

CHAPTER 8

CONCLUSIONS AND RECOMMENDATIONS

8.1 Introduction

The aim of this study was to investigate the possibility for the existence and development of the metabolic syndrome in a sample of “apparently healthy” rural and urban Africans in the Northwest province of South Africa.

- The questions addressed were whether the metabolic syndrome exists in the black population of the Northwest province and if it does, what are the characteristics of this syndrome in this population?
- The hypothesis tested was that despite the concept of “healthy obesity” in black women (Walker *et al.*, 1991) the metabolic syndrome will also develop in black South Africans when they adopt Western lifestyles.

The interpretation of the results were complicated by the bias which unexpectedly occurred in the subject sampling and the accompanied reduction of sample size as described in Chapters 3 and 4. Therefore, the results obtained in this study should only be interpreted as possibilities and indications in the development of the metabolic syndrome in this population.

8.2 Conclusions

8.2.1 Conclusions on the occurrence of the metabolic syndrome

- **Insulin resistance does exist in the studied population**
As discussed in Chapters 5 and 6, insulin resistance exists in this population. A worsening of the risk profile for NIDDM, CHD and obesity were detected from a condition of a high insulin sensitivity towards a high insulin resistance although the examined risk markers were still within the boundaries of normal ranges.
- **The clustering of risk factors of the metabolic syndrome does exist in the studied population**
Although the studied population consisted of “apparently healthy” subjects, up to five risk

factors in men and six in the women were observed. However, the incidence of clustering was low (discussed in Chapter 7).

- **Insulin resistance was not the underlying common factor in all the clusters of risk factors for the metabolic syndrome, in this population**

In this thesis the metabolic syndrome was defined as the clustering of risk factors for the chronic diseases of lifestyle with insulin resistance as underlying common factor (Reaven, 1988). The term “multiple metabolic syndrome” will be more appropriate to use in this population as it does not rely on assumptions about underlying etiologic mechanisms and retains a certain neutrality as suggested by Liese *et al.* (1998). Insulin resistance accounted for only 25% of the clusters in men and 34% in women.

8.2.2 Conclusion on the hypothesis of “healthy obesity” in black women

- **Obesity is a risk factor for the development of insulin resistance and a “multiple metabolic syndrome” in the studied population.**

Although the mean BMI of the women (26.9 kg/m²) was significantly higher and their mean insulin sensitivity index (129.9) was significantly lower than that of the men (BMI = 20.5 kg/m²; IS index = 154.4), the percentage of subjects who experienced no risk factors for the metabolic syndrome was approximately the same (42% men; 42.5% women). However, a definite increasing risk profile in obesity markers was observed from a condition of insulin sensitivity towards insulin resistance in both genders (Chapters 5 and 6). Insulin resistance accounted for 34% of the clusters that existed in the women. As the incidence of insulin resistance increases in these women, one could expect an increase in clustering of risk factors. Risk estimations indicated that insulin resistance could predict up to 68% of the clustering of risk factors in the women of this population (Chapter 7).

Risk estimations showed that urbanisation is a risk factor for the development of insulin resistance in women. It also revealed that low physical activity can be related to clustering of risk factors for NIDDM, CHD and obesity in women (Chapter 7). It can therefore be expected that changing lifestyles during urbanisation and a decrease in physical activity may turn the scale towards a worse risk profile in obese women.

Despite the role that “chance” could have played in these results, it can be concluded that “healthy obesity” does not exist in this population. Although these obese women were asymptomatic from chronic diseases at the time the study, they are at risk to develop these diseases.

8.2.3 Additional conclusions

- An increase in serum urea levels in women was associated with insulin resistance/decreased insulin sensitivity (Chapters 5, 6 and 7). The role of insulin resistance in the pathogenesis of hypertension is still very controversial. This finding needs further investigation as it may hold a key between kidney function and hypertension. Research indicated that hypertension frequently increases in African women with urbanisation (Malan *et al.*, 1992).
- Risk estimations revealed that a total serum cholesterol above 4.4 mmol/L might be a risk marker in the clustering of risk factors, as well as for insulin resistance to develop in the men. This is a much lower value than the accepted cutoff value of 5.5 mmol/L for increased risk of CHD (Rossouw *et al.*, 1988). In women, serum cholesterol is probably likely to predict clustering of risk factors at a level above 4.8 mmol/L (Chapter 7).
- Risk estimations also revealed a possible lower value for a two hour serum glucose: this study found a value of > 6.1 mmol/L to be a possible predictor for the clustering of risk factors in the men, compared to the accepted >7 mmol/L criteria set by the WHO (1997) (Chapter 7).
- Normal ranges for serum ferritin levels are 20 - 300 $\mu\text{g/L}$ in men and 20 - 120 $\mu\text{g/L}$ in women (Brink *et al.*, 1988). Risk estimations showed that a level greater than 163.4 $\mu\text{g/L}$ in men and 73.3 $\mu\text{g/L}$ in women may predict a risk for insulin resistance in this population. It should be kept in mind that the serum ferritin levels of the fasted sub-sample were significantly lower than the rest of the THUSA-subjects (Chapter 4). Therefore, this finding (although it should be interpreted with care due to the large interpersonal variations and small numbers) is alarming and needs further investigation.

- A plasma fibrinogen level above 4.3 g/L in women and 3.5 g/L in men was implicated as a possible risk factor in the development of insulin resistance in women and clustering of risk factors in men. As discussed in Chapter 7 the link between fibrinogen and insulin resistance in obese people can possibly be explained through the involvement of interleukin-6. In this study, obesity in the men was absent which might be an indication that the link between fibrinogen and the metabolic syndrome might be related to nutrition as suggested by James *et al.* (2000).
- The influence of urbanisation on the development of the metabolic syndrome is not clear. Although risk estimations revealed that urbanisation might be a predictor of insulin resistance in the women, the presence of risk factors and the clustering thereof were found in all levels of urbanisation. This was due to the fact that insulin resistance was not present in all the clusters of risk factors, but probably also due to “contamination” between the different urbanised groups.
- A low physical activity level seems to be a good indicator for the clustering of risk factors in the women of the studied population.
- Total food energy intake *per se* might not be a good indicator of obesity’s role in the development of the metabolic syndrome and/or insulin resistance. The macronutrient composition of the diet might give a better indication.
- In this population insulin resistance did not increase with age.

8.3 Recommendations

Due to the fact that we were in the fortunate position to investigate the development of the metabolic syndrome at an early stage in this population, emphasis should be on the development of culturally-sensitive appropriate community-based public health intervention programmes before the long-term complications of chronic diseases have devastating effects on the people.

Health intervention programmes should be based on a set of proper defined criteria. The data generated in this study provide a platform for future research programmes to define

such criteria. The following recommendations are suggested for future research:

1. Evaluation of the appropriate cutoff values for total serum cholesterol, serum ferritin and two hour serum glucose levels to predict profiles for risk factor clustering and insulin resistance in Africans. A study done by Maling *et al.* (1995) on metabolic markers of hyperinsulinaemia in Maori and Caucasian New Zealanders emphasises the ethnic specificity of biochemical markers of hyperinsulinaemia.
2. Serum urea as the possible link between insulin resistance and hypertension in black women should be investigated.
3. The effect of the macronutrient composition of the diet in the development of insulin resistance and/or the metabolic syndrome needs further investigation and is supported by the findings and suggestions of Wolever (2000).
4. The involvement of fibrinogen in the development of the metabolic syndrome should be investigated in more detail in this population.

The results of this study emphasised the importance of education and physical activity and their protective role against the clustering of risk factors of chronic diseases. It will therefore be appropriate to recommend that education on the relevancy of physical activity and healthy diets be included in health intervention programmes. Physical activity does not necessarily implicate gym exercises or participation in sport, but also includes walking, physical labour and dancing. It is suggested that practical and culturally-sensitive programmes should be developed for this population.

CONGRESS PRESENTATIONS

The following papers, based on this thesis have been presented:

Kruger, A. Vorster, H.H. May 1998. Does Syndrome X occur in the black population in the Northwest province? 5th Biennial Congress of the Association for Dietetics in Southern Africa and the 17th Biennial Congress of the Nutrition Society of Southern Africa. Sun City, South Africa.

Kruger, A. Vorster, H.H. October 1999. Characteristics of the metabolic syndrome in Africans of the Northwest province (THUSA study). Diet, Diabetes and cardiovascular diseases. Medical Research Council, Cape Town, South Africa.