Numerous studies have demonstrated the advantages of breastfeeding infants. In fact, breastfeeding is considered to be beneficial for both infants and mothers and recommendations for breastfeeding have been issued by professional agencies and societies including the American Academy of Pediatrics, the United Nation Children Funds (UNICEF) and the American Dietetic Association. The World Health Organization (WHO) has recommended that infants be exclusively breastfed for 4 to 6 months with the introduction of complementary food thereafter. However, based on a WHO expert consultation regarding the optimal duration of exclusive breastfeeding, this recommendation was changed in 2001 to extend the period of exclusive breastfeeding for 6 months. The objective of this study was to evaluate the trend in the pattern of infant nutrition in Saudi Arabia and to demonstrate the extent of compliance with the WHO recommendations.

SUBJECTS AND METHODS
The present nationwide nutritional survey was performed as part of the Health Profile for Saudi Children and Adolescents Projects. A detailed description of the methodology has been reported. Briefly, households were randomly selected using a stratified multistage probability sampling procedure from a listing based on the 1992 census (updated in 2001). This process was completely computerized. It was performed with the assistance of the General Directorate of Statistics, Ministry of Planning. The sample was cross-sectional and therefore no follow-up data was collected. The nutritional section of a validated questionnaire was administered to all mothers of healthy children less than 3 years of age at the time of the survey (2004-2005), after...
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obtaining their consent for the interview. It included information on initiation and timing of breastfeeding after birth, the reasons for not breastfeeding for those who were not breastfed or stopped breastfeeding, age at introduction of bottle milk formula feeding, feeding whole milk (cow, goat or camel) and the introduction of solid food. A trained member of the field team administered the questionnaire to mothers by direct interview during house visits. Simple descriptive statistics are used to present the results.

RESULTS

From 2004 to 2005, the mothers of 5339 children who were less than 3 years of age were interviewed. There was a history of breastfeeding in 4889 (91.6%) and 450 (8.4%) were formula fed and therefore never breastfed (Table 1). Only 23.2% of newborns were initiated on breastfeeding within the first hour after birth, and breastfeeding was delayed beyond 6 hours after birth in 28.1%. The prevalence of combined breast and milk formula feeding (Table 2) indicates a drop from 88.6% at birth to 1.8% at 12 months. Of the 772 mothers who had stopped breastfeeding at the time of the survey, the commonest cause given was insufficient milk in 351 (45.5%), followed by illness of the mother, breast problems and illness of the baby (Table 1). Nearly 80% and 90% of the infants were started on bottle milk formula by 4 and 6 months, respectively (Table 3). “Solid” food other than milk was introduced to 81.5% of infants between 4 to 6 months of age. Finally, about 40% of the infants younger than 12 months of age were fed whole milk.

DISCUSSION

The recognition of the importance of early nutrition has led to increasing research on human milk. The results of this research indicate that human milk should be the standard and exclusive infant feeding in the first months of life. These facts led to the initial recommendation of the WHO that infants be exclusively breastfed for 4 to 6 months before introducing any other fluid or food, with continuation of breastfeeding up to 2 years. According to the WHO definition, exclusive breastfeeding means no other food or fluids (including plain water and juices). Infant milk formulas are considered complementary food.8 In 2001, the WHO extended the period of exclusive breastfeeding to 6 months instead of the period 4 to 6 months. However, there is still debate about the optimal duration of exclusive breastfeeding.9,10

Early studies on infant nutrition in Saudi Arabia have described some aspects of the pattern of infant feeding. In 1988, Al-Frayh et al reported on infant feeding practices in 4796 infants under 1 year of age living in Riyadh and found that the average duration of breastfeeding was 5.05 months, while bottle feeding was started under 1.0 month of age in 27.3% and the mean age for starting solid food was 3.5 months.11 In another nutritional survey conducted in several semirural areas of Saudi Arabia, Al-Othaimeen et al found that 21.5% of 767 children were breastfed completely, 68.4% used mixed feedings and about 10% did not breastfeed.12 In more recent reports, Al-Jassir et al reported data collected from September 1999 to September 2000, from 21 507 infants and children less than 5 years attending primary health care centers in Riyadh and found that 98.9% were started on breastfeeding during the first week after birth and that breastfeeding was continued for more than 6 months in 52.7%. The mean duration

| Table 1. Pattern of breastfeeding in nationwide nutritional survey of 5339 children less than 3 years of age. |
|----------------------------------------------------------------------------------------------------------------|
| **Initial feeding** | **Number (%)** |
| Breastfed | 4889 (91.6) |
| Bottle fed (never breastfed) | 450 (8.4) |
| **Timing after birth (hours)** | **Number (%)** |
| <1 | 1134 (23.2) |
| 1-3 | 1334 (27.3) |
| 4-6 | 1048 (21.4) |
| >6 | 1373 (28.1) |
| **Age prevalence of breastfeeding (months)** | **Number (%)** |
| Birth | 3781 (88.6) |
| 1 | 2092 (49.0) |
| 2 | 1541 (36.1) |
| 4 | 876 (20.5) |
| 6 | 435 (10.2) |
| 12 | 76 (1.8) |
| **Reasons for stopping breastfeeding** | **Number (%)** |
| Mother had insufficient milk | 351 (45.5) |
| Mother was ill | 171 (22.1) |
| Breast problems/going to work | 92 (11.9) |
| Baby was ill | 64 (8.3) |
| Others | 94 (12.2) |
Table 2. Prevalence of combined feedings in a nationwide nutritional survey.

| Age (m) | Number bottle fed | Number breastfed | Prevalence (%) |
|---------|-------------------|------------------|----------------|
| Birth   | 485               | 3781             | 88.6           |
| 1       | 2174              | 2092             | 49.0           |
| 2       | 2725              | 1541             | 36.1           |
| 4       | 3390              | 876              | 20.5           |
| 6       | 3831              | 435              | 10.2           |
| 12      | 4190              | 76               | 1.8            |
| 18      | 4251              | 15               | 0.4            |
| 24      | 4260              | 6                | 0.2            |

*Prevalence at any age = total no. of children – no. bottle-fed / total no. of children.

Table 3. Pattern of complementary feeding in a nationwide nutritional survey.

| Introduction of complementary feeding (age in months) | Number (%) |
|------------------------------------------------------|------------|
| Bottle feeding                                        |            |
| Birth                                                | 485 (11.4) |
| 1                                                    | 2174 (51.0)|
| 2                                                    | 2725 (63.9)|
| 4                                                    | 3390 (79.5)|
| 6                                                    | 3831 (89.8)|
| 12                                                  | 4190 (98.2)|
| Total                                                | 4266 (100) |
| "Solid food"                                         |            |
| <4                                                   | 200 (4.2)  |
| 4-6                                                  | 3870 (81.5)|
| 7-12                                                 | 680 (14.3) |
| Total                                                | 4750 (100) |
| Whole milk                                           |            |
| <6                                                   | 78 (18.4)  |
| 6-11                                                 | 91 (21.4)  |
| 12+                                                  | 256 (60.2) |
| Total                                                | 425 (100)  |
tively. Compared to the previous survey, the results of this study indicated a higher breastfeeding rate at 1 month, and an earlier as well as a slower decline in the breastfeeding rate with age.\textsuperscript{18} The third national survey was the Saudi Arabia Family Health Survey conducted in 1995 and reported by Khoja and Farid in 2000. The main findings included an 87\% rate of breastfeeding, with only 31\% of infants younger than 4 months of age exclusively or predominantly breastfed. Bottle feedings were started in 33\%, 10.1\% and 8.4\% of infants less than 3, 3 to 5 and 6 months of age and older, respectively. The commonest age of introduction of solid food was between 3 to 5 months in 51.6\% of children, followed by 6 to 8 months of age in 23.7\%.\textsuperscript{19}

Our results are quite consistent not only with those of the nationally-representative surveys, but also with the other more recent local surveys. There is a very high prevalence of initiation to breastfeeding despite delay in initiation after delivery, indicating a willingness of Saudi mothers to breastfeed. Unfortunately, there is a clear tendency to introduce artificial milk formulas too early, leading to a parallel fast reduction and subsequent failure of breastfeeding. This high initiation rate is much higher than the US Healthy People 2010 goals of 75\% initiation.\textsuperscript{20} However, our rates of exclusive and continued breastfeeding are lower than the rates of 42.5\% for exclusive and 51.5\% for mixed (breast and formula) feeding in US children at 3 months, and the rates of 13.3\% for exclusive and 35.1\% for mixed breastfeeding at 6 months.\textsuperscript{21} In previous reports and in the present report, the rate of exclusive breastfeeding by age is not known, but judging from the age at introduction of bottle milk formula, this rate must be very low and far from both the old WHO recommendations of exclusive breastfeeding for 4 to 6 months and very far from the new recommendations calling for exclusive breastfeeding for 6 months.\textsuperscript{22,23}

We conclude that the pattern of infant nutrition in Saudi Arabia has not changed much over the last two decades. Unless the true causes of the premature introduction of milk formula bottle feeding are identified and corrective measures undertaken, we will remain very far from compliance with even the old WHO recommendations. The Saudi Public Health Authorities and other research funding institutions such as King Abdulaziz City for Science and Technology should give priority to research in the important field of infant nutrition.

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