Increased Risk of Rickets among Infants Raised in the Uzbek Cradle, Beshik

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Introduction: High rates of vitamin D deficiency rickets have been reported among Uzbek infants. Our study attempts to clarify the implications of the traditional Uzbek custom of constraining infants to a type of cradle known as a Beshik, in the development of infantile rickets. For up to 2 years after birth, Uzbek infants may spend almost the entire day inside Beshik under a full cover and with their body swaddled, i.e. wrapped snugly in sheaths of cloth or similar material so that the movement of the limbs becomes severely restricted. This practice generally prevents all exposure to sunlight.

Keywords: Beshik (Uzbek cradle); Child development; Rickets; Sunlight (Ultraviolet rays); Vitamin D deficiency

Introduction

Rickets is a failure of the osteoid tissue to calcify in a growing infant due to the deficiency of vitamin D. Vitamin D can be provided through dietary supplements in the form of dairy products, fish oils, etc; it can also be made in skin tissue if there is enough exposure to sunlight.1-3

Rickets type I (i.e., vitamin D dependent rickets) caused by a deficiency of vitamin D, is a relatively common disorder among Uzbek children especially those living in rural areas. There are estimates that about 30% of Uzbek children suffer from vitamin D deficiency rickets, some of whom may die from its complications.4 The Uzbek tradition of swaddling infants in a cradle called "Beshik" is very common in most Uzbek households, and is based on an Uzbek traditional belief that it helps to raise the children safely especially in circumstances where the mother needs to attend to other duties and cannot be near the child. Uzbek social scientists (U. Qoraboyev and B. Sarimsqoqv) have reported on the history of cradle use in Uzbekistan and in particular its use for children up to 1.5 or 2 years of age.4,5 It is a traditional custom for newborn babies to be kept indoors and not to be seen by others for forty days. Thereafter they may still be kept indoors lying in a Beshik and completely covered with a thick futon (Figure 1-A, B). The Beshik is also considered a convenient tool for mothers to keep the baby

Figure 1. The use of Beshik as a cradle. A. A Beshik decorated with blankets, pillows, covers, and etc. used to cover a newborn child. B. An Uzbek woman next to Beshik; the coverage over Beshik and the indoor environment keep the sunshine away from the growing infant.

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in check while doing housework. The total coverage can severely limit the exposure of infants to the ultraviolet rays of sunlight. Babies thus confined may not be exposed to any amount of sunshine for almost an entire year until they begin to walk. There is a hole at the bottom of the Beshik to release the urine and stool so that these infants may spend the entire day lying confined in the Beshik (Figure 1-C). In rural areas, mothers may work in the farms for the full day and come to their children only at breastfeeding time. It has been conjectured that such continuous use of Beshik may play a role in the higher rates of rickets among Uzbek children. The purpose of this research was to examine the role of Beshik use as a risk factor in the development of rickets among Uzbek children.

Figure 1. C. the cradle has two belts; the first belt is tied over infant’s legs and the second one over the chest. Urine pipes are seen in place as used to remove the urine.

Subjects and methods

Andijan, the fourth biggest city in Uzbekistan, is located in the eastern part of the country and has a population of 364,448 (Figure 2). “Eski-Shahar” (old-town) is one of the two main divisions of Andijan and is populated mostly by ethnic Uzbeks, while most of the Russian and other ethnicities live in the “newer” division and districts. Our research was based on primary data that we collected from a public hospital in Eski-Shahar. We visited the local Polyclinics # 2 in August 2007, which offered outpatient medical services to the residents of one of the 8 main neighborhoods in Eski-Shahar. We examined the patient records of a pediatrician in charge of the healthcare of 936 children 14 years of age or younger, residing in the neighborhood. In this hospital, cases of rickets were recorded upon a clinical diagnosis mainly based on physical examination which included observation of skeletal deformities such as delayed closure of the anterior fontanelle, craniotabes and a deformed skull, delayed sitting, crawling and walking, bowleggedness (genu varum), rachitic rosary, muscular hypotonia, abdominal hypotonia and distention, and pigeon chest (pectus carinatum). Among the children under care by the clinic, we examined the pediatric records of those less than 6 years old, dividing them into those with and those without a history of rickets. We estimated the risk ratio (relative risk, RR) of prolonged Beshik use in causation of rickets based on the data we found in the pediatric records. Moreover, we interviewed 10 mothers of those children diagnosed with rickets as well as a group of 10 mothers of healthy children of the same age as the rickets cases, to investigate the attributes of prolonged Beshik use, especially the duration of Beshik use in years and hours per day, the sunlight exposure allowance per day, and any intake of supplements.

Results

We conducted a case-controlled study based on the medical records of children with and without rickets who had or did not have a history of prolonged use of Beshik in their infancy. According to the medical records, there were 38 registered cases of rickets among 225 children less than 6 year old living in this area (187 controls). Our findings have been summarized in Table 1. Thirty-three out of 38 cases of rickets occurred with prolonged Beshik use (at least 20 hours per day) while only 39 children among the control group had a history of prolonged Beshik use. Using the formula for risk ratio (RR).

Table 1. The extracted data from 225 records of children, with & without rickets under care by Polyclinics # 2 in Eski-Shahar, Andijan City

<table>
<thead>
<tr>
<th>The year of birth</th>
<th>children born in that year who never had rickets</th>
<th>children born in that year who were recorded as rickets</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>36</td>
<td>7</td>
</tr>
<tr>
<td>2003</td>
<td>28</td>
<td>11</td>
</tr>
<tr>
<td>2004</td>
<td>33</td>
<td>5</td>
</tr>
<tr>
<td>2005</td>
<td>32</td>
<td>11</td>
</tr>
<tr>
<td>2006</td>
<td>31</td>
<td>3</td>
</tr>
<tr>
<td>2007 (till September)</td>
<td>27</td>
<td>1 (the most recent case)</td>
</tr>
<tr>
<td>Total</td>
<td>187(total no. of controls)</td>
<td>38 (total no. of cases)</td>
</tr>
</tbody>
</table>
RR = Risk(Quench) / Risk(NoQuench) = [a / (a + b)] / [c / (c + d)], we calculated a relative risk of about 14 (a=33, b=39, c=5, & d=148).

We also conducted interviews to inquire about the patterns of Beshik use as recorded by the pediatricians. Nine out of the 10 mothers who had a child with rickets reported a prolonged use of Beshik, meaning that nine out of 10 of the children spent more than 20 hours a day of their infancy in the cradle. The Beshiks were commonly located in rooms with less exposure to sunshine. Some children had spent about 2 hours a day outside the Beshik but were still kept indoors where they could hardly receive any direct sunlight. Among the 10 cases of rickets interviewees, 9 had been on an exclusive breastfeeding diet for at least 1-1.5 years and only one child had taken supplements containing vitamin D from birth (the same child with less hours spent in the Beshik). The healthy children in our control group did not have such a history of continuous or prolonged Beshik use and had not received vitamin D supplements either. However, they had generally spent a few hours outside the house with direct exposure to sunshine.

Discussion

For temperate climates, it has been estimated that about 2 hours of exposure to sunlight per week with only the infant's face exposed, or 30 minutes per week with the infant only in diapers would be sufficient to prevent vitamin D deficiency rickets. In countries with good sunshine such as in India and in African countries, rickets is usually associated with a dark skin pigmentation that can limit the penetration of sunshine. Uzbek people do not have darkly pigmented skin and in Andijan city there are approximately 300 days of sunny days in a year. However, many Uzbek children raised in Beshik receive substantially less exposure to sunlight and may spend more than 20 hours a day inside the cradle. In our study the great majority (33/38, close to 87%) of children with a history of rickets were brought up in a traditional Uzbek Beshik for the entire day and this would continue for almost 2 years. On the other hand, most of healthy children (148/187, close to 79%) were brought up without such continuous and prolonged use of a Beshik and spent some time outdoors. The relative risk of developing rickets among the infants with a history of prolonged Beshik use compared to infants without such a history, was 14 (RR # 14). This risk ratio suggests a considerably higher risk of rickets under these conditions. Even though the number of the interviewed mothers was small, the collected information confirmed the social gravity of the problem. The limited data in the pediatric records suggested that probably 40 to 70 percent of Uzbek infants born in Eski-Shahar had been raised in a Beshik to some degree, and about 20 to 40 percent were kept in Beshik for a prolonged time (more than 20 hours a day). These numbers could be significantly higher among Uzbeks living in rural areas.

Another important issue to consider is the role of nutritional factors. Rickets is uncommon in Northern European countries such as Norway, though exposure to sunshine is limited; the high quality of nutrition and the use of rich dietary supplements in these countries protect the infants against vitamin D deficiency. In Japan and Malaysia, the rate of rickets is also very low because fish consumption has a positive effect on serum 25(OH)D. However, Uzbekistan is a landlocked country with little access to seafood; people living in rural areas may eat only what they harvest; and food or milk do not contain added vitamin D supplements. In our study virtually none of the infants had received enough vitamin D supplementation; they were exclusively breastfed. Only one child had received vitamin D supplements from birth but still had a history of rickets; the supplementation was probably not provided accurately. The control group of children in our study had not received vitamin D supplements either; they were almost exclusively breastfed from birth.

Another possible contributing factor to the high rate of rickets is the immobility of infants in the Beshik. According to a retrospective research done by Australian scientists, both physical activity and sunlight are important factors in mineralization of bones in children. Physical activity stimulates the osteoblasts and increases the growth of the bones and their mineral content. Immobilization of infants can directly influence the development of clinical rickets. However, more research is needed to examine the relative significance of any of the two factors in the higher risk of rickets. There are similar swaddling customs in Mongolia for infants. To protect them against the cold climate, they may be kept swaddled from birth for at least several months. There is little exposure to sunlight; vitamin D supplementation is very little and exclusive breastfeeding is common; the rate of rickets has been reported as high. However, the babies are not always constrained to lie in a cradle and may be taken outdoors on sunny days. Some case-control studies have suggested that swaddling habits are not causing rickets in Mongolia.

Other factors such as poverty and poor life conditions, mother's level of education, the amount of supplement intake, etc may be involved in the higher rates of rickets among Uzbek infants. Poverty and a low level of education minimize the chances that infants receive enough vitamin D in their diet. A more detailed study on the hours of exposure to sunlight and/or being swaddled in the Beshik among a group of Uzbek children can help plan appropriate public health recommendations on the use of these cradles. Although strong traditional and cultural beliefs may make it difficult to abolish the use of the Beshik among Uzbeks, public health promotion efforts may help reduce the all day long pattern of usage.

Acknowledgments

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