Infant & Young Child Feeding n Nutrition in Perspective
透視嬰幼兒餵哺與營養
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Breastfeeding and Vitamin D

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Introduction

While breastfeeding is considered the most preferred and nutritious food source for infants and young children, breastmilk from healthy lactating mothers has been known to be intrinsically low in vitamin D content, irrespective of whether the mothers were supplemented.[1] There have been reports worldwide of vitamin D deficiency and rickets among breastfed infants who lack adequate sunlight exposure and do not receive vitamin D supplementation.[2] While there are ongoing global efforts to promote breastfeeding as optimal nutrition in early infancy, the vitamin D status of the breastfed infants has drawn the public's concern.

Sources of Vitamin D and Its Functions

The main source for most people is vitamin D synthesised in the skin by exposure to sunlight containing UVB radiation. Skin exposure to sunlight can be influenced by the following factors:[3]

- **Geographic & Seasonal**: latitude – only at latitude below 37°N is UVB sufficient for vitamin D synthesis throughout the year; at higher latitudes, UVB is insufficient during the winter season. Besides, time of the day and duration of exposure also determine whether sunlight exposure is adequate.
- **Atmospheric**: cloudiness and air pollution
- **Ethnicity & Life-style of the individual**: skin colour; time spent outdoors, clothing and sunscreen use

The American Academy of Pediatrics advises that appropriate protective clothing and hats should be in place, also sunscreen is applied on exposed area when children are exposed to sunlight.

When this source is limited, dietary sources (from food or supplements) become more important. Vitamin D is found in a small number of foods, including oily fish, e.g., salmon, sardines, and mackerel; red meat; liver; egg yolks and fortified foods, e.g., infant formulas, some breakfast cereals, etc. However, it is difficult to obtain enough vitamin D from food alone, and supplementation is needed.[4]

In breastfed infants, the natural sources of vitamin D are transplacental storage, milk intake, and cutaneous production from sunlight exposure. Maternal vitamin D status can be influenced by various factors, such as the amount of sun exposure, supplementation practices, and ethnicity.[2] Its status during pregnancy determines the physiological transplacental transfer and hence the vitamin D storage of infants at birth.[5] The vitamin D reserve would eventually be depleted if infants are unable to meet the recommended daily intake amount from milk intake and sunlight exposure.

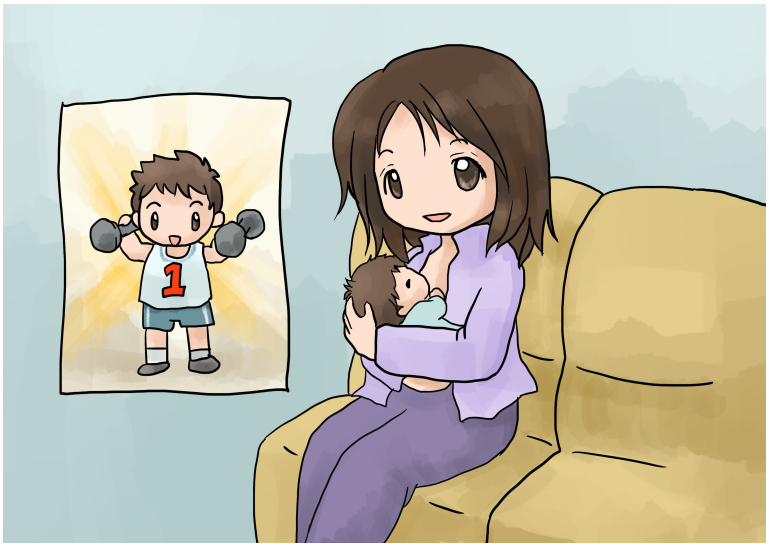
Vitamin D is essential for growth, bone health and immunomodulation. Severe vitamin D deficiency in infants and children would result in rickets and it causes osteomalacia (impaired bone mineralization) across age groups.[6,7]

Despite being a normal component of breastmilk, the amount of vitamin D present is usually inadequate to meet the daily requirement of an exclusively breastfed infant, even if the mother takes a vitamin D supplement in the dose range of 400 to 2,000 IU.[7] Direct sunlight exposure is generally not recommended for infants especially those under 6 months because of the associated risk of sunburn and skin cancer.[8]

Overseas Recommendations on Vitamin D for Breastfeeding Babies

To prevent rickets and vitamin D deficiency in healthy infants and children, the American Academy of Pediatrics and the Center for Disease Control and Prevention recommend a vitamin D intake of at least 400 IU/day.[9] Exclusively or partially breastfed infants should be supplemented with 400 IU/day of oral vitamin D from the first few days of life.

The Department of Health and Social Care of the United Kingdom recommends that babies should have a daily supplement containing 8.5 to 10 micrograms (i.e. 340 to 400 IU) of vitamin D throughout the first year if they are breastfed or receiving less than 500ml of infant formula a day.[4] Children aged 1 to 4 years should be given a daily supplement containing 10 micrograms of vitamin D throughout the year.



In Australia, the recommendation to use 10 micrograms vitamin D supplement daily (i.e., 400 IU/day) is limited to 'at risk' breastfed infants of dark-skinned and veiled women.[10]

Risk Factors for Vitamin D Insufficiency in Young Infants: Local Situation

There was a recent population-based, cross-sectional study[1] which assessed the risk factors for vitamin D insufficiency among healthy young infants in Hong Kong.

The study recruited infants aged 2 to 6 months from different districts in Hong Kong. Infants with any major congenital malformations, prematurity, low birth weight or of non-Chinese ethnicity were excluded from the study. Among the 208 surveyed infants, 77 were vitamin D insufficient (25(OH)D ≤50nmol/L), of which 31 were vitamin D deficient (25(OH)D <25nmol/L).

Being breastfed (aOR 12.81, p<0.001), being a girl (aOR 4.3, p=0.001), the use of sunscreen (aOR 4.08, P=0.017) and having a multiparous mother (aOR 3.74, p=0.001) were found to be the strongest risk factors for vitamin D insufficiency during infancy (all $p < 0.05$) in the study after mutual adjustment. The findings also revealed that the concomitant exposure of other risk factors among breastfed babies increased their risk of vitamin D insufficiency or deficiency.

Conclusion

Overseas and local studies reveal that infants are at risk of vitamin D insufficiency, especially those who are breastfed. While supporting breastfeeding, clinicians should provide education and proper guidance to parents on the importance of vitamin D and the effective ways of achieving adequate vitamin D intake, including supplementation of 400 IU/day. Consensus on vitamin D supplementation for infants among local professional bodies would be helpful in guiding clinical assessment and management in the local context.

Key Messages:

- Despite being a normal component of breastmilk, the amount of vitamin D present is usually inadequate to meet the requirement of an exclusively breastfed infant, even if the mother takes a vitamin D supplement in the dose range of 400 to 2,000 IU.
  儘管維生素 D 是母乳的正常成分，但其含量一般不足以滿足全母乳餵哺嬰兒的需要，即使母親有服用劑量範圍為400 至 2,000 IU 的維生素 D 補充劑也是如此。
- In a recent local study, risk factors for vitamin D insufficiency in healthy 2- to 6-month-old Chinese infants were identified as being breastfed, being a girl, use of sunscreen and having a multiparous mother.
  最近的一項本地研究顯示，健康的 2 至 6 個月大華人嬰兒出現維生素 D 不足的風險因素為：以母乳餵哺、女嬰、使用防曬霜和母親曾經生育。
- Risk factor assessment is essential for clinicians to identify vulnerable groups and provide relevant support to the mother-and-infant dyads, including education on adequate vitamin D intake and offering vitamin D supplementation as indicated.
  風險因素評估在臨床上非常重要，有助醫護分辨出高風險群組，從而提供相關的支援，包括向媽媽和嬰兒提供有關攝取充足維生素 D 的健康教育資訊，以及按需提供維生素 D 補充劑。

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