High prevalence of iron deficiency anemia in infants attending a well-baby clinic in northwestern Saudi Arabia

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ABSTRACT

الأهداف: تحديد معدل انتشار فقر دم نقص الحديد في الأطفال من عمر 6 أشهر إلى 24 شهراً المراجعين لعيادة الطفل السليم بالمراكز الصحية في المنطقة الشمالية الغربية من المملكة العربية السعودية.

الطريقة: اجريت هذه الدراسة الاستطلاعية الوبائية مستعرضة في المنطقة الشمالية الغربية من المملكة العربية السعودية في خمسة مراكز صحية تم اختيارها بطريقة عشوائية، وتم إجراء الدراسة في 500 طفل حيث تم اختيار 100 طفل من كل مركز صحي ، وأجريت الدراسة بأخذ عينة دم من الأطفال لتحديد نسبة الهيموجلوبين وكذلك نسبة الحديد لتحديد المصابين بفقر دم نقص الحديد ، وقد أجريت الدراسة في الفترة من أبريل 2013م إلى يناير 2014م.

النتائج: اظهرت نتائج الدراسة أن 246(49%) من 500 طفل مصاب بفقر دم نقص الحديد، وكان متوسط الأعمار15 شهراً ،كان منهم 130 (53%) من الذكور و116(47%) من الإناث (*p*=0367) وليس هناك فرق بين الذكور والإناث في معدل الإصابة. كما اظهرت الدراسة أن 126(51%) من 274 طفل سعودي تم فحصهم مصابون بفقر دم نقص الحديد.

الخاتمة: هذه النتائج توضح ارتفاع نسبة المرض بالمنطقة ، وهذه النسبة مشابهة لدراسات سابقة بالمملكة والعالم العربي. ونظراً لخطورة هذا المرض لما يسببه من إعاقة ذهنية وجسدية للأجيال القادمة فإننا نوصي بضرورة إنشاء برنامج وطني للوقاية من فقر دم نقص الحديد بالمملكة والذي يشمل إعطاء الجرعة الوقائية لعقار الحديد للأطفال الرضع من عمر 4 شهور ، وكذلك إجراء الكشف المبكر لجميع الأطفال الرضع عند عمر 12 شهر ، وذلك حسب توصية الأكاديمية الأمريكية لطب الأطفال.

Objectives: To determine the prevalence of iron deficiency anemia (IDA) in infants aged 6-24 months attending the well-baby clinic in primary health care centers (PHCCs).

Methods: This cross-sectional epidemiological study was conducted in the Northwestern region of Saudi Arabia from April 2013 to January 2014 in 5 randomly selected PHCCs. The sample size comprised 500 infants, with 100 infants screened from each PHC. Blood samples were obtained for estimation of hemoglobin and serum ferritin levels.

Results: Out of 500 infants, 246 (49%) cases had IDA with a mean age of 15.4 ± 6.5 months, with 130 (53%) males, and 116 (47%) females (*p*=0367). Out of 274 Saudi infants, 126 (51%) cases were diagnosed as IDA.

Conclusion: Iron deficiency anemia is very common in Saudi infants aged 6-24 months. A national program directed for primary prevention and early discovery of IDA in Saudi infants is recommended at PHCCs system. Iron supplementation is to be given at early infancy with universal screening of hemoglobin and ferritin estimation to all infants at 12 months of age.

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Iron deficiency anemia (IDA) is one of the most serious public health issues in developing countries, with 25% of the world population are affected by IDA.[1] The population group at risk are infants from 4-24 months, school aged children, female adolescents, pregnant women, and nursing mothers.[1] It is the common national problem throughout the world.[2] This national problem continues to be a worldwide concern as iron deficiency (ID) without anemia leads to long term neurodevelopment and behavior disorders

that may be irreversible.[2-4] Iron is essential for intact development of the baby, especially for the development of central nervous system in the first 2 years of life. Iron deficiency anemia adversely affects the central nervous functions resulting in delay in cognitive development.[5] Studies have shown large variations in the prevalence of IDA among developed countries (1-8%).[6-8] A high prevalence of IDA (30-51%) has been reported in developing countries.[9,10] The reported incidence in some Arab countries was 72% among infants.[11] Al Hifzi et al[12] reported that 52% of infants in the Kingdom of Saudi Arabia (KSA) attending well-baby clinics had IDA. For this global health problems, the American Academy of Pediatrics recommends universal screening with hemoglobin determination for IDA at one year of age.[13] As the previous study in KSA showed a very high prevalence of IDA,[12] and as KSA currently has undergone progressive development in many areas, the objective of this study was to determine the current prevalence of IDA, and to indicate whether this prevalence has decreased of these development, despite the lack of a national preventive program, which would recommend routine iron supplementation in all Saudi infants. Our aim is also to raise awareness of the Ministry of Health in KSA of this common problem, which requires national preventive measures to control help control the serious impact of this health issue.

Methods. This observational cross-sectional epidemiological study was carried out from April 2013 to January 2014 in Northwestern region of KSA to determine the prevalence of IDA among healthy infants attending well-baby clinics (WBC) at primary health care centers (PHCCs). This study was approved by the research ethical committee of the Department of Primary Health Care Centers in Northwestern KSA, and sponsored by the Charitable Health Care Society as a part of its program for prevention of common childhood disease. The inclusion criteria comprised: 1) All healthy infants attending well-baby clinics at selected PHCCs for vaccination. 2) Age between 6 and 24 months. The exclusion criteria comprised: 1) Infants with acute febrile illness. 2) Infants with a history of chronic disease. 3) Age less than 6 months or more than 24 months. The estimated sample was 500 infants, calculated by sample size calculator (Raosoft Inc, Seattle, WA, USA) assuming 4.5% precision, with 50% prevalence, and population size of 34523 with 95% confidence interval specified limits. The screening was conducted in 5 PHCCs selected randomly from 4 sectors including 100 infants for each PHCC. Iron deficiency anemia was defined as a hemoglobin level less than 11 gm/dl, or serum ferritin less than 10 µg/L. A dedicated medical team consisting of pediatric specialists, and a staff nurses. Prior to the study, teh team carried out public awareness session at the PHCC. The study was approved by the research ethical committee of the Department of Primary Health Care Centers, Madinah, KSA. Consent was obtained from parents with a questionnaire regarding pregnancy, delivery, parents education, nutritional habits, and was filled for each infant before collection of blood from venous site. All the samples were analyzed for hemoglobin level using a coulter machine (UDI Hem-III plus) (United Diagnostic Industry, Italy). The serum ferritin concentration was measured using an Architect-1-1000 SR machine (ABBOT Diagnostics Santa Clara, CA, USA). Infants with IDA were treated with iron therapy for 3 months; a physician at the PHCC carried out follow up to determine response to therapy.

Data was analyzed by Microsoft Excel computer program (Microsoft Corp., Redmond, WA, USA) and EPI-Info 7 program (Centers for Disease Control and Prevention, Atlanta, Georgia, USA), and chi square test was used for *p*-value. Infants with IDA were treated with iron therapy for 3 months, and follow up for response to therapy were carried out by physicians at PHCC.

Results. The total of 500 infants screened (100 infants from each of the 5 selected PHCCs), 274 (55%) were Saudi, and 226 (45%) were non-Saudi. The age range from 6-24 months, with a mean ± SD age of 15.4 ± 6.5. Iron deficiency anemia was found in 246 (49%) of all screened infants. Out of 274 Saudi infants, 126 (51%) had IDA, and out of 226 non-Saudi infants, 120 (53%)had IDA. Two hundred and ten (85%) of all infants with IDA were breast fed during the study, and 242 (98%) infants with IDA were the product of full term pregnancy. There were 130 (53%) males, and 116 (47%) females with IDA (p=0.367).

Discussion. Our study demonstrated a high prevalence of IDA among Saudi infants, similar to a previous report from 20 years ago.[12] Saudi Arabia had achieved significant cultural and economic development over the last 2 decades; however, despite this

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development, the prevalence of IDA had not reduced, possibly due to the absence of a national prevention program for IDA. Other reports from KSA show the highest prevalence of IDA in children from the Eastern province (41.3%).[13] The current findings show a prevalence lower than reports from other countries.[11,14] We found no significant gender difference among infants with IDA (p=0.367). In Latin American countries, IDA reportedly affects 70% of infants between 6-12 months, and 45% of infants between 12-24 months.[15] In Brazil, the prevalence of IDA is between 50 and 83%.[16,17] In KSA, the prevalence of IDA was 55% among school girls aged from 7-14 years.[18] The mean age of infants in our study was 15.4 ± 6.5 months, similar to a previous report from KSA by Babiker et al.[19]

The limitation of our study is that we did not study risk factor for IDA as our main objective was to determine the prevalence of IDA in the region. However, the risk factors have been studied and are known worldwide to include low birth weight, prematurity, exclusive breast feeding beyond the fourth month of life, weaning to whole milk, and introduction of complementary food without fortification.[20] The criteria for diagnosis of IDA in children used was hemoglobin concentration less than 11 g/dl,[21] and serum ferritin of less than 10 µg/L.[22] There is a big variation in the prevalence of IDA among developed and developing countries, the difference in prevalence may partly be explained by the different criteria used to define IDA. Several studies have clearly demonstrated that children with IDA have associated impaired motor and mental functions at an early stage of IDA.[23-26] Iron deficiency without anemia affect psychomotor development and cognitive function, which may not improve with iron therapy, which may not improved with iron therapy, and can lead to permanent cognitive defect with poor school performance.[27] Iron deficiency anemia is also a risk factor for cerebrovascular event in early childhood.[28] In our study, all infants with IDA received a therapeutic dose (6 mg/kg/day) of elemental iron for 3 months, and were followed up at PHCC. To prevent a psychomotor disorders and a life threatening complications such as stroke in children with IDA, the American Academy of Pediatrics recommend:[20] 1) Term healthy infants should be supplemented with one mg/kg per day of iron beginning at 4 months of age until appropriate iron containing complementary foods are introduced. 2) Preterm infants fed human milk should receive iron supplement of 2 mg/kg per day at one month of age until the infant is weaned to an iron fortified formula of complementary foods. 3) Screening of all infants at 12 months with hemoglobin estimation if the level is less than 11 g/dl; additional screening should include the measurement of serum ferritin.

In conclusion, this study demonstrates that IDA is still common in Saudi Arabian infants aged between 6 and 24 months, and this may lead to serious long-term complications. We suggest further national community based studies to support our findings. To prevent IDA in Saudi infants, we recommend the implementation of a national program directed at primary prevention and early discovery of IDA at PHC system level. This can be achieved by iron supplementation of 1 mg/kg/day for term healthy infants between 4 months and 2 years of age, and for preterm 2 mg/kg/day starting at one month for 2 years, and a universal screening of infants at 12 months with hemoglobin estimation for levels <11 mg/dl with additional measurement of serum ferritin.

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