

Poor vitamin D supplementation in infants

Cross-sectional study of maternal practices and awareness of vitamin D supplementation in infants in Al-Ahsa, Eastern Saudi Arabia

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ABSTRACT

الأهداف: لقياس معدل التكميل الغذائي للرضع بفيتامين د وتقدير مدى وعي الأمهات بأهمية التكميل الغذائي لرضعهم بفيتامين د وتقييم دور الأطباء في تعزيز سلوك التكميل الغذائي للرضع بفيتامين د لدى الأمهات.

الطريقة: أجريت دراسة مقطعية على 606 من الأمهات المراجعات لمراكز الرعاية الصحية الأولية في الأحساء. تم استخدام استبانة تتضمن 22 سؤالاً تشتمل على بيانات متعلقة بالخصائص الديموغرافية عن الأم ورضيعها وطرق الرضاعة و حضانة الرضيع إضافة إلى عناصر قياس مدى وعي الأم ودور الطبيب فيما يتعلق بدعم الرضع بفيتامين د في السنة الأولى من الرضاعة و جمعت البيانات بإجراء مقابلات مباشرة مع الأمهات. وتم حساب الأهمية الإحصائية باستخدام مربع «كاي» واختبار الإنحدار اللوجستي. واعتبرت القيمة الإحصائية أقل من 0.05 دالة على أهمية إحصائية.

النتائج: كان معدل الاستجابة 91%. كان 40% من الأمهات لا يمارسن التكميل الغذائي بفيتامين د. وكان أكثر من 40% من الأمهات لم تعرض عليهن أي نصائح من قبل الأطباء في ما يتعلق بالتكميل الغذائي للرضع بفيتامين د في السنة الأولى. أهم العوامل المرتبطة بعدم التكميل الغذائي للرضع بفيتامين د كانت قلة الوعي لدى الأمهات الحاضنات والتقصير من جانب الأطباء تجاه تقديم النصيحة للأمهات بخصوص التكميل الغذائي للرضع بفيتامين د خلال السنة الأولى.

خاتمة: هناك تجاهل لممارسة التكميل الغذائي للرضع بفيتامين د خلال السنة الأولى من الرضاعة والأسباب غالباً هي قلة وعي الأمهات والتقصير من جانب الأطباء بخصوص تقديم النصيحة لتعزيز هذه الممارسة.

Objectives: To describe the maternal practices and awareness of vitamin D supplementation in infants, and factors affecting these practices in Eastern Saudi Arabia.

Methods: A cross-sectional study was conducted with 606 mothers attending community-based primary health centers in Al-Ahsa, Eastern Saudi Arabia between March and April 2012. A 22-item questionnaire was used to assess the socio-demographic data of both infants and mothers, feeding methods, nursing practices including vitamin D supplementation, and mothers' awareness regarding vitamin D supplementation in infants by face-to-face interview. Chi-squared test was used to assess significant differences among these practices. Significant variables were subjected to multiple logistic regression. A *p*-value of 0.05 was used to indicate statistical significance.

Results: The response was 91%. Forty percent of mothers were not giving their infants vitamin D at the time of contact. More than 40% of the mothers were not aware of, and they were not offered advice on the need to give vitamin D to their infants. Lack of physician advice (odds ratio 42), and poor maternal awareness of the necessity to give vitamin D to their infants (odds ratio - 2.676) are the most significant factors related to the absence of vitamin D supplementation in infants (*p*<0.05).

Conclusions: Vitamin D supplementation during the first year of infancy is low. This is most likely due to the lack of maternal awareness and physician neglect in providing advice to mothers regarding vitamin D supplementation in infants.

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Routine supplementation of vitamin D to infants is justifiable since vitamin D deficiency, and its consequences are highly prevalent. This is attributable to the fact that natural sources of vitamin D usually do not meet the daily requirement for the infants in certain areas of the world.¹⁻⁵ Consequently, there are clear international guidelines, such as, American Academy of Pediatrics (AAP), Institute of Medicine (IOM), American Academy of Family Physicians (AAFP), Health Canada, National Institute of Health and Care Excellence (NICE), and the European guidelines, which strongly recommend vitamin D supplementation in infants.^{2,3,6,7} The magnitude of vitamin D supplementation in infants is largely non-satisfactory with considerable variations.⁸ For example, the prevalence of vitamin D supplementation in infants is very low in the USA (overall 4-7%); with the lowest among one month old infants.³ A study conducted in the USA found that less than 50% of physicians recommended vitamin D supplementation.⁹ Furthermore, a British survey¹⁰ revealed only 12% of the breast-fed, and 13% of the non-breast-fed infants were recorded as receiving vitamin D supplements. In a cross-sectional survey conducted in Canada, 70% of participants adhered to the Health Canada recommendations regarding vitamin D supplementation for breast-fed infants. The overall prevalence of vitamin D supplementation in Switzerland was 64%.¹¹ Another study reported that 60% of Norwegian infants received oral vitamin D supplementation.¹² But the qualities of these supplementations (to breast-fed infants or to all infants and to which age group of infants) are not known and need further studies and evaluations.^{11,12} Based on a literature search using Medline search tools, we found a lack of comprehensive studies carried out in Saudi Arabia, or adjacent areas, assessing infant vitamin D supplementation practices. There are no clear guidelines or policies that would address this issue in Saudi Arabia.⁵ Therefore, the aim of this study was to assess the practice of vitamin D supplementation in infants in Eastern Saudi Arabia.

Methods. This cross-sectional study comprised mothers from 5 different community-based primary health centers in Al-Ahsa area, namely: Rashdeya,

Qassiba; Omran; Faisaly; and Salheya. The mothers included those who nursed 0 to 12 months old healthy infants, and visited child vaccination and well-baby clinics for follow up or vaccination appointments.

Sampling procedure. A sample size of 20% of women from these centers was selected proportionally by using one-in-four systematic random selection in each center. Overall 606 mothers were selected.

Data collection. Pre-trained staff nurses who used a face-to-face interview, collected data daily during the period from March to the end of April 2012 using a structured questionnaire written in the Arabic language. The questionnaire comprised 22 items. The items addressed mainly maternal and infant socio-demographic data as well as mothers' awareness and practices of vitamin D supplementation for their infants. Each questionnaire was completed in 5-10 minutes.

Mothers were classified according to their nationality into Saudi and non-Saudi. Age was categorized into 3 groups 15-24 year olds, 25-34 year olds, and 35-50 year olds. Regarding parity, they were categorized into primiparous who have one child, multiparous with less than 6 children, and grand multiparous with more than 5 children. Regarding their residency, mothers were categorized into rural- and urban-located. Mothers' occupation was classified as employed or non-working housewife. The monthly income was classified into poor income (less than 5000 SAR), average income (5000 to 14000 SAR monthly), and high income (15000 SAR and more monthly). Education level was classified into low (primary school level or less), average (intermediate and high school level), and high (bachelor or diploma degree and more). Infants' ages were classified into 2 categories (less than 6 months, and 6-12 months old). The mode of delivery was classified as normal, vaginal, or cesarian section. Regarding infants gestational ages, 2 classes were described: preterm (less than 36 weeks gestation), and term (more than 36 weeks gestation). Infant's birth weights were recorded as small (less than 2.5 Kg) and normal (2.5 Kg and more). Mothers' awareness was assessed using 5 questions. The score for the correct responses was computed. The median was used as a cutoff point. The score above and below were recorded as good, or poor. Mothers were classified according to their practices into giving, or not giving vitamin D to their infants at the time of interview. Furthermore, they were classified according to their feeding methods into exclusive breast feeders, mixed feeders (formula and breast), and exclusive formula feeders. They were categorized according to the status of the baby sitter into maternal nursing (mother herself)

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or others (not the mother). In addition, mothers were asked regarding exposing their infants to sun during their nursing practice; and based on their responses, were classified as exposing and non-exposing. The questionnaire also recorded information on whether their physicians advised them to give vitamin D to their infants.

Statistical methods. Data was analyzed using the Statistical Package for Social Sciences version 14 (SPSS Inc., Chicago, IL, USA). The questionnaire reliability was determined by the split half method. Frequency distribution tables were constructed. Chi-squared test was conducted to assess the significant differences among the categories. Variables that were significant were subjected to multiple logistic regression. A *p*-value of 0.05 or less was used to indicate statistical significance.

Results. Overall, 564 mothers (out of 606) completed the interview reflecting a response rate of 91%. The questionnaire reliability using the split-half method was 61%. Most mothers were of Saudi nationality. Most participating mothers were between 25-34 years old. More than half of the mothers were multiparous. Only one-tenth of them was grand multiparous. Around three-quarter of mothers lived in urban areas. Most mothers were housewives. Employed mothers formed less than 10% of the total. Half of all mothers had low income, and a small number of the mothers had high income. Most mothers had an average or high education, and only 10% had low education. Half the infants were less than 6 months old, and males. Almost 85% of infants were products of full term normal vaginal delivery. One third of all infants were small in body weight.

More than half of the mothers were fully aware of the importance of giving vitamin D to their infants, while more than 40% of the mothers were not offered advice or vitamin D prescriptions to their infants from their physician. Overall, 38.3% mothers gave vitamin D supplementation to their infants. Maternal vitamin D supplementation to infants was significantly associated with the mothers' awareness as well as physician advice regarding vitamin D supplementation in infants (Table 1). Vitamin D supplementation in infants was significantly related to the place of residency "rural/urban" (Table 2). Two infant factors were significantly associated with the supplementation; these were infants gestational and chronological ages (Table 3). Among the significant factors associated with vitamin D supplementation, low maternal awareness was associated with less vitamin D supplementation

Table 1 - Factors associated with vitamin D supplementation in 564 mothers at Al-Ahsa, Kingdom of Saudi Arabia.

Variables	n	Supplementation n (%)	P-value
<i>Mother's awareness</i>			
Poor	257	61 (23.7)	0.000
Good	307	155 (50.5)	
<i>Nursing</i>			
Mother	531	204 (38.4)	>0.5
Others	33	12 (36.4)	
<i>Feeding</i>			
Breast	152	53 (34.9)	0.43
Bottle	143	53 (37.1)	
Mixed	268	110 (41.0)	
<i>Physician's role</i>			
Advised	278	200 (71.9)	0.000
Non-advised	250	13 (5.2)	

Table 2 - Maternal factors associated with supplementation in a sample of 564 mothers at Al-Ahsa, Kingdom of Saudi Arabia.

Variables	n	Supplementation (n) (%)	P-value
<i>Mother's nationality</i>			
Saudi	538	209 (38.8)	0.2
Non-Saudi	26	7 (26.9)	
<i>Mother age, years</i>			
15-25	137	56 (40.9)	0.85
25-35	279	101 (36.2)	
35-50	98	37 (37.8)	
<i>Parity</i>			
Primiparous	142	59 (41.5)	0.57
Multiparous	345	126 (36.5)	
Grand multiparous	64	25 (39.1)	
<i>Residency</i>			
Rural	148	76 (51.4)	0.000
Urban	412	139 (33.7)	
<i>Mother's occupation</i>			
Housewife	507	189 (37.3)	0.11
Employed	56	27 (48.2)	
<i>Income</i>			
Low	200	73 (36.5)	0.45
Average	234	93 (39.7)	
High	45	21 (46.7)	
<i>Mother's education</i>			
Low	63	25 (39.7)	0.2
Average	285	99 (34.7)	
High	214	91 (42.5)	

compared with high maternal awareness (*p*=0.000, odds ratio [OR] 2.676). Mothers who did not obtain advice from their physician were significantly less likely to give their infants vitamin D supplementation (*p*=0.000, OR 42) (Table 4).

Discussion. This study showed that more than 60% of Saudi mothers who live in Al-Ahsa city were not giving vitamin D to their infants at the time of contact. This is a relatively high number, indicating that this issue

Table 3 - Infant factors associated with vitamin D supplementation at Al-Ahsa, Kingdom of Saudi Arabia (N=564).

Variable	n	Supplement n (%)	P-value
<i>Infant age, months</i>			
<6	247	78 (31.6)	0.004
6-12	265	116 (43.8)	
<i>Infant gender</i>			
Male	292	105 (36.0)	0.2
Female	272	111 (40.8)	
<i>Delivery</i>			
Vaginal	468	174 (37.2)	0.2
Cesarean	96	42 (43.8)	
<i>Gestational age</i>			
Preterm	35	21 (60.0)	0.006
Term	527	194 (36.8)	
<i>Birth weight (Kg)</i>			
Small	165	63 (38.2)	>0.5
Normal	372	143 (38.4)	

Table 4 - Multiple logistic regression analysis of variables associated with supplementation of vitamin D among 564 mother at Al-Ahsa, Kingdom of Saudi Arabia.

Variable	Significance	Odds ratio	95% confidence interval
<i>Residency</i>			
Rural	0.486	1.219	0.698-2.129
Urban			
<i>Infant age</i>			
<6 months	0.504	1.192	0.712-1.998
6-12 months			
<i>Gestational age</i>			
Preterm	0.752	0.852	0.314-2.307
Term			
<i>Mother's awareness</i>			
Poor	0.000	2.676	1.582-4.524
Good			
<i>Physician advice</i>			
Advised	0.000	42.6	22.003-82.480
Non advised			

needs to be addressed. The reasons for this poor vitamin D supplementation in infants are not exactly known, and this needs further robust studies to determine important barriers to this desirable practice. For Canadians who do not give vitamin D supplementation to their infants, their justifications included cessation of exclusive breastfeeding, thinking it was unnecessary, lack of time or forgetfulness, supplementation only in the winter, and that infants did not like the supplement.² It was found that only 6% of the exclusively breastfeeding Canadian mothers reported that they had not been informed about giving vitamin D supplementation to their infants by the health care professionals.² Even in the USA, many health care professionals are not

recommending vitamin D supplements for infants because they think that rickets is rare, that infants receive sufficient sunlight, and that breast milk has adequate levels of vitamin D.³ A study in USA⁹ found that less than 50% of physicians recommended vitamin D supplementation. This suggests a considerable global neglect of physicians, mainly general practitioners, and general pediatricians in promoting vitamin D supplementation for infants. In our survey, only 50% of mothers in Al-Ahsa were offered advice by a health professional to give vitamin D to their infants, regardless of the strict adherence to a certain standard recommendation. Thus, the practicing clinicians should be urged to be more aware of this issue, and consider the current international recommendations. The findings indicated maternal awareness, and physician advice was the factors that are significantly associated with the practice of vitamin D supplementation in infants in Al-Ahsa. Other factors such as residency location (rural versus urban), infant age, gestational age, and other socio-demographic data were proposed as factors that may play a role in infant vitamin D supplementation in Al-Ahsa but were not important. In our study, we compared exclusively breast-fed with non-breast-fed infants and we noticed that breast-fed infants are less likely to receive vitamin D. Although this difference did not reach statistical significance, it shows an important trend. This trend is common; for example, a study conducted in the USA³ revealed that less than 10% of exclusively breast fed, and less than 30% of mixed fed infants met the recommendations regarding vitamin D supplementation, while most formula-fed infants (up to 90%) in the USA met these recommendations.³ A study conducted in Montreal, Canada² showed that none of the infants who were exclusively formula-fed from birth received vitamin D supplementation, and none of their mothers had been advised to supplement. In the UK, only 12% of the breast-fed, and 13% of the non-breast-fed infants were recorded as receiving vitamin D supplements.¹⁰ This is paradoxical as breast milk is relatively deficient in vitamin D, and exclusively breast-fed infants are known to be more prone to the development of vitamin D deficiency.^{2-4,13} Regardless of the status and circumstances of the infants, they should receive vitamin D supplementation based on standard international recommendations preferably AAP 2008 recommendations,³ which state that 400 IU of vitamin D supplementation should be given daily from birth until introduction of vitamin D supplemented food, or the age of one year, regardless of the feeding status.³

Although our study was limited by its observational cross-sectional design with a relatively small sample size, which is not well representative of the Saudi population, and selected from the governmental sector only, which may not reflect the whole population as there are other private and insurance sectors, it is fair to suggest that physicians, particularly obstetricians, pediatricians, and general practitioners should be aware and work as a team to ensure adequate vitamin D intake during antenatal, postnatal, infancy and, childhood by providing vitamin D supplements and a balanced diet, and encourage sun exposure to both infants and mothers according to the standard recommendations. Mothers should be educated and oriented on the importance of vitamin D as routine prophylaxis for every newborn, particularly breast-fed who are susceptible to develop vitamin D deficiency and its consequences. These recommendations may have important positive implications for growing children in preventing vitamin D deficiency and its complications, which is highly prevalent in our area,⁴ particularly when we consider the growing evidence that suggests relationship between vitamin D deficiency and other autoimmune, cardiovascular, and respiratory disorders.¹⁴

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