, 31]

Similarly, in the context of environmental factors, the study showed that 98% of the mothers practiced El Bkhour during their pregnancy. El Bkhour, also called incense in scented grains, is a practice of Arab culture. It comes from a mixture of several materials: sandalwood, agar, incense resin, natural essential oil and sometimes the grains of harmel, chebba ... The one found at the herbalists market sold at a price accessible to all budgets. As soon as it heats, its scent is diffused in every corner [32]. Indeed, *Peganum harmala* L. (harmel) is traditionally used in the Middle East and North Africa as an emmenagogue, abortionist or to activate childbirth. Unfortunately, ignorance of contraindications and failure to respect doses make these plants become a real poison, alert the poison and pharmacovigilance center of Morocco [33-36]. Pregnant Moroccan women use the seeds of the plant for abortion or to facilitate childbirth, which can lead to serious accidents that sometimes lead to a fatal outcome. In Morocco, harmel intoxication is not uncommon: it represents 4.6% of all plant poisoning received at CAPM [38]. Poisoning has been reported from the fumigation of this plant, which is a common practice for either therapeutic or prophylaxis purposes [37-38].

Nursing care for malformed children reveals difficulties with 53%. According to several studies [2,8], several factors are incriminated in the future of new born malformed namely the nature of the malformation, the notion of prematurity, the quality of the care which makes therefore the presence of the problems of diagnostic and therapeutic with an increase in the mortality rate. The obstacles are identified in the absence of a protocol for the management of malformed children and the total absence of case reporting at the level of the teratovigilance service of the Poison Control Center and pharmacovigilance of Morocco CAPM. This declaration is a priority of the Ministry of Health and the declaration helps to reinforce the efforts as well as to guide a good strategy of sensitization and an adequate support. Good ongoing training and a guide to care for these malformed children will alleviate the complications of this anomaly.

Conclusion and Recommendations

Congenital anomalies are the leading cause of death and neonatal and infantile disability in our country. They are a real public health problem at the national level. The origin of these malformations is multifactorial determined by the interaction of genetic, medicinal and environmental factors. In all cases, pregnancies not followed and lack of iron / folic acid intake as well as socioeconomic and cultural levels are among the most observed risk factors. Taking non-prescription medications and the use of medicinal plants, namely fenugreek and El bkhour, are also considered to be factors in this anomaly. The identification of risk factors specific to each country allows specific prevention measures. Surveillance of pregnant women, education of young women of childbearing age and monitoring

of pregnancies should be public health priorities. Prenatal diagnosis should be done to allow better management.

Our results allow us to recommend:

Sensitize pregnant women of reproductive age on the risk factors for having malformed children

➤ Educate and care for pregnant women during prenatal consultations to identify risk factors

➤ Treat any curable condition that may be the cause of congenital malformation.

➤ Strengthen the policy of women's supplementation with folic acid in the periconceptional period and the danger of self-medication

➤ Sensitize pregnant women during prenatal consultations regarding the teratogenic effect of fenugreek.

➤ Provide hospitals with a laboratory for the analysis of Toxoplasmosis and rubella pregnancy assessments, free of charge

➤ To sensitize nursing staff on the interest of malformed case reporting at CAPM level

➤ Provide services through a protocol for the care of malformed children

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