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General Discussion
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In this thesis we studied nutritional and health aspects of asylum seekers' children in The Netherlands. We hypothesized that nutrition and growth of asylum seekers' children were influenced by the living conditions. Asylum seekers' children of different background are exposed to changing environmental factors that can influence the nutritional habits and the availability and affordability of food products. Socio-economic aspects, such as the availability and affordability of food products, cultural and nutritional habits, family relationships and the coping mechanisms in a new environment, influence the dietary intake of migrants.\(^1,2\) Many migrant families often have a low socio-economic status with a low family income which might cause food insecurity which has shown to be strongly related to unfavourable dietary habits.\(^3,4\) Last decennia nutritional research has tried to find evidence for the importance of adequate dietary intake at childhood to optimize health and to prevent chronic diseases in adulthood.\(^5,6\)
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In Chapter 2 we estimated the quality of the dietary intake of asylum seekers children in The Netherlands in relation to age, gender and origin of the children. We found that the dietary fat intake was high and consisted of mostly saturated fatty acids in a substantial fraction of the asylum seekers’ children. The fat percentage of the total energy intake and the composition of the fat intake are considered to be the most important nutrition health indicator for children. The high intake of unfavourable fat in asylum seekers’ children was most prominent in children originating from Eastern Europe. Neither gender nor length of stay in The Netherlands correlated with the quality of fat intake. Possibly, this observation could be explained by the negative relationship existing between energy density and price, in which high energy dense diets are those that include more fast foods, snacks and desserts, whereas diets lower in energy density are those higher in (mostly expensive) vegetables and fruits as shown in several studies. High fat diets are of great concern because they are considered to carry an increased risk on development of overweight and obesity. The high saturated fat intake found in our study is in contrast with studies among migrant children form Turkey and Morocco in The Netherlands. Those study showed a particular low intake of saturated fat and a higher intake of carbohydrate with a better ratio between polysaccharides and mono/disaccharides than the conventional Dutch diet. Such differences in dietary fat intake have been described between traditional diets of people from Northern and Southern European countries with the most beneficial fat composition in the so called Mediterranean diet with high percentage of unsaturated fatty acids. With migration, a mixture of dietary habits often develops together with an increase of fast food consumption, causing an higher saturated fat intake which might induce unfavourable lipid and insulin levels that are associated with increased cardiovascular disease risks. Micronutrients enable the body to synthesize and/or activate enzymes, hormones and transport proteins essential for proper growth and development. Despite the small amounts needed, the consequences of insufficient availability can be serious. In our dietary study we found a compromised dietary intake of several micronutrients. The intake of iron, calcium and vitamin D was strongly related with the age of the children. Gender or length of stay in The Netherlands did not show a relation with micronutrient intake. Low micronutrient intakes are not seen in the national nutritional survey’s in The Netherlands, which report that the diet of Dutch children between 2-12 years is mainly micronutrient adequate. Situations where the intake may be less adequate are either a disease state, which profoundly affects the demand, or reduces intake, or absorption, or food insecure environmental circumstances. Such food insecure circumstances might have been the case for asylum seekers’ children prior to their stay in The Netherlands. However, world wide even in emergency situations such as war inadequate intake is mostly found in infants and adolescents, as the demand for growth is then higher than during the primary school.
In several European studies inadequate micronutrient intake clearly correlate with socio-economical circumstances. To prevent micronutrient inadequacies a dietary intake with five portions of fruit and vegetables daily is advised in the nutritional guidelines. Fresh fruit and vegetables are rather costly, indicating again that poverty could play an important role in our observations. Improvement of the socio-economical circumstances might contribute to more adequate dietary intake.

The most common nutritional deficiency, iron deficiency, is also strongly related to socio-economic conditions. Asylum seekers' children might be vulnerable for iron deficiency because of their socio-economic situation and possibly also because exposure to nutritional risks prior to their stay in The Netherlands. In Chapter 4 we investigated the prevalence of Iron Deficiency (ID) and anaemia in asylum seekers’ children in The Netherlands in relation to demographic variables and dietary intake of iron. We found a prevalence of ID 10-16% of ID (depending on the definition cut of value of ferritin) and 4% IDA. The prevalence was the highest in children originating from Africa and in children below 6 years of age. The prevalence that we observed was similar to that described in refugee children in more disadvantageous situations. This observation suggests that the situation prior to migration influences the iron status more than the current dietary intake. In accordance with this interpretation the iron status was not related with the current dietary iron intake. The high prevalence of ID among asylum seekers’ children is of great concern. Iron is an essential nutrient important for the transport of oxygen in red blood cells and in mitochondria of nucleated cells. Iron deficiency adversely affects the cognitive performance behaviour and growth of infants, pre- and school aged children. Because of long-term neurological effects early detection, treatment and/or prevention of ID is of importance. The American Nutritional Surveillance System 2000 aimed to reduce the prevalence of iron deficiency to less than 3% among children of 1-14 years of age. Upon nation-wide interventions the prevalence of ID has profoundly decreased. Such nationwide interventions are not indicated in The Netherlands whereas the prevalence of ID among the general Dutch population is estimated 2.6% in children between 2 and 9 years of age and 0.8% in children at 9-15 years of age. In general, the prevalence of ID is related to infant age, breast-feeding, recent infections and inadequate dietary iron intake. We might expect in line with other European studies that prevalence of ID in asylum seekers’ infants and adolescents in The Netherlands is higher than those reported in our study. WHO recommends screening on ID and subsequently treatment in areas where the prevalence is high, to reduce the prevalence to less than 3% among children aged 1-4 years. Our data show a high prevalence of ID in asylum seekers’ children. Also, our results indicate that dietary intake of iron is an unreliable parameter to screen on ID in this group. Rather, appropriate biochemical investigations are necessary. A single finger prick method
could be an effective and useful tool to screen for ID and haemoglobinopathy among asylum seekers’ children. Interventions such as supplementation seem to be justified given the confirmed beneficial effects of supplementation.\textsuperscript{40}

In the Netherlands vitamin D is the only micronutrient for which nutritional guidelines advise supplementation. Asylum seekers’ children in The Netherlands are theoretically susceptible for inadequate vitamin D levels because of their often dark pigmented or covered skin, unfamiliarity with supplement use and marginal dietary intake. We determined the vitamin D status [s-25(OH)D levels] of Asylum seekers’ children in The Netherlands mid spring in relation to demographic variables and the dietary intake of vitamin D and calcium (Chapter 5). In a subgroup we reassessed the vitamin D status after the summer, during which the children had been assigned at random to remain un-supplemented or to receive vitamin D supplements. In mid-spring 13\% of the asylum seekers’ children had Vitamin D deficiency (VDD) [s-25(OH)D ≤30nmol/L] and 42\% hypovitaminosis D [s-25(OH)D ≤50nmol/L]. The compromised vitamin D status could be attributed to a marginal dietary vitamin D intake, geographic origin (skin pigmentation), seasonal variation and a lack of supplement use. This high prevalence is remarkable since vitamin D deficiency is rare among the general Dutch population. Our present results accord with recent concerns about a compromised vitamin D status among migrants in The Netherlands,\textsuperscript{41-43} in the United kingdom and in several Northern European countries.\textsuperscript{44-48}

Adequate vitamin D levels are important for the calcium homeostasis in the body and for the development and maintenance of a healthy skeleton. Early detection of children at risk for impaired bone mineralization seems warranted to guarantee optimal reserve for later life.\textsuperscript{49}

In Chapter 6 we describe the results of the bone mineralization of asylum seekers’ children with seasonal low s-25(OH)D concentrations in relation to the dietary calcium intake. Our data indicate that seasonal low vitamin D levels particularly reduce the mineralization in asylum seekers’ children with inadequate calcium intake. Adequate dietary intake of calcium could easily be obtained with a regular Dutch diet that normally includes dairy products. However, to reach adequate vitamin D levels dietary intake will be insufficient and with reduced endogenous synthesis of vitamin D because of a dark pigmented skin, supplementation is necessary.\textsuperscript{50} To further delineate the observed relationship between the dietary intakes of calcium, vitamin D status and bone mineralization, it would be interesting to apply more detailed dietary nutrient intake methods. Detailed information on the nutritional habits of asylum seekers' children could be of value for nutritional education and for development of strategies to prevent nutritional inadequacies. Strategies to recognize in an early stage, those children who are
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more vulnerable for reduced bone mineralization, will be very helpful to develop further intervention. Recognition of these children may be complicated by the fact that bone is an active tissue that is constantly being remodelled. Analysis of the bone density with different paediatric DEXA software shows discrepancies. The discrepancies and the lack of multi-ethnic references may limit the value of our findings. However, the importance of optimal bone health at young age justifies recommendations to develop strategies to improve the vitamin D status of asylum seekers’ children.

In addition to biochemical aspects of nutrition, growth parameters are also important to assess the nutritional condition of children. We evaluated the use of the Dutch growth references to monitor the growth and nutritional status of asylum seekers’ children in The Netherlands. (Chapter 3.) Our results indicated that the growth of pre-pubertal asylum seekers’ children could be reliably monitored with the use of the Dutch growth reference charts. Our results correspond with the conclusions of the Multi-centre Growth reference Study by WHO that stated that all children have the same growth potential, provided that they are exposed to the same nutritional environment. Interestingly, the prevalence of overweight and obesity increased from 15% to 21% of asylum seekers’ children during their stay in The Netherlands. Since the potential growth of asylum seekers’ children is similar to that of the general Dutch population the high and increasing prevalence of overweight and obesity among the asylum seekers’ children in The Netherlands is alarming. In the general population in The Netherlands the prevalence of overweight and obesity has also increased to almost 10%, but among some migrant groups the values amount up to 15-30%, including our present data. The increased prevalence of overweight and obesity has occurred in many industrialising countries and urbanised areas of developing countries during the past decades. The rate and the extended of this increase assumes that the growth in overweight and obesity is caused largely by environmental factors. From the many environmental factors which are suggested to be partly responsible for this increase, including socio-economic situation, food insecurity, limited physical activities, television watching and low education level, it can be concluded that asylum seekers’ children are in a vulnerable position. Because of the adverse health effects later in life, prevention of overweight and obesity should have priority in asylum seekers’ child health care.

The diet of children aged 2-12 years strongly depends on their environment, in particular their parent(s) or caregiver. The possibility for the caregiver to provide an energy-adequate diet with sufficient amounts of micronutrients depends on knowledge of healthy diets, affordability of food products and cultural and religious habits. In our study we only
measured the current dietary intake and did not investigate dietary knowledge, cultural or religious habits or affordability of food products. We can speculate that the variability in education level and limited knowledge of the Dutch language, might have influenced the dietary habits of the caregiver. The influence of cultural and religious habits seems limited, as macro- and micronutrient contents of an optimal diet can be achieved with most traditional diets. The affordability of food product might exert a greater influence, because the daily allowance for an asylum seekers’ child is limited and an optimal diet high in fruits and vegetables is costly. Improvement of the dietary intake of asylum seekers’ children is therefore only likely to be achieved with a multifaceted strategy in which knowledge, availability and affordability are the key factors. Such a strategy should include appropriate investigation of the iron status of the asylum seekers’ child shortly after arrival in The Netherlands. We could ethically not justify investigating the iron status at arrival and at follow-up without treating ID. The fact that we did not find a low prevalence of ID among children who had been in the Netherlands for a prolonged period indicates that efficient spontaneous recovery of ID does not easily occur.

The studies reported in this thesis were aimed to monitor the growth and nutritional status of asylum seekers’ children in The Netherlands, to evaluate the determinants used to monitor growth and health of asylum seekers’ children and to identify potential nutritional risks in this unique group of children. The studies were supported by an unrestricted grant of the Community health Service for Asylum Seekers (Medische Organisatie Asielzoekers Noord Nederland) to provide scientific data for the development of guidelines, standards and protocols to optimize the health care service for asylum seekers' children in The Netherlands. Shortly after publication of the data on the dietary intake of the asylum seekers' children the food allowance for asylum seekers were increased to the minimum necessary food allowance estimated by the Dutch Budget Institute (NIBUD). Vitamin D supplements are considered self medication (no-prescription) however the national board of the Community health Service for Asylum Seekers has implemented free access to vitamin D supplements for asylum seekers' children below 4 years of age in the Netherlands. Based on present data on the vitamin D status and seasonal vitamin D deficiency the national board has decided to reconsider the indication for providing free vitamin D supplements. In the study area food information markets were organised and leaflets with information on adequate children’s nutrition were developed and translated in the main languages the interest for both of the asylum seekers' parents was high. After publication of our data the national board has decided to explicit the need of nutritional education in their youth program and to update the used nutritional education material for asylum seekers in all regions of The Netherlands.
In conclusion, the present studies have delineated the growth and nutritional status of asylum seekers’ children in The Netherlands. Asylum seekers’ children are vulnerable for both macro- and micronutrient inadequacies. The energy-dense dietary composition might be one of the factors related to the increase of overweight and obesity among the asylum seekers’ children. The consequences of inadequate intake for iron and vitamin D intake were confirmed in high prevalence of anaemia and compromised bone mineralization, respectively. A multifaceted strategy seems justified to develop preventive nutritional and education programs such as nutritional education, free provision of micronutrient fortification of commonly used foods and/or supplementation of iron and cholecalciferol.

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