



Research Article

JMR 2018; 4(2): 63-68

March- April

ISSN: 2395-7565

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www.medicinarticle.com

Received: 15-02-2018

Accepted: 10-04-2018

Additional risk factors for malnutrition in children infected with HIV

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Abstract

Introduction: HIV infection affects the nutritional status, due to increased energy requirements in patients. This study looked for susceptible factors that could increase under nutrition in children living with HIV. **Material and method:** The mothers/caregivers were interviewed on the feeding of the patients with reference to the 7 basic food groups which enable to estimate the Individual Dietary Diversity Score (IDDS) of children infected with HIV. The quantity and daily frequency of meals as well as their nutritional status was assessed. **Results:** More than half (58.5%) of the patients were aged 12-35 months. Weaning was done before 6 months in 19.3%, and most of them (91.0%) consumed at least 3 meals daily. In 60.0%, the mothers/guardians practiced dietary restrictions; this concerned beans (18.5%), cow milk (10.7%), eggs (7.6%), and pork (7.4%). The IDDS was weak in 34.0% patients. The risk of having malnutrition was increased in children of uneducated mothers/guardians ($P=0.000$) and when only 3-5 nutrients' groups were used to enrich porridge. The protective factors against malnutrition were introduction of complementary foods after the age of 6 months ($P=0.000$), absence of food restriction ($P=0.008$). **Conclusion:** Proper feeding would prevent malnutrition in children in spite of the risk due to HIV infection. In the present study, feeding of children living with HIV was not sufficiently diversified. The reinforcement of nutritional education of mothers/guardians is crucial.

Keywords: Children, HIV, Malnutrition, Factor, Addition, Feeding.

INTRODUCTION

Malnutrition is one the most frequent causes of death in young children. Many factors such as loss of appetite, gastroenteritis and respiratory infections which expose the children to emaciation are responsible for this ^[1]. Risk of malnutrition is higher in subjects infected with HIV ^[2] as well as a higher death risk when these two affections coexist ^[2,3]. In fact, malnutrition and HIV/AIDS make up a vicious circle responsible for many severe complications. Anticipating the implementation of a balanced diet is crucial considering the increased energy needs of patients infected with HIV. The importance of improving competence of the population and health personnel in health promoting activities has been demonstrated^[4]. The HIV epidemic came at a time when human resources in the health sector were not adequate for proper nutritional management of children. Efforts to curb malnutrition are impeded by a deficit in competent personnel in the dietary domain ^[4]. These personnel play an important role in nutritional education with parents ^[5]. Parents' knowledge play an important role on the feeding of children and are influenced by cultural constraints as well as parents social status ^[6]. Actually, feeding practices and traditional dietary restrictions affect feeding in children ^[7,8]. In Ethiopia, these were associated with an insufficiently diversified complementary feeding in infants infected with HIV ^[9]. The aim of this study was to describe certain factors that can aggravate malnutrition in children infected with HIV.

MATERIAL AND METHOD

A transversal study was carried out in children infected with HIV aged between 6-59 months followed up at the day unit of the mother and child center in Yaounde. A semi-structured interview was carried out with mothers/guardians on their sociodemographic and economic characteristics as well as the health status of living mothers. Each patient underwent a dietary survey by means of a dietary recall. This consisted in a qualitative registration of all food groups consumed by the children during 3 days before the interview. The number of meals per day as well as dietary restrictions was also noted. We described the mode of feeding of patients from birth, for those who were at least breastfed, the age of breastfeeding withdrawal and the time of weaning. For those who consumed porridges, the daily quantity was estimated with point of reference a 250ml bowl; the quality was evaluated based on 7 food groups used to enrich it. These were (1) roots, cereals, tubercles; (2) dairy products; (3) meat products and eggs; (4) fats and oils;

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(5) fruits and vegetables rich in vitamin A; (6) legumes and nuts; (7) and other fruits and vegetables [10]. The porridge was said to be of good, of average or of bad quality if it was constituted of at least 5, 3-5, or 1-2 food groups respectively. Aside from porridges, dietary diversification was also evaluated using the patients' individual dietary diversity scores. This was low, average or high if patients had received less than 2, between 3-5 or more than 5 food groups respectively. The number of meals consumed daily as well as the quantity was estimated using the same volume of 250ml. Children less than 12 months of age were not frequently fed if they received less than 2 meals or less than 2 bowls of porridge daily. In patients aged over 12 months, a minimum of 3 meals was required aside from breastfeeding or baby milk in take. Mothers'/guardians' knowledge on malnutrition was also evaluated. Anthropometric indices weight/height (W/H), height/age (H/A), and mid upper arm circumference (MUAC) were obtained from the medical files of patients. Acute malnutrition was defined by a W/H index < -2 Z-score or MUAC < 125mm; it was said to be chronic when H/A < 2 Z-score. For this study however, only acute malnutrition was of interest.

Statistical analysis

Categorical variables were described by the frequency by means of a univariate analysis. Using bivariate analysis, we sort out the existence of a relationship of dependency between malnutrition and certain explicative variables. The Chi2 test was used to test the dependency hypothesis, considering p values < 0.05 as the threshold for

significance. The influence of variables suspected to have a possible effect on malnutrition was sort out using an analysis.

Ethical considerations

This study obtained approbation from the national ethics board. We obtained consent from the participants and we also respected confidentiality. No invasive acts linked to drawing of blood which could compromise the subjects' health were carried out.

RESULTS

Description of the study population

A total of 200 respondents were interviewed amongst which were 162 mothers (81.0%) and 38 (19.0%) guardians of patients whose mothers were deceased. Most of the living mothers (130/162 making 80.2%) were in good health; only 32 (19.8%) were manifesting disease at the time of the survey. Most of the mothers/guardians were married (111 making 55.5%), the rest were single (76 making 38.0%). About 4/5 (161 i.e. 80.5%) resided in Yaounde and 137 (68.5%) had at least attained a secondary or higher level of education. Monthly revenue was less than 25000 francs CFA in 74 (37.0%). More than 2/5 (45.0%) practiced a liberal profession or business or agriculture (Table 1). More than half (58.5%) of patients infected with HIV were aged between 12-35 months.

Table 1: Sociodemographic Characteristics of Children and Profile of Respondents

Modalities	Variables	Frequency	Percentage
Characteristics of children			
Age (months)	12-35	117	58.5
	36-59	83	41.5
Sex	Male	79	39.5
	Femelle	121	60.5
Characteristics of mothers/guardians of children			
Place of residence	Yaounde	161	80.5
	Out of Yaounde	39	19.5
Vital status of the begetter mother	Deceased	38	19.0
	Alive	162	81.0
Health status of the begetter mother	Sick	32	19.8
	In good health	130	80.2
Matrimonial status of respondents	Married	111	55.5
	Single	76	38.0
	Divorced/widow	13	6.5
Religion of respondents	Catholic	88	44.0
	Protestant	47	23.5
	Muslem	30	15.0
	Living churches	35	17.5
Number of children catered for	< 3	80	39.6
	≥ 3	120	60.4
Level of education of respondents	Secondary/higher	137	68.5
	Primary	52	26.0
	Uneducated/qur'an	11	5.5
Monthly revenue of respondents	< 25000 FCFA	74	37.0
	25000-50000 FCFA	57	28.5
	≥ 50000 FCFA	69	34.5
Profession of respondents	administrator or student	68	34.0
	Trader	67	33.5
	Housewife	42	21.0
	Farmer	23	11.5

Table 2: Knowledge of Mothers/Guardians and Feeding Habits

Variables	Modalities	Number	Percentage
Do you know about malnutrition?	Yes	164	82,0
	No	36	18,0
Have you ever received counseling on nutrition?	Yes	160	80,0
	No	40	20,0
Do you use different ingredients to prepare porridge for your child?	Yes	70	35,0
	No	130	65,0
Feeding practices in children			
How did you feed the child at birth?	Breastfeeding	99	49,5
	Baby milk	60	30,0
	Mixed feeding	41	20,5
For how long did you breastfeed the child? (N=140)	< 6 months	27	19,3
	≥ 6 months	113	80,7
What age was your child at the time of dietary diversification (months)	< 6	77	55,0
	> 6	63	45,0
How many meals does the child have in a day?	1 – 2	18	9,0
	≥ 3	182	91,0
What quantity of porridge does the child consume in a day? (number of bowls)	≥ 2	23	11,5
	< 2	133	66,5
	Not consumed	44	22,0
How would you describe the quality of ingredients used to enrich porridges (N=156)	Bad	52	33,3
	Average	55	35,3
	Good	49	31,4
Consumption of different varieties of complementary foods	Yes	70	35,0
	No	130	65,0
Do you practice dietary restrictions?	Yes	120	60,0
	No	80	40,0
Individual dietary diversity scores	Low	68	34,0
	Average	66	33,0
	High	66	33,0
Systematic washing of hands	Yes	107	53,5
	No	63	31,5
Is the child's weight taken regularly ?	Yes	66	33,0
	No	71	35,5
	At times	63	31,5

Table 3: Influence of Sociodemographic Characteristics on the Nutritional Status of Children Living With HIV

Variables	Total	Malnutrition		OR	P
		Yes n(%)	Non n(%)		
Characteristics of children					
Sex	Male	79	21 (26.6)	58 (73.4)	0.206
	Female	121	23 (19.0)	98 (81.0)	
Age (months)	12-35	117	36 (30.8)	81 (69.2)	0.000
	36-59	83	8 (9.6)	75 (9.4)	
Characteristics of mothers/guardians					
Place of residence	Yaounde	161	27 (16.8)	134 (83.2)	0.206
	Out of Yaounde	39	17 (43.6)	22 (56.4)	
Vital status of the begetter mother	Deceased	38	7 (18.4)	31 (81.6)	2.3
	Alive	162	37 (81.6)	115 (18.4)	
Health of living begetter mother	Sick	32	16 (50.0)	16 (50.0)	1.3
	Good health	130	21 (16.2)	109 (83.8)	
Marital status of mothers/guardians	Single	76	17 (22,5)	59 (77,6)	2,08 ^b
	Divorced/widow	13	20 (18,0)	91 (82,0)	
	Married/union	111	7 (53,9)	6 (46,1)	
Religion	Catholic	88	21 (23,9)	67 (76,1)	

	Protestant	47	5 (10.6)	42 (89.36)	0.62 ^a	0.003
	Muslem	30	10 (3.3)	20 (66.67)	1.71 ^b	
	Living church	35	8 (22.9)	27 (77.14)	1.14	
Level of education	None or koranic	11	7 (63.6)	4 (36.36)		0.000
	Primary	52	18 (34.6)	34 (65.38)	5.70 ^c	
	Secondary/higher	137	19 (13.9)	118 (86.13)	0.56	
Monthly revenue	< 25000	74	31 (41.9)	43 (58.11)		
	25000-50000	57	6 (10.5)	51 (89.47)	0.07 ^c	0.000
	>50000	69	7 (10.14)	62 (89.86)	0.08 ^c	
Profession	Farmer	23	11 (47.8)	12 (52.17)		
	Trader	67	15 (22.4)	52 (77.61)	0.02 ^a	0.004
	Maid	42	10 (23.8)	32 (76.19)	0.06	
	Administrator	68	8 (1.8)	60 (88.24)	3.04 ^b	

^ap<0.1 ;^bp<0.05 ;^cp<0.01

Table 4: Knowledge and Feeding Practices of Mothers/Guardians; Followup of Growth and Impact on the Nutritional Status of Children Living with HIV

Variables		Total	Malnutrition (%)		OR	P
			Yes	No		
Are you aware about malnutrition ?	Yes	164	30 (18.3)	134 (81.7)	3.2	0.007
	No	36	14 (38.9)	22 (61.1)		
Have you ever received counseling on nutrition?	Yes	160	30 (18.7)	130 (81.3)	1.94	0.026
	No	40	14 (35.0)	26 (65.0)		
How did you feed the child at birth?	Breastfeedi	99	26 (26.3)	73 (73.7)	1.18 ^a	0.334
	With	60	10 (16.7)	50 (83.3)		
	Mixed	41	8 (19.5)	33 (80.5)		
What was the duration of breastfeeding (months)? (N=140)	< 6	27	10 (37.0)	17(63.0)	0.67	0.039
	≥ 6	113	34 (19.4)	91 (80.6)		
At what age (months) did you start with other foods?	< 6	77	25 (32.1)	52 (67.3)	0.15	0.000
	≥ 6	63	6 (8.9)	57 (91.1)		
How many meals per day does the child have?	1 - 2	18	5 (27.8)	13 (72.2)	0.42	0.518
	≥ 3	182	39 (21,2)	143 (78,8)		
What quantity of porridge does the child consume per day (in bowls) ?	> 2	23	4 (17,4)	19 (82,6)	0,48	
	<2	133	30 (22,6)	103 (77,4)		
	None	44	10 (21,7)	34 (77,3)		
How do you enrich porridge? (quality of ingredients used)	Bad	52	17 (32,7)	35 (67,3)	1,74	0.005
	Average	55	12 (21,8)	43 (78,2)		
	Good	49	6 (12,2)	43 (87,8)		
Is the child food diversified?	Yes	70	7 (10.0)	63 (90.0)	9.04	0.003
	No	130	37 (28.5)	93 (71.5)		
Have you forbidden foods?	Yes	120	34 (28.3)	86 (71.7)	0.7	0.008
	No	80	10 (12.5)	70 (87.5)		
IDDS	Low	68	19 (27.9)	49 (72.1)	1.50	0.472
	Average	66	12 (18.2)	54 (81.8)		
	High	66	14 (21.2)	52 (78.8)		
Is the child's weight taken regularly?	At times	63	8 (12.7)	55 (87.3)	19.51	0.000
	Yes	66	8 (12.1)	58 (87.9)		
	No	71	28 (39.4)	43 (60.6)		

^ap<0.1 ;^bp<0.05 ;^cp<0.01, IDDS : Individual dietary diversity score

Description of feeding practices of mothers/guardians

About 4/5 (169 i.e. 82.0%) of mothers/guardians had knowledge on malnutrition (Table 2). At birth, 99 patients (49.5%) were breastfed; 41 (20.5%) received mixed feeding. Weaning was done before the age of 6 months for 27 (19.3%) and most of the patients i.e. 182 (91.0%) had at least 3 meals daily. In 120 (60.0%), mothers/guardians practiced dietary restrictions. These concerned certain legumes such as beans (18.5%), cow milk (10.7%), eggs (7.6%) and pork (7.4%). In 67 (34.0%), the individual dietary diversity score (IDDS) was low.

Characteristics of patients with acute malnutrition

Malnutrition was observed in 44 patients with a prevalence of 22.0%. The age range from 12-35 months was most affected (30.8%). Malnutrition predominated (81.6%) in patients whose mothers were still alive and affected over half (53.9%) of those whose mothers were living as a couple; either married or living in common-law (Table 3). Furthermore, malnutrition was noted predominantly (63.6%) in subjects whose mothers/guardians were uneducated (p= 0.000). There was an association between the quality of ingredients used to enrich

porridges and malnutrition ($p= 0.005$) as well as consumption of different food varieties ($p= 0.003$); (Table 4). Protective factors against malnutrition were the introduction of complementary foods after the age of 6 months ($p= 0.000$), and not practicing dietary restrictions in children ($P= 0.008$).

DISCUSSION

Limits of the study: Certain confounding factors such as the level of the household income act and in association with the quality of the habitat on the direct causes of malnutrition in children. It would be illusory to focus on sociodemographic, economic and nutritional factors to explain malnutrition in children. We did not carry out a survey of family life in order to determine explanatory factors for malnutrition in the study population. The relational aspect of malnutrition was not explored, such as breakups, nursing, child-entourage relationships, discriminatory attitudes, perception, mother's feeling about her status and the child's disease ; these situations could influence the nutritional status and feeding habits vis-a-vis children [11].

HIV infection greatly affects the weight and the growth of the child [12]. In a study carried out on severe malnutrition in Yaounde, children infected with HIV were 3.8 times more emaciated than the others [2]. The objective of our survey was to determine possible factors that could influence nutritional status in children 12-59 months of age who were already predisposed to malnutrition due to HIV infection. Despite the fore mentioned limits, it is logical to affirm that the occurrence of malnutrition in subjects infected with HIV is influenced by mothers' knowledge, sociodemographic factors, cultural factors, socioeconomic factors as well as feeding practices [7,8].

Mothers' level of education also plays an important role in the occurrence of malnutrition. In Malaysia, authors have reported a negative relationship between mothers who attained a secondary level of education and the nutritional status of children [13]. In addition to intellectual capacities, educated mothers receive nutritional education which is useful for adapting nutrition to the children's needs. Coupled with the amelioration of economic level, this education also helps to further improve the nutritional status of children [14]. It all begins with breastfeeding from birth which has numerous benefits [15], even in an HIV context [16]. Meanwhile, there is lots of prejudice surrounding this [17]. Weaning conditions equally impede the application of feeding norms recommended by the WHO [18]. Inappropriate feeding in the first 6 months of life consequently causes an alteration in the nutritional status at the age of 12 months [19]. According to the findings of this study, about half the patients (49.5%) were breastfed and the breastfeeding was carried out over 6 months in most of them (80.7%). The taking of ARVs by mothers was not investigated, although the mode of feeding was not conformed to the A option of the prevention of mother-to-child transmission (PMTCT) [20] in place at the time of the study. We observed that amongst the subjects that were breastfed, or who received mixed feeding, or those who were not breastfed, malnutrition occurred in 16.7%, 26.3% and 19.5% respectively. The WHO recommends an increase in energy intake of 10% in asymptomatic children infected with HIV [21]. In African regions as in other regions, traditional practices and traditional diet restrictions contributes to the occurrence of malnutrition. A lot of taboos limit children's access to certain foods of animal origin; for example the prohibition of egg consumption [7]. In this present study, not only were the number of meals required with respect to age not respected, some patients were restricted certain foods by their mothers. This practice has been described by other authors [22].

Knowledge of mothers is crucial in the implementation of nutritional activities. Actually, there exists an association between level of education and knowledge of mothers [23]. Education of the woman is therefore an indicator of level of comprehension. Children of more educated mothers; that is those who attained a secondary level of

education had a lesser risk of developing malnutrition [24-26]. Educated mothers usually break ties with tradition and dietary restrictions. They would be more inclined to exploit received information in order to make better use of available food stuffs. From our results, it follows that when mothers were well informed on malnutrition, complementary feeding was balanced and also implemented at the right time. Meanwhile, not all were counseled to this effect. In as much as they had contact with health facilities, they missed some counselling sessions [25]. Some mothers practiced mixed feeding which is strictly advised against in the prevention of HIV transmission. Actually, in certain studies, authors have brought out that recommendations were incompatible with local norms [26,27].

Poverty of the woman is one the obstacles to children having access to care [28-33]. They being involved in revenue generating activities contribute to well being of the family and the nutritional well being of the children [17]. It is for this reason that the IDDS is used to express the economic aptitude of homes to get access to food, especially proteins of animal origin which can improve IDDS [34]. In our study, the mother's revenue influenced nutritional status of children. Patients whose mothers/guardians gain lower than 25000 francs CFA were more exposed to malnutrition. On the contrary, mothers' occupation could negatively influence the occurrence of malnutrition in children [35]; less time to be allocated for this [36-39].

CONCLUSION

Proper feeding would enable the prevention of malnutrition inspire of the inherent risk due to HIV infection. In as much as mothers master the concept of malnutrition, most of them did not diversify the diet of their children living with HIV. The reinforcement of nutritional education in mothers is crucial.

Contributions of authors

NF elaborated the draft, NS, LA, TNN and DR reread the document. All authors approved the final version of the document.

Acknowledgements

The authors thank the staff of the day care unit for the management of HIV infection at the mother and child center of the Chantal Biya Foundation for their collaboration.

Conflict of interest: None.

REFERENCES

1. Yassin M, Taha M, Jamiea SA. Risk factors associated with wasting among children aged 6 to 24 months old in Gaza strip. *Int J Med.* 2016;4(1):26-31.
2. Nguefack F, Ehouzou MN, Kamgaing N, Chiabi A, Eloundou OE, Dongmo R, et al. Caractéristiques cliniques et évolutives de la malnutrition aiguë sévère chez les enfants infectés par le VIH : étude rétrospective sur 5 ans. 2015;5(2):223-32.
3. Patel D, Bland R, Coovadia H, Rollins N, Coutsooudis A, Newell M-L. Breastfeeding, HIV status and weights in South African children: a comparison of HIV-exposed and unexposed children. *AIDS.* 2010;24(3):437-45.
4. Fanzo JC, Graziose MM, Kraemer K, Gillespie S, Johnston JL, Pee S de, et al. Educating and Training a Workforce for Nutrition in a Post-2015 World. *Adv Nutr Int Rev J.* 2015;6(6):639-47.
5. Reinsma K, Nkuoh G, Nshom E. The potential effectiveness of the nutrition improvement program on infant and young child feeding and nutritional status in the Northwest and Southwest regions of Cameroon, Central Africa. *BMC Health Serv Res.* 2016;16(1):654.
6. Nankumbi J, Muliira JK. Barriers to Infant and Child-feeding Practices: A Qualitative Study of Primary Caregivers in Rural Uganda. *J Health Popul Nutr.* mars 2015;33(1):106-16.
7. Ekwochi U, Osuorah CDI, Ndu IK, Ifediora C, Asinobi IN, Eke CB. Food taboos and myths in South Eastern Nigeria: The belief and practice of mothers in the region. *J Ethnobiol Ethnomedicine.* 2016;12:7.

8. Arzoaquoi SK, Essuman EE, Gbagbo FY, Tenkorang EY, Soyiri I, Laar AK. Motivations for food prohibitions during pregnancy and their enforcement mechanisms in a rural Ghanaian district. *J Ethnobiol Ethnomedicine*. 2015;11:59.
9. Haile D, Belachew T, Berhanu G, Setegn T, Biadgilign S. Complementary feeding practices and associated factors among HIV positive mothers in Southern Ethiopia. *J Health Popul Nutr*. 2015;34:5.
10. WHO. Indicators for assessing infant and young child feeding practices [Internet]. 2010 [cité 15 août 2017]. Disponible sur: <http://www.who.int/nutrition/publications/infantfeeding/9789241599290/en/>
11. Bouville J-F. Etiologies relationnelles de la malnutrition infantile en milieu tropical. *Devenir*. 2003;15(1):27-47.
12. Arpadi SM. Growth failure in HIV-infected children. publisher not identified; 2005.
13. Adnan N, Muniandy ND. The Relationship between Mothers' Educational Level and Feeding Practices among Children in Selected Kindergartens in Selangor, Malaysia: A Cross-sectional Study. *Asian J Clin Nutr*. 2012;4(2):39.
14. Saaka M. Relationship between Mothers' Nutritional Knowledge in Childcare Practices and the Growth of Children Living in Impoverished Rural Communities. *J Health Popul Nutr*. 2014;32(2):237-48.
15. Turck D. Allaitement maternel : les bénéfices pour la santé de l'enfant et de sa mère. *Arch Pediatr*. 2005;Supplement 3(12):S145-65.
16. Okanda JO, Borkowf CB, Girde S, Thomas TK, Lecher SL. Exclusive breastfeeding among women taking HAART for PMTCT of HIV-1 in the Kisumu Breastfeeding Study. *BMC Pediatr*. 2014;14:280.
17. Obladen M. Bad milk, part 1: antique doctrines that impeded breastfeeding. *Acta Paediatr*. 2012;101(11):1102-4.
18. Kimani-Murage EW, Wekesah F, Wanjohi M, Kyobutungi C, Ezeh AC, Musoke RN, et al. Factors affecting actualisation of the WHO breastfeeding recommendations in urban poor settings in Kenya. *Matern Child Nutr*. 2015;11(3):314-32.
19. Becquet R, Leroy V, Ekouevi DK, Viho I, Castetbon K, Fassinou P, et al. Complementary feeding adequacy in relation to nutritional status among early weaned breastfed children who are born to HIV-infected mothers: ANRS 1201/1202 Ditrane Plus, Abidjan, Cote d'Ivoire. *Pediatrics*. 2006;117(4):e701-10.
20. WHO. New guidance on prevention of mother-to-child transmission of HIV and infant feeding in the context of HIV [Internet]. WHO. 2010 [cité 9 janv 2017]. Disponible sur: <http://www.who.int/hiv/pub/mtct/PMTCTfactsheet/en/>
21. WHO. Nutrient requirements for people living with HIV/AIDS [Internet]. 2003 [cité 7 janv 2017]. Disponible sur: <http://www.who.int/nutrition/publications/hivaids/9241591196/en/>
22. Santos-Torres MI, Vásquez-Garibay E. Food taboos among nursing mothers of Mexico. *J Health Popul Nutr*. 2003;21(2):142-9.
23. Ciampa PJ, Vaz LME, Blevins M, Sidat M, Rothman RL, Vermund SH, et al. The Association among Literacy, Numeracy, HIV Knowledge and Health-Seeking Behavior: A Population-Based Survey of Women in Rural Mozambique. *PLoS ONE* [Internet]. 22 juin 2012 [cité 20 mai 2014];7(6). Disponible sur: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3382184/>
24. Hasan MT, Soares Magalhaes RJ, Williams GM, Mamun AA. The role of maternal education in the 15-year trajectory of malnutrition in children under 5 years of age in Bangladesh. *Matern Child Nutr*. 2015;n/a-n/a.
25. Flax VL, Hamela G, Mofolo I, Hosseinipour MC, Hoffman I, Maman S. Infant and Young Child Feeding Counseling, Decision-Making, and Practices Among HIV-Infected Women in Malawi's Option B+ Prevention of Mother-to-Child Transmission Program: A Mixed Methods Study. *AIDS Behav*. 2016;20(11):2612-23.
26. Tuthill EL, Chan J, Butler LM. Challenges faced by healthcare providers offering infant feeding counseling to HIV-positive women in sub-Saharan Africa: A review of current research. *AIDS Care*. 2015;27(1):17-24.
27. Chopra M, Doherty T, Mehatru S, Tomlinson M. Rapid assessment of infant feeding support to HIV-positive women accessing prevention of mother-to-child transmission services in Kenya, Malawi and Zambia. *Public Health Nutr*. 2009;12(12):2323-8.
28. Rahman M, Islam MA, Mahalanabis D. Mothers' knowledge about vaccine preventable diseases and immunization coverage in a population with high rate of illiteracy. *J Trop Pediatr*. 1995;41(6):376-8.
29. Cui F-Q, Gofin R. Immunization coverage and its determinants in children aged 12-23 months in Gansu, China. *Vaccine*. 2007;25(4):664-71.
30. Tadesse H, Deribew A, Woldie M. Predictors of defaulting from completion of child immunization in south Ethiopia, May 2008 – A case control study. *BMC Public Health*. 2009;9:150.
31. Sohn M-W, Yoo J, Oh EH, Amsden LB, Holl JL. Welfare, Maternal Work, and On-Time Childhood Vaccination Rates. *Pediatrics*. 2011;128(6):1109-16.
32. Lamontagne JF, Engle PL, Zeitlin MF. Maternal employment, child care, and nutritional status of 12-18-month-old children in Managua, Nicaragua. *Soc Sci Med*. 1998;46(3):403-14.
33. Bamji MS, Thimayamma BVS. Impact of women's work on maternal and child nutrition. *Ecol Food Nutr*. 2000;39(1):13-31.
34. Thorne-Lyman AL, Valpiani N, Sun K, Semba RD, Klotz CL, Kraemer K, et al. Household dietary diversity and food expenditures are closely linked in rural Bangladesh, increasing the risk of malnutrition due to the financial crisis. *J Nutr*. 2010;140(1):182S-8S.
35. Toyama N, Wakai S, Nakamura Y, Arifin A. Mother's working status and nutritional status of children under the age of 5 in urban low-income community, Surabaya, Indonesia. *J Trop Pediatr*. 2001;47(3):179-81.
36. Desai S, Jain D. Maternal Employment and Changes in Family Dynamics: The Social Context of Women's Work in Rural South India. *Popul Dev Rev*. 1994;20(1):115-36.
37. Mindlin M, Jenkins R, Law C. Maternal employment and indicators of child health: a systematic review in pre-school children in OECD countries. *J Epidemiol Community Health*. 2009;63(5):340-50.
38. Gennettian LA, Hill HD, London AS, Lopoo LM. Maternal employment and the health of low-income young children. *J Health Econ*. 2010;29(3):353-63.
39. Bianchi SM. Maternal employment and time with children: Dramatic change or surprising continuity? *Demography*. 2000;37(4):401-14.