# The South African National Health and Nutrition Examination Survey

# SANHANES-1

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## 3.6 Nutritional status of adults

### 3.6.1 Vitamin A status of females of reproductive age

Vitamin A deficiency (VAD) is an endemic nutritional disorder throughout much of the developing world, particularly affecting the health and survival of infants, young children, and pregnant and lactating females. These age and life-stage groups represent periods when both nutrition stress is high and diet likely to be chronically deficient in vitamin A (West 2003). Females of reproductive age are also prone to vitamin and mineral deficiencies and may provide insight into the magnitude of micronutrient deficiencies among newborns. It has been reported that approximately 19 million pregnant females are vitamin A deficient (WHO 2009). Health consequences of vitamin A deficiency include mild to severe (blinding) stages of xerophthalmia, and inadequate vitamin A levels in breast milk.

South Africa has implemented a national vitamin A supplementation (VAS) programme for children six months to five years of age and for post-partum females. In addition, a food fortification programme was enacted in 2003. The 2005 National Food Consumption Survey revealed very high levels of vitamin A deficiency among females of reproductive age (27.2%) based on the WHO recommended serum retinol levels of < 0.7 µmol/L (WHO 2011). The present SANHANES-1 survey assessed vitamin A status of this vulnerable group in order to track the impact of current national policy.

Serum vitamin A (retinol) concentrations of < 0.70 mmol/L have traditionally been considered indicative of deficiency based on empirical data from population-based studies that did not exclude the influence of inflammation on serum vitamin A levels. The findings of the 2005 National Food Consumption Survey, documented, however, that the presence of inflammation did not adversely impact on serum vitamin A levels. In adults, appropriate cut-off values < 0.70 mmol/L and < 1.05 mmol/L have been used for different purposes. In this survey, a serum vitamin A concentration of < 0.70 mmol/L, as defined by the WHO, has been used for both children and adults in the assessment of vitamin A status, as follows:

- Vitamin A deficient: serum retinol concentration < 0.70 µmol/L
- Vitamin A sufficient: serum retinol concentration ≥ 0.70 µmol/L.

The following prevalence cut-offs for low serum retinol (< 0.70 µmol/L) to define VAD in populations and its level of public health significance, were applied (WHO 2011):

| Degree of public health problem | Mild | Moderate | Severe |
|---|---|---|---|
| Prevalence of low serum retinol (< 0.70 µmol/L) | 2–9% | 10–19% | 20% or more |

## Results

Overall, South African females of reproductive age had a VAD prevalence of 13.3%, reflecting a moderate public health problem of VAD (Table 3.6.1.1). Although the group 16–25 years of age had lower mean serum retinol concentrations (1.09 µmol/L compared to 1.10 µmol/L) and a lower prevalence of VAD (11.6% compared to 15.8%), these differences were not significant.

No significant urban–rural differences in mean retinol and VAD prevalence were found. However, the formal urban and rural formal areas had higher mean retinol concentrations and lower VAD prevalence, respectively. Western Cape had the highest mean retinol (1.24 µmol/L) and Limpopo the lowest (0.98 µmol/L), Gauteng second lowest

(1.03 µmol/L) and Mpumalanga third lowest (1.04 µmol/L). The difference between the highest and the three lowest means was significant. Further, VAD prevalence was the lowest in Western Cape (7.1%) and differed significantly compared to Mpumalanga, which had the highest VAD prevalence (22.8%) among the provinces. There was a trend for the mean serum retinol concentrations inversely reflected the VAD prevalence, with the exception of Northern Cape, which had the same mean retinol (though with wider 95% CI and fewer numbers) as Western Cape (1.24 µmol/L). Limpopo, with the lowest mean retinol concentrations had the second highest VAD prevalence at 20.4%. This province had the fewest participants, as well as the widest 95% CIs.

Sample numbers were very low for whites (n = 9) and Indians (n = 34), limiting comparisons between race groups. Coloured females had the highest mean retinol and lowest VAD prevalence, a significant finding when compared with black African females (serum concentration 1.27 µmol/L compared to 1.07 µmol/L and a prevalence of 7.2% compared to 14.4%, respectively).

*Table 3.6.1.1: Mean serum vitamin A and vitamin A status among female participants aged 16 to 35 years by age, locality, province, and race, South Africa 2012*

| Background characteristics | Serum vitamin A µmol/L | | Vitamin A < 0.7 µmol/L | | Vitamin A ≥ 0.7 µmol/L | | |
|---|---|---|---|---|---|---|---|
| | Mean | 95% CI | % | 95%CI | % | 95%CI | Sample |
| **Age group** | | | | | | | |
| 16–25 years | 1.09 | [1.06–1.13] | 11.6 | [8.8,15.1] | 88.4 | [84.9,91.2] | 682 |
| 26–35 years | 1.10 | [1.03–1.17] | 15.8 | [9.6,24.7] | 84.2 | [75.3,90.4] | 476 |
| Total | 1.10 | [1.06–1.14] | 13.3 | [9.9,17.5] | 86.7 | [82.5,90.1] | 1 158 |
| **Locality** | | | | | | | |
| Urban formal | 1.13 | [1.06–1.19] | 12.4 | [7.1,20.7] | 87.6 | [79.3,92.9] | 534 |
| Urban informal | 1.03 | [0.93–1.13] | 14.4 | [8.3,23.8] | 85.6 | [76.2,91.7] | 177 |
| Rural formal | 1.17 | [1.09–1.24] | 11.5 | [7.7,16.9] | 88.5 | [83.1,92.3] | 211 |
| Rural informal | 1.06 | [1.00–1.12] | 15.1 | [10.5,21.2] | 84.9 | [78.8,89.5] | 236 |
| Total | 1.10 | [1.06–1.14] | 13.3 | [9.9,17.5] | 86.7 | [82.5,90.1] | 1 158 |
| **Province** | | | | | | | |
| Western Cape | 1.24 | [1.16–1.31] | 7.1 | [4.6,10.9] | 92.9 | [89.1,95.4] | 264 |
| Eastern Cape | 1.11 | [1.02–1.21] | 9.0 | [5.1,15.3] | 91.0 | [84.7,94.9] | 171 |
| Northern Cape | * | * | * | * | * | * | 94 |
| Free State | 1.12 | [1.05–1.18] | 8.1 | [3.4,18.4] | 91.9 | [81.6,96.6] | 116 |
| KwaZulu-Natal | 1.04 | [0.94–1.14] | 16.4 | [9.8,26.3] | 83.6 | [73.7,90.2] | 114 |
| North West | 1.15 | [1.07–1.23] | 8.8 | [4.6,16.3] | 91.2 | [83.7,95.4] | 167 |
| Gauteng | 1.03 | [0.92–1.15] | 17.8 | [8.1,34.7] | 82.2 | [65.3,91.9] | 106 |
| Mpumalanga | * | * | * | * | * | * | 81 |
| Limpopo | * | * | * | * | * | * | 45 |
| Total | 1.10 | [1.06–1.14] | 13.3 | [9.9,17.5] | 86.7 | [82.5,90.1] | 1 158 |
| **Race** | | | | | | | |
| African | 1.07 | [1.02–1.11] | 14.4 | [10.5,19.5] | 85.6 | [80.5,89.5] | 781 |
| Coloured | 1.27 | [1.21–1.34] | 7.2 | [4.3,11.9] | 92.8 | [88.1,95.7] | 331 |
| Total | 1.10 | [1.06–1.14] | 13.3 | [10.0,17.6] | 86.7 | [82.4,90.0] | 1 155 |

*95% CI: 95% confidence interval*

** Too few observations to record reliably*

## Discussion

It is almost ten years since vitamin A supplementation (2002) and food fortification (2003) were implemented in South Africa, and about seven years since the last national food consumption survey (NFCS–2005) (Labadarios 2007) when vitamin A status was last assessed in females. A comparison with the current SANHANES-1 results shows that among females of reproductive age, a decrease in the national prevalence of VAD by more than 50% (13.3% compared to 27.2%) was documented together with an increase in the mean serum retinol levels, 0.96 µmol/L, compared with the present 1.10 µmol/L.

As with the 2005 survey, females in formal urban and rural formal areas of residence had the lowest VAD prevalence and the highest mean retinol concentrations. There was, however, an overall improvement for all localities compared to NFCS 2005. Mean retinol and VAD improved in all the provinces, except for Mpumalanga and Northern Cape. The 2005 sample numbers for Northern Cape were low at 32 participants and could have influenced the results. Limpopo, while showing a slight increase in mean retinol, had the second highest VAD prevalence of the provinces – the sample number was small at 45 compared to 161 in 2005. Coloured females had significantly higher mean retinol levels compared to black African females, 1.27 µmol/L compared to 1.07 µmol/L. If one discounts the two groups with the low numbers of participants, then VAD was most prevalent among the majority of the black African group of females.

It is encouraging to note the improved vitamin A status, more so among females of reproductive age, over the past decade. There has been a marked improvement in vitamin A status among females in KwaZulu-Natal, but deterioration in those from Mpumalanga. In the case of the latter, VAS is unlikely to have made an impact on VAD since the supplementary dose is not high enough and of insufficient duration. In this regard, the 2011 WHO guidelines (WHO 2011a) on VAS state that supplementation in pregnant and post–partum females is not recommended for the prevention of maternal and infant morbidity and mortality. The National Department of Health decided to stop post-partum VAS in August 2012 (Department of Health Circular 2012). This decision needs to be reviewed in light of the present findings, which, though showing an improvement in vitamin A status, they also indicate VAD of moderate public health importance among females of reproductive age. The cessation of post-partum VAS may impact on the transfer of retinol to young infants via breast milk, and hence their vitamin A status. What is disconcerting, however, is that South African females have lower mean retinol levels (1.10 µmol/L) than those found in Ghana (1.54 µmol/L in non-pregnant and 1.15 µmol/L in pregnant females) (Kirkwood 2010), Nepal (1.15 µmol/L in pregnant females) (West 1999), Vietnam (1.49 µmol/L) (Arnoud L 2012), Brazil (1.61 µmol/L in post–partum females) (Andreto 2012), and Iran (2.38 µmol/L) (Jafari 2013).

Finally, it should be remembered that optimal breast feeding of infants and young children and consumption of an adequate and varied diet with vitamin A-rich foods by both females and children, combined with other health improvement measures such as control of infectious diseases, are the best strategies for avoiding vitamin A deficiency. Furthermore, the current policy on food fortification should continue despite recent evidence (Awasthi, Peto, Read et al. 2013) that vitamin A status may have only a modest effect on child mortality.

### 3.6.2 Anaemia and iron status of adults

Anaemia is one of the most common and intractable nutritional problems in the world today (WHO 2007). Some two billion people are anaemic, defined as haemoglobin (Hb)