Original Research Article

Preliminary study of the prevalence of hypotrophy and fetal alcohol syndrome in Antananarivo, Madagascar

Mbolanirina L. Rakotomahefa Narison^{1*}, Arthur B. A. Ratsimbazafy², Zo L. Andrianadison³,
Honore S. Raobijaona⁴

¹Paediatrician, Pilot Unit of Paediatric Oncology, CHU JRA, Antananarivo, Madagascar

²Department of Pediatrics, CHU Analakininina, Toamasina, Madagascar

³Department of Pediatrics, Befelatanana, Antananarivo, Madagascar

⁴Faculty of Medicine, Antananarivo, Madagascar

Received: 25 February 2020

Revised: 08 June 2020

Accepted: 16 June 2020

*Correspondence:

Dr. Mbolanirina L. Rakotomahefa Narison,
E-mail: mahefambola@yahoo.fr

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Hypotrophy is a major contributor to neonatal mortality and morbidity in underdeveloped countries. In Madagascar, efforts have been made to improve this situation, particularly with regard to prevention and early treatment. This prevention is mainly focused on the search for determining factors. Fetal Alcohol Syndrome (FAS) is not yet mentioned in Madagascar although more than 9% of Tananarivian women drink alcohol. A study was conducted in our department to determine the relationship between maternal alcohol intake and hypotrophy.

Methods: The prospective study was carried out in the pediatrics department of the Joseph Raseta Befelatanana University Hospital Centre, on hospitalized hypotrophic newborns (below the 10th percentile) over a period of 3 months from December 1, 2018 to February 31, 2019. In the newborn, authors studied facial features, neurological abnormalities and associated malformations. For the mother, alcohol consumption, pregnancy information was analyzed. The character of FAS could thus be classified.

Results: Author counted 21 hypotrophs among the 128 newborns hospitalized during this period. The facial abnormalities observed were: upper lip thickness abnormality (9.5%) and retrognathism (4.7%). Neurological signs described were: difficulty sucking (76.1%), hypotonia (66.6%), restlessness (9.5%), hyper-responsiveness (9.5%), hypertonia (9.5%) and tremor (4.7%). Two organ malformations (9.5%) were seen: cardiac and biliary tract malformations. Only one mother (4.7%) admitted having taken alcohol during pregnancy. Seven cases of familial alcoholism were reported. At the end of this study, we were able to identify only one case of doubtful FAS (4.7%), 2 cases of suspected FAS (9.5%) and 1 case of confirmed FAS (4.7%).

Conclusions: This syndrome remains under-diagnosed in Madagascar due to the lack of staff training on FAS and the non-systematization of the search for its signs during systematic visits.

Keywords: Facial dysmorphism, Fetal alcoholization, Hypotrophy, Newborns

INTRODUCTION

Hypotrophy is one of the main causes of mortality and morbidity in underdeveloped countries. In Madagascar, a recent multicentre study shows that 100% of newborns

weighing less than 1000 grams and 42% of newborns weighing between 1000 and 2000 grams die during hospitalization.¹ Efforts have been made to improve this situation, particularly with regard to prevention and early care. Such prevention focuses primarily on identifying

determining factors such as foetal alcohol syndrome (FAS), which has never been mentioned in Madagascar, whereas the prevalence of alcohol consumption in Antananarivo is 36.2 per cent, a quarter of which is thought to be among women.² This consumption of alcohol during pregnancy remains little studied and, consequently, poorly detected and inadequately treated.³ It is estimated that there are two million alcohol-dependent people in France, 600000 of whom are women.⁴

An American study shows that 15.1% say they consume alcohol during pregnancy.⁵ Heavy consumption which, because of the recognised effects on the unborn child, poses alarming public and individual health problems. In Madagascar, alcohol consumption during pregnancy is difficult to assess, but is not rare.²

The objective is to evoke the frequency of FAS in Malagasy hospitals through a summary study carried out on hypotrophic children in order to alert those concerned.

METHODS

This is a prospective study carried out in the paediatrics department of the Joseph Raseta Befelatanana University Hospital Centre, in hospitalized hypotrophic newborns (below the 10th percentile) over a period of 3 months from 1 December 2018 to 31 February 2019.

The following parameters were studied: facial features, neurological abnormalities, associated malformations, biometrics, and discharge mode for the newborns included; maternal or family alcohol consumption, pregnancy information and parental socio-economic status; the character of FAS:

- FAS is said to be suspicious if there is an association of hypotrophy, two signs of facial dysmorphism, but no reported alcohol consumption and no known etiologic factor for the hypotrophy.
- FAS is considered suspect if there is an association of hypotrophy, one sign of facial dysmorphic disorder and suspected alcohol use or a personal or family history of alcohol use in favour.
- FAS is confirmed if there is an association of hypotrophy, one or two signs of facial dysmorphism, and a high likelihood of maternal alcohol use and/or a personal maternal alcohol history.

Author excluded other hypotrophic newborns with obvious causes of hypotrophy.

RESULTS

Out of 128 newborns admitted during this study period, we identified 21 (16.4%) cases of hypotrophy (weight for age below the 10th percentile). Male predominance was observed with a sex ratio of 1.2. Twelve (57.1%) term newborns were born at term, 9 (42.8%) were premature,

with the youngest being 31 weeks of amenorrhea (AS). The average term is 36 weeks of amenorrhea.

Two types of facial abnormalities were observed: upper lip thickness abnormality found in 2 newborns (9.5%) and retrognathism found in only one newborn (4.7%).

From the neurological point of view, 16 cases present sucking difficulty (76.19%), 14 cases hypotonia (66.6%). Two respective cases of agitation (9.52%), hyperreactivity (9.5%) and hypertonia (9.5%) were also found. Only one newborn presented tremor (4.76%).

Figure 1: Neurological problems encountered.

Two other malformations were observed (9.5%): non-cyanogenic blowing heart disease of the inter-ventricular communication (IVC) type and biliary atresia.

The information obtained concerning pregnancy showed only one mother who admitted to drinking alcohol during pregnancy (4.7%). For family alcoholism, 7 cases were reported (33.3%). Nine cases came from a low socio-economic family (42.8%) and the rest from a middle-class family (57.1%).

Among parturients, according to the survey and the analysis of obstetrical records, no pathology, either acute or chronic, had been contracted during pregnancy.

These different parameters allowed us to identify only one case of suspicious FAS (4.7%), 2 cases of suspicious FAS (9.5%), and 17 cases of newborns without FAS. We found only one confirmed case of FAS (4.7%). Of the newborns included, 16 were discharged normally (76.1%) and 5 died during hospitalization (23.8%).

DISCUSSION

Prenatal exposure to alcohol is affecting an increasing number of countries. Madagascar is not spared by this scourge, which affects children from birth to adolescence. Fetal Alcohol Syndrome (FAS) is present in 0.5 to 3 births per thousand, representing an estimated incidence of 700 to 2,000 newborns per year in France.⁶ In areas with very high alcohol levels, an incidence of FAS

ranging from 4.3 (Reunion Island) to 10 per thousand for Amerindians is observed.^{4,7,8} In Madagascar, no large-scale epidemiological study of its prevalence has been conducted to date.

The typical clinical picture of FAS includes the association of ante- or postnatal growth retardation or hypotrophy, highly suggestive facial dysmorphia with characteristic facial features, and neurodevelopmental disorders, most often complicated by other malformations.⁸⁻¹⁰

The growth disorder includes at least one of the following criteria: low birth weight for gestational age, delayed postnatal weight growth and/or abnormally low weight for height in the absence of nutritional disorders. Hypotrophy below the 10th percentile was the main selection criterion in our study. Growth retardation was the primary diagnostic criterion for FAS, even in more moderate amounts. It exists from birth, affecting weight, height, head circumference, and persists later. The extent of growth retardation is a function of the amount of alcohol ingested by the mother and whether or not it continues during pregnancy.¹¹ During maternal alcoholization, IUGR is due to the metabolic effect of alcohol on cell growth. In Dakar, hypotrophy was found in 10.7% of newborns, therefore, of similar frequency to our study.¹² Apart from FAS, other possibilities are at the origin of hypotrophy: chronic maternal disease, congenital malaria, maternal hypertension, maternal malnutrition but also the socio-economic factors that could be found among our cases.^{13,14} For developing countries such as Madagascar, maternal malnutrition must be researched and taken into account. In this study, the maternal brachial perimeter of less than 210 mm is taken as a sign of malnutrition.¹⁵ There were no cases among the mothers of the 21 newborns included. A Dakar study on fetal hypotrophy found 91.9% of malnourished women.¹²

Facial dysmorphia includes:

- Discriminating signs: narrow palpebral fissures, flat median facial mass, smooth and bulging philtrum and thin upper lip,
- Associated signs such as epicanthus, flat nose root, minor pinna abnormalities, small snub nose and micrognathia.

For this study authors found only two cases of facial dysmorphic facial features: a thin upper lip and micrognathism: this may be due to our overly strict mode of selection by eliminating newborns for which another obvious etiology explained the dysmorphic facial features, some of which are identical to FAS.¹⁶

Concerning neurological disorders, they include a small cranial perimeter at birth and/or cerebral anomalies (microcephaly, complete or partial agenesis of the corpus callosum and cerebellar hypoplasia) and/or neurological

anomalies more or less severe according to age such as fine motor performance abnormalities, central deafness, oculomotor coordination disorders.^{16,17} In this study, neurological disorders are represented primarily by difficulty sucking, but this may be the result of various factors associated with FAS, such as prematurity, an infectious disease, or a lack of vision.^{16,17}

In this study, neurological disorders are represented primarily by difficulty sucking, but this may be the result of a variety of factors associated with FAS such as prematurity, an associated infection that must be taken into account. No malformations of the central nervous system were found in the 21 newborns. With respect to these disorders, there are other aspects grouped under the terminology of Fetal Alcohol Spectrum Disorder dominated by learning, memory and learning disabilities responsible for school difficulties, cognitive and behavioural problems that will appear late in life.^{17,18}

In addition to these abnormalities, other malformations are possible, which are called Alcohol-related birth defects (ARBDs), which are mainly:^{5,19,20}

- Cardiac: atrial septal defects, ventricular septal defects, transposition of large vessels, tetralogy of Fallot;
- Skeletal: nail hypoplasia, short fifth finger, pectus excavatum, camptodactyly; radiocubital synostosis, hemivertebrae, scoliosis, Klippel Feil syndrome, arthrogryposis;
- Renal: hypoplastic, dysplastic, agenesis kidneys; horseshoe kidney; ureter duplication; hydronephrosis.
- Ophthalmological: strabismus, retinal vascular anomalies, refractive disorders related to microphthalmia and optic nerve atrophy; deafness

In this study, it is more common in the hypotrophs found. Two malformations are observed (9.5%): inter-ventricular communication (IVC) and biliary atresia. In a study carried out on eutrophic and hypotrophic children from Sabiri in Morocco, its frequency is 0.4%.²¹ Other external and internal malformations could exist but were not detected due to lack of adequate training of medical personnel and absence of relevant morphological paraclinical examinations. It should be remembered that many of these malformations are inapparent at birth. As with dysmorphia, there is a relationship between the existence of malformations and the dose ingested, on the one hand, and the period of alcohol intake during pregnancy, on the other.

Risk factors significantly linked to the occurrence of congenital malformations are the taking of medication (antiepileptics) and/or plants during pregnancy, the presence of chronic pathology in the mother, mainly diabetes, family history of congenital malformation, twin pregnancy and certainly FAS.²¹ The critical period would be that of organogenesis.

Concerning maternal alcoholism, Malagasy customs always emphasize male authority, so very few women admit to having taken alcohol during and even outside of pregnancy for fear of being despised by society. For example, only one woman admitted drinking alcohol during pregnancy (4.7%). In Lubumbashi in the Democratic Republic of Congo, Kabamba found that 26.2 % of the women interviewed admitted having consumed alcohol during pregnancy.²² However, beer consumption is on the rise and is not more admitted by women. It is known that bioassay cannot replace questioning and that no study has so far been able to determine a marker which alone can be used to assess the consumption of alcoholic beverages.²³ Mortality was 30.6% in a study conducted in Burkina Faso.²⁴ It was a little less at 23.8% in our study. Neonatal mortality at low birth weight remains a concern in many countries such as Cameroon.²⁵ It is therefore imperative to take more sustained action to improve prevention and adequate care of newborns (early antenatal screening of hypotrophic babies, adoption of the kangaroo method, strengthening the means of resuscitation of the newborn).

These different parameters allowed us to highlight only one case of doubtful FAS (4.7%), 2 cases of suspect FAS (9.5%) and 17 cases of newborns without FAS. We found only one confirmed case of FAS (4.7%). In southern Reunion Island, there is an incidence of FAS of 4.3/1,000: 1.8/1,000 for full FAS and 2.5/1,000 for partial FAS.⁶ This study, which is still preliminary and summary, is limited to a small, single-centre sample and conducted in a general pediatric ward, without maternity; it does not reflect the true prevalence of FAS. Authors difficulties concerned the diagnosis of partial forms, without knowledge of maternal alcoholization. Because none of these dysmorphic abnormalities are specific for FAS, hypotrophy or dysmorphia can only be an aid to diagnosis. The other problem is the fairly marked features of certain ethnicities that may have sometimes interfered with the diagnosis of FAS craniofacial dysmorphia.

In Madagascar, the rigorous supervision measures that are necessary concern:

- Information, through the media, of all the actors involved, starting with the pregnant women themselves, but also adolescents, women of childbearing age and the general public about the danger of alcohol during pregnancy.
- Training of all health professionals concerned with pregnancy, birth and child, as well as teachers on the signs and screening for FAS.

CONCLUSION

For Madagascar, prevention by screening mothers and families at risk during prenatal consultation makes it possible to prevent and also to take care of children at risk. Systematic and rigorous screening for neurological and dysmorphic signs of FAS in maternity and

neonatology, especially in hypotrophic children, should improve their prognosis by allowing early and appropriate management. Alcoholism, even if doubtful, should be declared to health personnel and paediatricians in order to alert them to the risks incurred by the newborn, from birth but also for the early management of the child. This care allows the search for malformations and the prevention of further endangerment of the child: breeding difficulties, rejection, failure at school, exclusion, marginalization, which are factors of drug addiction, delinquency and alcoholism.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Service de Lutte Contre les Maladies liées aux Modes de Vie. Enquête Sur Les Facteurs de Risque de Maladies Non Transmissibles à Madagascar. Condense. Min SAN/PF. 2005;31:9-10.
2. Organisation Mondiale de la Santé (OMS). Enquête sur les Facteurs de Risque des Maladies Non Transmissibles à Madagascar. (Selon l'approche STEPS de l'OMS). 2005;1-31
3. LaFlash S, Aronson RA, Uttech S. Alcohol use during pregnancy: implications for physicians. *Wisconsin Med J.* 1993 Sep;92(9):501-6.
4. Chanal C, Toubin RM, Benos P, Mazurier E, Misraoui M, Clutier J, et al. Support for pregnant women with drug addiction at the Montpellier University Hospital: perinatal and psychosocial results. *Gynecol Letter.* 2001;265:39-43.
5. Flynn HA, Marcus SM, Barry KL, Blow FC. Rates and correlates of alcohol use among pregnant women in obstetrics clinics. *Alcohol Clin Exp Res.* 2003;27:81-7.
6. Boussiron D. Données épidémiologiques et syndrome d'alcoolisation fœtale. *Le Courrier des Addictions.* 2003 Dec;5(4):149-55.
7. Lesure JF. L'embryofoetopathie alcoolique à l'île de la Réunion: un drame social. *Revue de pédiatrie (Paris).* 1988;24(6):265-71.
8. Grant BF. Prevalence and correlates of alcohol use and DSM IV. alcohol dependence in the United States : results of the National Longitudinal Alcohol Epidemiologic Survey. *J Stud Alcohol.* 1997;58(5):464-73.
9. Bieder J, Callens H. Embryofoetopathie alcoolique (syndrome de Lemoine). *Ann Med Psychol.* 2002;160:67-71.
10. Beck F, Richard JB. Epidémiologie de l'alcoolisation. *EMC-endocrinologie-Nutrition.* 2013;10(1):1-9.
11. Crepin G, Dehaene P, Samaille C. Aspects cliniques, évolutifs épidémiologiques de l'alcoolisme fœtal: un fléau toujours d'actualité. *Bulletin l'Académie Nat Méd.* 1989;173(5):575-85.

12. Camara B, Diack B, Diouf S, Signate-Sy H, Sall MG, Ba M, et al. Les faibles poids de naissance: fréquence et facteurs de risque dans le district de Guédiawaye (banlieue de Dakar - Sénégal). *Médecine d'Afrique Noire.* 1996;43(5):260-5.
13. Mounier-Vehier C, Delsart P. Hypertension artérielle de la grossesse : une situation à risque cardiovasculaire. *La Presse Médicale.* 2009;38(4):600-8.
14. Moyambe JN, Bernard P, Khang'Mate F, Nkoy AM, Mukalenge FC, Makanda D, Twite E, Ndudula AM, Lubamba C, Kadingi AK, Kayomb M. Etude des facteurs de risque du retard de croissance intra-utérin à Lubumbashi. *Pan Afr Med J.* 2013;14(1).
15. Chabra S, Bhandari V. Some medico-socio demographic factors and intra-uterine growth retardation. *J Indian Med Assoc.* 1996;94(4):127-30.
16. Fallet-Bianco C, Bazin A, Daumas-Duport C. Conséquences de l'exposition prénatale à l'alcool sur le système nerveux central. *Med Fœtale Echogr Gynecol.* 2001;47:17-27.
17. Crépin G, Bréart G, Réthoré M, Bégué MM, Barois M, Bréart MM, et al. L'alcoolisation fœtale. *Bull l'Académie Nationale Méd.* 2016;200(3):601-21.
18. Bieder J, Callens H. Embryofoetopathie alcoolique (syndrome de Lemoine). *Ann Med Psychol.* 2002;160:67-71.
19. Serreau R, Maillard T, Verdier R, Bouchara L, Catteau C, Hervé C, et al. Clinical study and prevalence of fetal alcohol syndrome treated in the medico-social establishments of the Reunion Island. *Arch Pediatrics.* 2002 Jan 1;9(1):14-20.
20. Lejeune C. Syndrome d'alcoolisation fœtale. *Devenir.* 2001;13(4):77-94.
21. Sabiri N, Kabiri M, Razine R, Kharbach A, Berrada R, Barkat A. Facteurs de risque des malformations congénitales: étude prospective à la maternité Souissi de Rabat au Maroc. *J Pédiatrie Puériculture.* 2013 Sep 1;26(4):198-203.
22. Kabamba AT, Shamashanga LK, Longanga AO, Lukumwena ZK. Prévalence de la prise d'alcool pendant la grossesse à Lubumbashi, République Démocratique du Congo. *Pan Afr Med J.* 2014;18(1).
23. Larsson G, Ottenblad C, Hagenfeldt L, Larsson A, Forsgren M. Evaluation of serum gamma-glutamyl transferase as a screening method for excessive alcohol consumption during pregnancy. *Am J Obstet Gynecol.* 1983;147(6):654-7.
24. Ouédraogo/Yugbaréab SO, Kaboréb R, Kouetaab F, Sawadogob H, Daoab L, Nacroac B, et al. Facteurs de risque de décès des nouveau-nés de faible poids de naissance à Ouagadougou (Burkina Faso). *J Pédiatrie Puériculture.* 2013;26(4):204-9.
25. Chiabi A, Mah E, Essomba MJ, Nguefack S, Mbonda E, Tchokoteu PF. Facteurs associés à la survie des nouveau-nés de très faible poids de naissance à l'hôpital gynéco-obstétrique et pédiatrique de Yaoundé, Cameroun. *Arch Pédiatr.* 2014 Feb 1;21(2):142-6.

Cite this article as: Rakotomahefa Narison ML, Ratsimbazafy ABA, Andrianadison ZL, Raobijaona HS. Preliminary study of the prevalence of hypotrophy and fetal alcohol syndrome in Antananarivo, Madagascar. *Int J Contemp Pediatr* 2020;7:1496-500.